PROJECT MANUAL

May 1, 2026

Bid Set Addendum E
Volume 1

Yurok Health & Wellness Center

Weitchpec, CA

PYATOK
360 22nd Street
Suite 200
Oakland, CA 94612
T: 510.465.7010

Pyatok.com

Project: 2307

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END OF DOCUMENT

SECTION 00 71 13 - GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.1 GENERAL CONDITIONS OF THE CONTRACT

A. General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition, as modified by Owner, hereinafter referred to as General Conditions, are hereby made a part of this Specification.

B. The Contractor is hereby specifically directed, as a condition of the Contract, to acquaint itmself with the Articles contained therein, and to notify and apprise all Subcontractors and any other parties to the Contract of, and bind them to, its conditions.

C. No contractual adjustments shall be due as a result of failure on the part of the Contractor, Subcontractors or other parties to the Contract to fully acquaint themselves with the General Conditions.

D. The General Conditions of the Contract may be amended by Supplementary Conditions.

E. The provisions of the General and Supplementary Conditions when included and Division 01, General Requirements, apply to the Work specified in each Section of the Specifications.

F. Where conflicts occur concerning the Architect's duties and responsibilities between the General Conditions and the Agreement between the Owner and Architect, the Agreement shall take precedence.

G. If not otherwise included in the Owner Contractor Agreement or specifically included in the bidding documents, the Contractor shall obtain the Owner’s insurance requirements prior to submitting a bid.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Yurok Health and Wellness Center

1. Project Location: Rube Ranch Road, Weitchpec, CA, lot 531-082-002
2. Architect's Project Number: 2307

B. Owner: Yurok Tribe.

C. Architect: PYATOK

1. Architect's Address: 360 22nd Street, Suite 600, Oakland, CA 94612

1.3 WORK COVERED BY CONTRACT DOCUMENTS

1. Three interconnected buildings serving as residential treatment center, outpatient clinic, and other community-serving meeting rooms. Project includes site improvements, a new access road, parking, new utility connections, septic fields, site retaining walls, and water storage and supply tanks for domestic and fire suppression water.
2. Buildings are of Type V-A construction, fully sprinklered, and are considered for CBC Chapter 5 purposes to be one interconnected building governed by A-3 occupancy.
3. Central Commons Building: Two-story wing including OSHPD 3 outpatient clinic, central mechanical and electrical rooms, commercial kitchen and dining are, communal spaces for treatment center residents, and administrative spaces for facility staff.
4. West House: Two-story wing with workshop and classroom space for treatment center residents, overnight suites for guests, maintenance and storage spaces, and dormitory facility for residents, including 9 sleeping rooms, lounge, restrooms, showers, laundry, and managers's office.
5. East House: One-story wing serving as dormitory facility for residents, including 11 sleeping rooms, lounge, restrooms, showers, laundry, and manager's office.

B. Project is on Yurok Tribe land and is subject to its jurisdiction.

1. See Drawings for governing codes and regulations.
2. Contract Documents may include voluntary compliance requirements with certain federal, state, city, and county codes and regulations.

C. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products: Non-fixed furniture, equipment and appliances indicated in Drawings.

1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated, and as follows.

1. Contractor may use Owner's property for construction operations and staging, but may not use surrounding areas except as specifically granted.

1.6 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

2. Plans for off-site parking, site access routes, hours of operation, and procedures for addressing neighbor concerns shall be agreed upon with the Owner prior to start of construction.

B. Controlled Substances: Use of tobacco products, cannabis products, and other controlled substances on Project site is not permitted. Smoking is not permitted within 25 feet of entrances, operable windows, or outdoor air intakes.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.
4. Contingency allowances.

1.2 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders. See Section 01 26 00 "Contract Modification Procedures."

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 UNIT-COST ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.9 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.10 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

~~A. Exterior Mockup: Lump sum allowance of $30,000.~~

~~B. Moisture Vapor Control: Unit-cost allowance to apply moisture vapor control membrane at ground floor slabs on grade to receive resilient flooring products.~~

A. Artwork Coordination: Allowance of $50,000 to cover coordination of work design and/or created by artists (including designers and craftspeople) selected by the Tribe. Allowance is intended to cover Contractors' costs for direct coordination with artists, provision of supporting work including blocking, electrical connections not indicated in the base drawings, and installation of completed artwork where required. Expenses for the design and production of the artwork will covered by the Owner and are not included in the Allowance.

1. Architect and Owner will provide a schedule of artwork elements and associated budgets for each.

B. Exterior Mock up: Allowance of $30,000 to provide free standing mock up of exterior components including exterior side, wood siding, storefront, and entry canopy. Architect to provide drawing for general layout of mock up.

C. Display Case at Entry Hall: Allowance of $20,000 to provide glazed display case at Entry Hall. Refer to Section 10 12 00 "Display Cases" for specifications.

~~D. Vapor Emission Treatment (09 05 61.13): Contractor to provide Allowance for application of Vapor Emissions Treatment at concrete slab on grade areas to receive sheet floor materials.~~

END OF SECTION

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 01 21 00 "Allowances" for procedures for using unit prices to adjust quantity allowances.
2. Section 01 26 00 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

A. Unit price is an amount incorporated into the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the Part 3 "Schedule of Unit Prices" Article contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Moisture mitigating membrane at slabs-on-grade.

1. Description: Treatment of concrete floor slab in contact with earth and to receive resilient flooring, in accordance with Section 09 05 61.13 "Moisture Vapor Emission Control."
2. Unit of Measurement: One square foot of concrete slab treated.

END OF SECTION 01 22 00

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SECTION 01 23 00 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by Contractor for certain work that may be added to or deducted from the Guaranteed Maximum Price amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following Notice to Proceed, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate 1: Sliding Visual Partition at Activity Room.

1. Alternate: Bid the following:

a. Provide sliding visual partition at Activity Room at Line C.5
b. Provide 6 panel symmetrical system approximately 9'-6" tall with top and bottom track.

c. BOD for Door to be Raydoor SW65 with solid while laminate infill panels, and recessed floor track.
d. Provide manufacturer's locking door hardware.

2. Base Bid: Do not include sliding visual partition at Activity Room.

B. Alternate 2: Trail Work and Associated Furnishings and Improvements:

1. Alternate: Bid trail work and associated furnishings and improvements as designed on Landscape Drawings.

a. Sheet L-102 Cultural Trail.
b. Sheet L-102 Gathering Area.

2. Base Bid: Do not include the Work of Alternate 2.

C. Alternate 3: Monument Signage at Site Entry:

1. Alternate: Bid entry monument signage indicated on Landscape Drawings.

a. Sheet L-101.

2. Base Bid: Include lighting and electrical supply for signage only, not the signage.

D. Alternate 4: Construction Staking.

1. Alternate: Bid compaction testing as follows:

a. Contractor to provide compaction testing as required by the Contract Documents, including the Geotechnical report. Work to be performed by qualified technicians. Contractor is required to submit qualifications documents of the compaction Tester, and Design Professional of Record to the Construction Manager. The contractor is required to obtain approval of qualifications from the Construction Manager prior to commencing work. Reference Section 01 40 00 "Quality Requirements" for additional information.

2. Base Bid: Do not include compaction testing.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 23 00 "Alternates" for products selected under an alternate.
2. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use facsimile of form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES or ICBO.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor[through Construction Manager] of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Requested substitution provides sustainable design characteristics that specified product provided.
    c. Substitution request is fully documented and properly submitted.
    d. Requested substitution will not adversely affect Contractor's construction schedule.
    e. Requested substitution has received necessary approvals of authorities having jurisdiction.
    f. Requested substitution is compatible with other portions of the Work.
    g. Requested substitution has been coordinated with other portions of the Work.
    h. Requested substitution provides specified warranty.
    i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    d. Requested substitution provides sustainable design characteristics that specified product provided.
    e. Substitution request is fully documented and properly submitted.
    f. Requested substitution will not adversely affect Contractor's construction schedule.
    g. Requested substitution has received necessary approvals of authorities having jurisdiction.
    h. Requested substitution is compatible with other portions of the Work.
    i. Requested substitution has been coordinated with other portions of the Work.
    j. Requested substitution provides specified warranty.

k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes Proposal Request, Contractor shall issue a Change Order for signatures of Owner and Architect on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 00 71 13 - General Conditions of the Contract.
2. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with continuation sheets.
b. Submittal schedule.
c. Items required to be indicated as separate activities in Contractor's construction schedule.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Schedule Updating: Update and resubmit the schedule of values with the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use Contractor forms similar to AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

E. Waivers of Mechanic's Lien for Current Payment Application: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit executed waivers of lien on forms provided by California Contractors State License Board.

F. Waivers of Mechanic's Lien for Prior Application: If requested, with each Application for Payment, submit waivers of mechanic's liens from subcontractors for construction period covered by second to last payment received by Contractor.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following, if requested:

1. List of subcontractors.
2. Schedule of values as agreed in Owner contract.
3. Contractor's construction schedule (preliminary if not final).

4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Report of preconstruction conference.
9. Contractor's certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project management and documentation web site (Project Web Site).
5. Project meetings.

B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

A. Project Communication: Deliver project correspondence via project management and documentation website. See Article "Project Web Site" herein.

B. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activitiesto avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
e. Indicate required installation sequences.

f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Locations: Locations requiring coordination drawings include, but are not limited to, the following:

   a. Conduit and services cast into concrete.
   b. Conduit, piping, and other services exposed overhead in finished Work.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

   a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. RFI number, numbered sequentially.
6. RFI subject.
7. Specification Section number and title and related paragraphs, as appropriate.
8. Drawing number and detail references, as appropriate.
9. Field dimensions and conditions, as appropriate.
10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
11. Contractor's signature.
12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI, except as follows.

1. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
2. Architect's receipt of more than 10 RFIs in one day will be deemed to allow additional 5 working days of response time.

3. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

4. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
5. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Submit software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. RFI number including RFIs that were returned without action or withdrawn.
4. RFI description.
5. Date the RFI was submitted.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT WEB SITE

A. Provide, administer, and use Project Web Site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web Site shall include the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Photo documentation, except as managed in separate photographic documentation service.
7. Submittals forms and logs.
8. Drawing and specification document hosting, viewing, and updating.
9. Online document collaboration.

10. Reminder and tracking functions.
11. Ball-in-court function, indicating party responsible for next action for RFI, submittals, and other correspondence.
12. Archiving functions.
13. Scanning services for paper submittals provided by subcontractors and suppliers, at Contractor's option.

B. Provide Project Web Site user licenses sufficient for full, simultaneous project team access, for use of the Owner, Architect, and Architect's consultants.

C. Provide software training at Architect's office or as a web conference for Project Web site users.

D. Conduct a meeting to establish protocols for the Project for use of the Project Web Site for communication and documentation.

1. Meeting may be incorporated into the Preconstruction Conference.
2. Attendees shall include, at minimum, Owner, Architect, and their consultants, Contractor and its superintendent, and major delegated-design subcontractors.

E. On completion of Project, provide two complete archive copies of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

F. Provide a Project Web site software packages under its current published licensing agreement. Available Project Web Site systems:

1. Textura Corporation; Procore for Construction.
2. Plangrid, Inc.; Plangrid.

G. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.

2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Lines of communications.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of record documents.
    l. Use of the premises and existing building.
    m. Work restrictions.
    n. Working hours.
    o. Owner's occupancy requirements.
    p. Responsibility for temporary facilities and controls.
    q. Procedures for moisture and mold control.
    r. Procedures for disruptions and shutdowns.
    s. Construction waste management and recycling.
    t. Parking availability.
    u. Office, work, and storage areas.
    v. Equipment deliveries and priorities.
    w. First aid.
    x. Security.
    y. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.

f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for completing sustainable design documentation.
e. Requirements for preparing operations and maintenance data.
f. Requirements for delivery of material samples, attic stock, and spare parts.
g. Requirements for demonstration and training.

h. Preparation of Contractor's punch list.
i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
j. Submittal procedures.
k. Coordination of separate contracts.
l. Owner's partial occupancy requirements.
m. Installation of Owner's furniture, fixtures, and equipment.
n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Status of sustainable design documentation.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of proposal requests.
16) Pending changes.
17) Status of Change Orders.

18) Pending claims and disputes.
19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Material location reports.
5. Site condition reports.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports and for Submittal Schedule.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.
3. Section 01 81 13 "Sustainable Design Requirements" for scheduling building flush-out.
4. Section 01 91 13 "General Commissioning Requirements" for scheduling commissioning activities.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file. Where standard for Contractor, submittals may be kept on file at Project Site and on Project Web Site.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Prepare at weekly intervals.

F. Material Location Reports: Prepare at weekly intervals.

G. Site Condition Reports: Prepare at time of discovery of differing conditions.

1.4 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Review delivery dates for Owner-furnished products.
4. Review schedule for work of Owner's separate contracts.
5. Review submittal requirements and procedures.
6. Review time required for review of submittals and resubmittals.

7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for Project closeout and Owner startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Owner's schedule provided as part of Agreement shall govern milestone dates and time limits.
2. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following, except as otherwise agreed by Owner, Architect, and Contractor for specific activities:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Building Flush-Out: Per Section 01 81 13 "Sustainable Design Requirements."
6. Commissioning: As determined by CxA, per Section 01 91 13 "General Commissioning Requirements."
7. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion, unless otherwise agreed by Owner, Architect, and Contractor.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Coordinate delivery dates with Owner.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Use of premises restrictions.
    b. Seasonal variations.
    c. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.

6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion. Include other milestones indicated in Owner's schedule.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.

4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

3. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing.
    j. Commissioning.
    k. Building flush-out.
    l. Punch list and final completion.
    m. Activities occurring following final completion.

4. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
5. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

B. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

C. Initial Issue of Schedule: Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.

D. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.

17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

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SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting photographic documentation.
2. Section 01 77 00 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph . Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
g. Unique sequential identifier keyed to accompanying key plan.

1.3 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage an experienced photographer to take construction photographs. Photographer on Contractor's staff is acceptable.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

D. Preconstruction Photographs: Before commencement of excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.
b. Immediate follow-up when on-site events result in construction damage or losses.
c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
d. Substantial Completion of a major phase or component of the Work.

e. Extra record photographs at time of final acceptance.

END OF SECTION 01 32 33

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 01 31 00 "Project Management and Coordination" for Project Web Site for electronic submittal exchange.
3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule, and for Critical Path activities.
4. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
5. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect'sresponsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect'sresponsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

a. Designate submittals for Critical Path activities in submittal schedule. See Section 01 32 00 "Construction Progress Documentation".
b. Allow 10 working days for critical path submittals and 20 working days for all other submittals. See "Processing Time" herein.

c. Include additional time for groups of submittals requiring concurrent review.
d. Include additional time for large submittals.

2. Include concurrent review by consultants and Owner according to discipline of consultants indicated in Project Directory.
3. Indicate concurrent or coordinated review of related submittals, including, but not limited to, the following groups:

   a. Doors, frames, glazing systems, windows, louvers, and door hardware.
   b. Stairs and railings.
   c. Flashing, roofing, waterproofing, and air and weather barriers.
   d. Casework and countertops.

4. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
5. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

   a. Review initial submittal schedule with Architect, Owner, and Consultants for requirements for concurrent review. Indicate engineering disciplines and Owner's special concerns applicable to each submittal.

6. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule monthly, indicating status of submittals and changes to schedule resulting from changed construction progress schedule.

7. Format: Arrange the following information in a tabular format:

   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action; informational.
   d. Concurrent reviewers.
   e. Name of subcontractor.
   f. Description of the Work covered.
   g. Scheduled date for Architect's final release or approval.
   h. Scheduled date of fabrication.
   i. Scheduled dates for purchasing.
   j. Scheduled dates for installation.
   k. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

4. No extension of Contract Time will be authorized because of failure to transmit submittals to Architect sufficiently in advance of the Work to permit processing.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 working days for initial review of each critical path submittal.

    a. Allow 20 working days for initial review of submittals not designated as critical path.
    b. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 working days for review of each resubmittal.
4. Concurrent Consultant Review: Where the accepted Submittal Schedule indicates that submittals may be transmitted simultaneously to Architect and to Architect's consultants or Owner, allow 10 working days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
5. If Architect receives more than 5 submittals in one day, additional time will be required for review.

C. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Do not provide paper submittals except when original stamped, signed, or notarized letters or certificates are specified; and for transmittals and materials schedules accompanying samples. Provide original paper submittals in addition to electronic facsimile of required documents.
2. Indicate name of firm or entity that prepared each submittal on label or title block.
3. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
4. Include the same information for processing and recording action taken as indicated for electronic submittals.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architectwill discard submittals received from sources other than Contractor.

    a. Transmittal Form for Paper Submittals: Provide the same information as required for transmittal of electronic submittals.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section. Provide transmittal form with index of contents, with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Contractor.
    e. Name of firm or entity that prepared submittal.
    f. Names of subcontractor, manufacturer, and supplier.
    g. Category and type of submittal.
    h. Submittal purpose and description.
    i. Specification Section number and title.
    j. Specification paragraph number or drawing designation and generic name for each of multiple items.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Indication of full or partial submittal.
    o. Transmittal number.
    p. Submittal and transmittal distribution record.
    q. Other necessary identification.
    r. Remarks.

4. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Provide submittals indicated in accepted Submittal Schedule, as required for confirming Architect’s intent, including but not limited to the submittals indicated in Specification Sections.
2. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
3. Action Submittals: Architect will return reviewed submittals electronically.
4. Informational Submittals: rchitect will not return copies.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications unless otherwise indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.

h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.

3. Provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
b. Range Samples: If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person and compliance with specified qualifications. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

1. Welding Certificates: Where welding qualifications are specified, submit written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
2. Installer Certificates: Where installer qualifications are specified, submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Where manufacturer qualifications are specified, submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. HPD and EPD: For each product, submit one of the following.

1. EPD (Preferred): Environmental Product Declaration, conforming to one of the following:

a. ISO 14025, 14040, 14044, and EN 15804.
b. ISO 21930.

2. HPD: Health Product Declaration, per Health Product Declaration Collaborative Standard 1.0 or 2.0 and the following:

a. Include Full Disclosure of Known Hazards for all intentional ingredients and residuals, disclosed at least to 1,000 ppm.
b. Include Role and Percentage Range for each line item.

3. Manufacturer's letter stating that neither EPD nor HPD is available.

N. Material Safety Data Sheets (MSDS) and Safety Data Sheets (SDS): MSDS and SDS are for Contractor's use in maintaining safe Project conditions and are not required submittals. As such, they are not reviewed by the Architect.

1. MSDS and SDS are not acceptable evidence of compliance with sustainable design requirements. Submit Product Data, HPD, EPD, or Manufacturer Certificates for sustainable design data.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file f certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
2. Where required by authorities having jurisdiction, provide paper copies of certificate, signed and sealed by the responsible design professional.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. Section 01 43 39 "Mockups" for mockups, including preconstruction testing conducted on mockups.

1.2 DEFINITIONS

A. Delegated Design: Work requiring services of a professional engineer on behalf of the Contractor, a subcontractor, a manufacturer, or a supplier. Includes work indicated as design-build. For the purposes of the Contract Documents for this Project, the terms "Delegated Design" and "Design-Build" are interchangeable. Both terms refer to assigning design responsibility to the Contractor and subcontractors for a portion of the Work.

B. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

C. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

D. Mockups: See Section 01 43 39 "Mockups."

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

K. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data : For Contractor's quality-control personnel.

B. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: See Section 01 43 39 "Mockups."

1. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

1.7 DELEGATED DESIGN, GENERAL

A. Scopes shall be assigned by Contractor; the following information is provided to assist Contractor in coordinating the Work.

B. Design elements intended as delegated design subcontracts include, but are not limited to, the following:

1. Aluminum-framed storefront.
2. Non-structural, interior, light-gauge metal framing.
3. Automatic fire sprinkler system.

4. Fire alarm system.
5. Emergency Responder Radio Commuication System (ERRCS).
6. Solar photovoltaic system.
7. Exterior building maintenance system.

1.8 CONTRACTOR'S RESPONSIBILITY FOR DELEGATED DESIGN

A. Within design intent indicated in Drawings and performance Specifications, Contractor is responsible for design of delegated design subcontracts, including sizes, sequence, placement, and details of construction.

B. Contractor is responsible for performance design, code compliance, permit submittals, method of construction, and coordination and integration of delegated design subcontracts with other work.

C. Guarantee the following:

1. Delegated design work shall be constructed in compliance with building codes, regulations, and ordinaces in effect.
2. Delegated design work shall be fit for its intended use.
3. Delegated design work shall not incorporate or employ the use of any product, process, or technique which may be protected by common law or statutory patent, copyright, or trade secret rights unless Contractor or subcontractor is lawful owner or licensee of the product, process, or technique.

D. Design Documentation: For each delegated design subcontract, Contractor shall cause drawings, calculations, and specifications to be prepared by design professionals licensed to practice in California. Submit design documentation for review by authorities having jurisdiction and Architect.

1. It shall be the Contractor's responsibility, and that of his registered professionals, to prepare the plans and calculations as required for submittal to the authorities having jurisdiction for all necessary agency approvals for that scope of work.

1.9 DEFERRED APPROVAL REQUIREMENTS FOR DELEGATED DESIGN SUBCONTRACTS

A. Deferred Approval Requirements: In connection with delegated design subcontracts as shown or specified, Contractor shall submit complete list of materials and other required details as required under the submittal section herein of these specifications.

1. Detailed drawings and calculations shall be prepared under the supervision of, and stamped / signed by a professional Structural Engineer registered in that discipline in the State of California.
2. See Section 01 33 00 "Submittal Procedures" for deferred approval submittal requirements.

B. Architect and design consultants will review shop drawings and material data for consistency with the design intent only. Contract drawings indicate design intent and shall be used as providing the minimum required for design, fabrication, function, support and anchorage. This review does not relieve the Contractor and the Contractor' s subcontractors and design professionals of their responsibilities

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architectand Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
2. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 APPLICABLE CODES AND ORDINANCES

A. Applicable Codes: See Code Analysis in Drawings.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Code Agencies:

DIN	Deutsches Institut für Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233
ICC-ES	ICC Evaluation Service, LLC www.icc-es.org	(800) 423-6587 (562) 699-0543

C. Government Agencies, Federal and National:

COE	Army Corps of Engineers www.usace.army.mil	(202) 761-0011
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce National Institute of Standards and Technology www.nist.gov	(301) 975-4040
DOD	Department of Defense http://dodssp.daps.dla.mil	(215) 697-2664
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322

FG	Federal Government Publications www.gpo.gov	(202) 512-1800
GSA	General Services Administration www.gsa.gov	(800) 488-3111 (202) 619-8925
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory Environmental Energy Technologies Division http://eetd.lbl.gov	(510) 486-4000
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742
SD	Department of State www.state.gov	(202) 647-4000
TRB	Transportation Research Board National Cooperative Highway Research Program www.trb.org	(202) 334-2934
USDA	Department of Agriculture Agriculture Research Service U.S. Salinity Laboratory www.ars.usda.gov	(202) 720-3656
USDA	Department of Agriculture Rural Utilities Service www.usda.gov	(202) 720-2791
USDJ	Department of Justice Office of Justice Programs National Institute of Justice www.ojp.usdoj.gov	(202) 307-0703
USP	U.S. Pharmacopeia www.usp.org	(800) 227-8772 (301) 881-0666
USPS	United States Postal Service www.usps.com	(202) 268-2000

D. Government Codes and Standards, Federal:

CFR	Code of Federal Regulations Available from Government Printing Office www.gpo.gov/fdsys	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
	Available from Defense Standardization Program www.dsp.dla.mil	
	Available from General Services Administration www.gsa.gov	(800) 488-3111 (202) 619-8925
	Available from National Institute of Building Sciences/Whole Building Design Guide www.wbdg.org/ccb	(202) 289-7800
MILSPEC	Military Specification and Standards (See DOD)	
USAB	United States Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
USATBCB	U.S. Architectural & Transportation Barriers Compliance Board (See USAB)	

E. Government Agencies and Codes, State and Local:

1. See also "Blueprint for a Clean Bay" in Drawings.

CBHF	State of California Department of Consumer Affairs Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation www.bearhfti.ca.gov	(800) 952-5210 (916) 574-2041

CCR	California Code of Regulations Office of Administrative Law California Title 24 Energy Code www.calregs.com	(916) 323-6225
CDHS	California Department of Health Care Services (Formerly: California Department of Health Services) (See CCR)	
CDPH	California Department of Public Health Indoor Air Quality Program www.cal-iaq.org	
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(800) 848-5580 (415) 703-2782
SCAQMD	South Coast Air Quality Management District www.aqmd.gov	(909) 396-2000
BAAQMD	Bay Area Air Quality Management District www.baaqmd.gov (415) 771-6000	

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

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SECTION 01 43 39 - MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes construction, administrative and procedural requirements for mockups.

B. Related Requirements:

1. Section 01 40 00 "Quality Requirements" for quality control and quality assurance requirements other than mockups.

1.2 DEFINITIONS

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Stand-alone mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

B. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.3 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, unit mockups, and room mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.4 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified for preconstruction testing performed on mockups. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Recommendations on retesting and reinspecting.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Fabricator Qualifications: Fabricator engaged for Work to be included in mockup specified herein.

C. Installer Qualifications: Installer engaged for Work to be included in mockup specified herein.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

E. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies and mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    e. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

F. Mockups, General: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect 14 calendar days in advance of dates and times when mockups will be constructed.

3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's acceptance of mockups before starting work, fabrication, or construction.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Where specified, mockups may be retained as part of the Work. Otherwise, demolish and remove mockups when directed.

G. Integrated Exterior Mockups: Construct stand-alone integrated exterior mockup of assemblies indicated in Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.6 TESTING AND VERIFICATION OF MOCKUPS

A. Integrated Exterior Mockups:

1. Integrated exterior mockups shall be tested for air and water infiltration according to pressure tests indicated in the specifications for the fenestration being tested.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES
1. Temporary Field Office
2. Temporary Utilities
3. Temporary Telephone Service
4. Temporary Sanitary Facilities
5. Temporary Controls: Barriers And Fencing
6. Security Requirements
7. Waste Removal Facilities and Services
8. Temporary Signage
9. Dust Control
10. Erosion Control
11. Existing Conditions Verification
12. Vehicular Access and Parking
13. Removal of Utilities, Facilities, and Controls
14. Tree Protection Plan

B. RELATED SECTIONS
1. Section 01 51 00 - Temporary Utilities.
2. Section 01 57 19 – Environmental & Cultural Protection
3. Section 31 11 00 – Clearing and Grubbing
4. Section 31 22 00 - Earthwork

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 20 00, Price and Payment Procedures.

1.3 QUALITY ASSURANCE

A. Comply with governing regulations and utility company regulations and recommendations for the construction of temporary facilities, including but not necessarily limited to code compliance, permits, inspections, testing, and health and safety compliance.

1.4 PROTECTION OF EXISTING CONDITIONS

A. A. Contractor shall restrict Work to Limits indicated on the Drawings. Contractor shall protect existing, adjacent facilities from damage, including soiling, debris accumulation.

B. B. Contractor shall protect existing trees designated on plans to remain. All work related to the protection, removal, pruning, and other items related to trees shall be as directed by an ISA Certified Arborist.

1.5 MAINTENANCE OF PUBLIC ACCESS AROUND CONSTRUCTION ZONE

A. Public access for pedestrians and bicyclists will be maintained around the Work limits as noted on plans. Provide signage to clearly indicate temporary routes.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 TEMPORARY FIELD OFFICE

A. Contractor may locate a field office trailer onsite. Size and location of trailer to be approved by Owner prior to placement.

B. Installation techniques or requirements.

3.2 TEMPORARY UTILITIES - See Section 01 51 00

3.3 TEMPORARY TELEPHONE SERVICE

A. The Contractor shall maintain lines of communication throughout the project in which the Project Manager and site Foreman can be reached during work hours.

3.4 TEMPORARY SANITARY FACILITIES

A. Provide and maintain portable construction toilet facilities for Contractor's employees and Owner Representatives.
   1. Toilet Facilities: Provide sufficient suitably enclosed toilets with urinal for use by all trades engaged on project. The Owner shall approve location.
   2. Washing Facilities: Provide properly mounted and adequate wash sinks connected to water supply, in location approved by the Owner.
   3. Drinking Water Facilities: Provide clean, sanitary, and adequate drinking water.

B. Maintain daily in clean and sanitary condition.

3.5 TEMPORARY CONTROLS: BARRIERS AND ACCESS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner and residents access to their property and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades required by governing authorities for public rights-of-way.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

D. MAINTENANCE OF PUBLIC ACCESS AROUND CONSTRUCTION ZONE

E. Maintain public access around the Construction Zone and Work limits as noted on plans. Provide signage to clearly indicate temporary routes (see 3.08 B,1).

3.6 SECURITY REQUIREMENTS

A. Contractor is responsible for security of areas of his work during the entire time of the Contract. Within this responsibility, the Contractor will repair and/or replace all damages to the work and loss of materials due to vandalism or theft. This includes damages to existing facilities due to construction activities.

3.7 WASTE REMOVAL FACILITIES AND SERVICES

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Provide wildlife resistant containers for food or food waste. Dispose of waste off-site weekly.

3.8 TEMPORARY SIGNAGE

A. Project Identification Sign
   1. Provide project identification sign to be posted in advance of construction. Provide painted plywood project identification sign, size to be 4' x 6' and must last the duration of the Project. Sign to read: Site Improvements for the Yurok Tribe, date-to date of construction, construction company name and contact phone number. Design approval of the sign by the Owner and shall be obtained prior to fabrication and construction.
   2. Erect on site at location to be approved by the owner.
   3. No other signs are allowed without Owner permission except those required by law.

B. Temporary Public Access Signage
   1. Provide temporary public access signage to be posted upon installation of temporary barriers and site controls. Locate two (2) signs as indicated on plans and in details.

3.9 DUST CONTROL

A. Use water wagons or spray from hoses to control dust created by work operations.

B. Comply with all Tribal and pertinent state dust control ordinances.

3.10 EROSION CONTROL

A. Contractor is advised that the State of California has adopted National Pollution Discharge Elimination Requirements in accordance with the requirements of the Clean Water Act. State funded projects are subject to all of the requirements contained in those acts. The contractor shall abide by all of the laws, ordinances, and regulations associated with the NPDES and the Clean Water Act.

B. The SWPPP must be maintained throughout the course of construction and be available at the construction site. The contractor is advised that he shall conform to this requirement and that he shall implement all of the measures required by the SWPPP, including maintenance of diligent record keeping and logs as required by the SWPPP.

C. The contractor shall provide copies of the updated SWPPP to the Owner prior to starting construction operations. The contractor shall provide copies of his SWPPP records and logs during the course of construction, on a monthly basis to the Owner. The contractor shall also keep copies of these records and logs with the SWPPP at the construction site for potential viewing by the State of California Regional Water Quality Control Board.

3.11 EXISTING CONDITIONS VERIFICATION

A. Contractor shall record existing site conditions, either by photographs or video, to provide a record of pre-construction site conditions.

B. Contractor is responsible to contact U.S.A (800-642-2444) to stake and mark the location of all existing utilities before commencing Work. Pot hole as required to determine and verify location and depth.

3.12 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and the Owner.

B. Provide and maintain access to fire suppression equipment and emergency vehicle access and access to adjacent residential housing for the public and the Owner, free of obstructions.

C. Provide means of removing mud and sanitizing vehicle wheels when entering and leaving the site.

3.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary field office, utilities, equipment, facilities, and materials prior to Final Application for Payment inspection.

B. Remove underground installations to a minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary work.

D. Unless otherwise directed, restore existing and permanent facilities used during construction to original condition.

E. Maintenance and Removal:
   1. Maintain all temporary facilities and controls as long as needed for safe and proper completion of work. Remove all such temporary facilities and controls as rapidly as progress of work will permit.
   2. Non-compliance with requirements within this section may result in payment being withheld and/or deductive change orders for lack of proper facilities and controls. If

necessary, the owner will provide such facilities and controls as required and back charge the Contractor.

3.14 TREE PROTECTION PLAN

A. Tree protection notes on plans provide the option of implementing specific controls or providing an alternative plan prepared by an ISA Certified Arborist. All protection work shall be supervised by an ISA Certified Arborist.

END OF SECTION

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 23 00 "Alternates" for products selected under an alternate.
2. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
3. Section 01 42 00 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products indicated by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

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SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site.
2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor and professional engineer.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
2. Operational Elements: Do not cut and patch operating elements, such as fire separation assemblies and electrical wiring systems, and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components, such as waterproofing membranes and equipment supports, in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 01 81 13 "Sustainable Design Requirements."

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Hazardous materials are not expected to be encountered during the Work.

1. Notify Owner and Architect if suspected hazardous or archaeological materials are encountered. Stop work in the affected area.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 NOISE, FUGITIVE DUST AND EMISSIONS CONTROL

A. Comply with AHJ requirements for site management of noise, dust, and emissions.

B. Comply with AHJ requirements for construction equipment emissions, maintenance, and idle times.

C. Site shall be maintained to comply with AHJ regulations for dust and rubbish management.

D. In the case of conflict between state, county, federal, and local requirements, the more stringent requirement for each control type shall govern.

3.7 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.8 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.9 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.10 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.11 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 31 10 00 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

G. Source Separated Method: Sorting recovered materials into specific material types, with a minimum amount of contamination between materials on site.

H. Commingled Method: Collecting recovered material types into a single bin or mixed collection system on site, then separating materials into recyclable material types in an off-site facility.

1.3 PERFORMANCE REQUIREMENTS

A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1. Use source-separated method or commingled method, at Contractor's option.
2. Construction Waste:

a. Achieve minimum End-of-Project rates for salvage/recycling of 65 percent by weight of total non-hazardous solid waste generated by the Work.

b. Asphalt and Concrete: Recycle 100 percent of asphalt and concrete waste generated by demolition and construction Work.
c. Landscape Waste: Recycle 100 percent of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing.
d. Packaging: Salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Plastic sheet and film.
4) Polystyrene packaging.
5) Wood crates.
6) Plastic pails.
7) Glass, plastic, and metal containers.

3. Waste Hauler:

a. For waste collected by commingled method, utilize waste management company that can provide verifiable documentation of waste diversion.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

A. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

B. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

C. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

D. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609, CalGreen, and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

1. Identify separation method required for field constructed work.
2. Identify separation method at modular-construction factory.
3. Identify diversion facility for field-constructed work.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use forms acceptable to Owner and authorities having jurisdiction . Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use forms acceptable to Owner and authorities having jurisdiction. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Manufacturers' Reclamation Programs: Include list of manufacturers and their designated local receivers and type of materials each will accept for recycling. Include names, addresses, and telephone numbers.
6. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
7. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 01 50 00 "Temporary Facilities and Controls."

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Donation: Collection is not permitted on Project site.

1. Contractor shall transport items for donation or arrange for pickup.

C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

1. Exception: If permitted by authorities having jurisdiction, waste may be burned at waste-to-energy furnace at modular-construction factory.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01 32 33 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 01 73 00 "Execution" for progress cleaning of Project site.
3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 DEFINITIONS

A. Maintenance Materials Submittals: Products and tools supplied by Contractor but not installed, to be stored by Owner for future use in maintaining the facility. Also known as "Attic Stock."

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

D. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 MAINTENANCE MATERIAL SUBMITTALS (ATTIC STOCK)

A. Maintenance Material Submittals: Deliver to Owner as specified herein.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit test/adjust/balance records.
3. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Advise Owner of changeover in heat and other utilities.
6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.
5. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
6. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
7. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect.

    a. Label with identification matching Maintenance Material Schedule.
    b. Label with manufacturer's name and model number, where applicable.

B. Procedures Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."

C. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architectwill either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first andproceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Page number.

4. Submit list of incomplete items in the following formats:

a. MS Excel electronic file. Architectwill return annotated file.
b. PDF electronic file. Architectwill not return file but may use for reference.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
j. Remove labels that are not permanent.
k. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

p. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.
6. Reasonable accommodations manual and notices.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect'scomments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.

7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Earthquake resulting in damage or suspected damage.
2. Fire.
3. Flood.
4. Gas leak.
5. Water leak.
6. Power failure.
7. Water outage.
8. System, subsystem, or equipment failure.
9. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.

6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.

3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.7 REASONABLE ACCOMMODATIONS MANUALS AND NOTICES

A. Content:

1. Instructions for adapting dwelling units to tenants' needs and disabilities.
2. List of adaptations included in dwelling unit designs, for distribution to tenants at move-in.

a. Provide additional paper copies of list of adaptations, one for each adaptable unit, in 8 1/2 by 11 inch format, for Owner's distribution at initial move-in.

3. Organize manual into a separate section for each listed adaptation.
4. Include adaptation procedures and repair materials with sources, as described below.

B. Adaptations: As determined with Owner, including but not limited to the following:

1. Removal of under-sink cabinets, under-workspace cabinets, and vanity cabinets for roll-under countertop access.
2. Installation of grab bars at toilets, bathtubs, and showers.
3. Addition of switches and electrical outlets within reach range.
4. Installation of accessible wand controls at window vertical blinds.

C. Adaptation Procedures: Include the following:

1. Removal instructions for under-sink cabinets, under-workspace cabinets, and vanity cabinets.
2. Diagrams or drawings of blocking installed during Work of this Contract to receive future grab bars.
3. Wiring diagrams for adding wall-mounted switch for vent hood.
4. Wiring diagrams for adding outlets within ADA reach range in kitchen.
5. Repair instructions for materials subject to damage by adaptation procedures.

D. Repair Materials and Sources: Include lists of materials and local sources for each material and related services.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Reasonable Accommodations Manual: Assemble a complete set of information as specified herein.

F. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

G. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 01 78 39 "Project Record Documents."

H. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 01 73 00 "Execution" for final property survey.
2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints and two CD-ROM copies of PDF digital data files.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Conditions addressed by RFI, including date and number of RFI.
    m. Details not on the original Contract Drawings.
    n. Field records for variable and concealed conditions.
    o. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Annotated PDF electronic file with comment function enabled.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 01 33 00 "Submittal Procedures" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.

B. Format: Submit record Specifications as annotated PDF electronic file .

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.

f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:

   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 78 23 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Owner will furnish an instructor to describe Owner's operational philosophy.
2. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01 79 00

SECTION 02 41 00 - DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes, but is not limited to the following:
   1. The Contractor shall provide all equipment, tools, materials, and labor necessary to complete the Work.
   2. Completely coordinate with Work of all other trades.
   3. Provide protection for all existing objects or conditions designated on the Drawings to remain on the site or return to the Owner.
   4. Provide protection to prevent injury or damage to persons or adjacent properties.
   5. Remove and dispose of demolished materials from the site as indicated on the drawings.
   6. Comply with applicable codes and ordinances concerning demolition operations.

B. Definition: The term "demolition", as used herein, includes the removal and disposal of all existing objects (except for those objects designated to remain) down to the existing grade level or subgrade level to the extent indicated or as otherwise required to permit new construction and all other Work as described in this Section necessary to complete all Demolition Work.

C. Use of explosives will not be permitted.

D. RELATED SECTIONS
   1. Section 01 57 00 – Temporary Facilities and Controls
   2. Section 01 57 19 – Environmental Protection
   3. Section 31 10 00 – Site Clearing
   4. Section 31 22 00 – Earthwork

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 20 00, Price and Payment Procedures.

1.3 PERMITS, ORDINANCES, ETC.

A. Procure and pay for all necessary permits or certificates required to complete the Demolition Work specified. Make any and all required notifications and comply with all applicable Federal, State, and Local ordinances concerning demolition operations.

1.4 JOB CONDITIONS

A. Visit the site and examine the existing conditions and observe the conditions under which the Work is to be performed. Notify the Project Manager of unsatisfactory conditions and do not proceed with the Work until unsatisfactory conditions have been corrected in a

manner acceptable to the Project Manager or Designated Representative. Note all conditions as to character and extent of Work involved.

1.5 EXISTING UTILITIES

A. Contractor is responsible to contact U.S.A (800-642-2444) to stake and mark the location of all existing utilities before commencing Work. Pot hole as required to determine and verify location and depth.

B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

1.6 PROTECTION

A. Execute all Demolition Work in an orderly and careful manner with due consideration for any existing condition designated to remain. Provide protection to preserve existing items indicated to remain and to prevent injury or damage to persons or adjacent properties.

B. Use all means necessary to protect existing conditions designated to remain and adjacent properties. Avoid any encroachment on adjacent properties. In the event of damage or loss to any existing condition designated to remain or adjacent properties, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to Owner.

C. Do not interfere with the normal traffic on roads, streets, walks, or use of adjacent properties. Provide alternate routes around closed or obstructed traffic ways as required by governing regulations.

D. Protect existing trees per plans.

1.7 CUTTING AND PATCHING

A. Cut existing sidewalks, roads, and curbs as required to complete Demolition Work. Pavement shall be cut vertically along straight lines forming the edges of the Demolition Work and so as not to damage the adjacent pavement. Repair all pavement as specified in Sections of the specification covering the applicable trades.

1.8 DUST CONTROL

A. Use all means necessary to prevent the spread of dust during performance of the Work of this Section; thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

PART 2 - PRODUCTS

2.1 OTHER MATERIALS

A. All other materials, not specifically described but required for proper completion of the Work of this Section, shall be as selected by the Contractor subject to approval by the Project Manager.

PART 3 - EXECUTION

3.1 PREPARATION

A. Notification
   1. Notify the Project Manager at least two (2) full working days prior to commencing the Work of this Section.

B. Site Observation
   1. Prior to all Work of this Section, carefully observe the entire site for all objects designated to be removed and to be preserved.
   2. Contact the Underground Service Alert (U.S.A.) at 1-800-227-2600 to stake and mark the location of all existing utilities prior to the beginning of Work.
   3. Locate all existing utility lines indicated on the Drawings to remain and determine the requirements for their protection.
   4. Locate, if any, all existing utility lines indicated on the Drawings to be disconnected and capped, and determine all requirements for disconnecting and capping.

C. Clarification
   1. The Drawings do not purport to show all objects existing on the site.
   2. Before commencing the Work of this Section, verify with the Project Manager all objects to be removed and all objects to preserve.

D. Scheduling
   1. Schedule all Work in a careful manner with all necessary consideration for adjacent properties and the general public.
   2. Avoid interference with the use of, and passage to and from, adjacent properties.
   3. Conduct operations so as not to interfere with the use of adjacent roads, streets, drives, walks, service lines, etc.

E. Disconnection of Utilities
   1. Before starting site construction, arrange for the disconnection of all utility lines designated to be removed, relocated, or capped with the appropriate utility company. Utility company services for this Work shall be paid for by the Contractor.

F. Protection of Utilities
   1. Retain and protect in operating condition all active utilities traversing the site designated to remain.

3.2 DEMOLITION OF OBJECTS

A. Remove and dispose of all existing objects (except for those objects designated to remain) down to existing grade level or subgrade level to the extent indicated or as otherwise required to permit new construction.

B. Tree Demolition – where trees are indicated for removal, remove all of tree, tree trunk and roots, including below grade.

3.3 BACKFILL AND COMPACTION

A. All excavations left by the Demolition Work shall be filled and compacted to make the surface at these points conform in contour and density to that of the surrounding ground, and as specified per plan and these special provisions.

3.4 DISPOSAL OF DEBRIS

A. All material removed under this Contract, which is not to be salvaged or reused, or otherwise specified on the Plan shall become the property of the Contractor and be promptly disposed of. It shall be the responsibility of the Contractor to procure dumping facilities or other means of disposal for all items specified to be removed from the site. Storing or permitting refuse to accumulate on the site will not be permitted.

B. Disposal of all materials from the site shall be done in a lawful manner. Transport all refuse materials from the site without spilling on the streets.

C. Burning of refuse material on the site will not be permitted.

END OF SECTION

SECTION 02 42 00 - DEWATERING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes construction dewatering.

1.2 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control flow into excavations and permit construction to proceed on dry, stable sub-grades.

1.3 SUBMITTALS

A. No submittals needed for this item,

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: comply with water disposal requirements of authorities having jurisdiction.

1.5 CODES, ORDINANCES, AND REGULATIONS

A. Do all work and install materials and/or equipment in accordance with the requirements of the applicable Federal, State, County, City, and applicable laws and ordinances having jurisdiction.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Protect sub-grades and foundation soils from softening and damage by rain or water accumulation.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

B. Before excavating below groundwater level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.

C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry sub-grades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of the foundations, drains, sewers, and other excavations.

a. Do not permit open sump pumping that leads to loss of fines, soil piping, sub-grade softening, or slope instability.

D. Reduce hydrostatic head in water-bearing strata below sub-grade elevations of foundations, drains, sewers, and other excavations.

a. Maintain piezometric water level a minimum of twenty-four (24) inches below surface of excavation.

E. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to the Owner.

a. Remove dewatering system from project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of thirty-six (36) inches below overlying construction

G. Damages: promptly repair damages to adjacent facilities caused by dewatering operations.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A Measurement and payment for all work shall be in accordance with the contract BID SCHEDULE, refer to Section 004100 and actual work as field measured and verified. No payments will be made for materials on hand. All payments to be made following field verification of work.

END OF SECTION 02 42 00

SECTION 03 10 00 – CONCRETE FORMWORK

1.1 DESCRIPTION OF WORK

A. Work under this section includes the furnishing and installing of all form work for cast-in-place concrete, complete, with all related accessories, items and incidentals required.

1.2 APPLICABLE STANDARDS (latest editions apply)

A. ACI – American Concrete Institute
   1. 301, Specifications for Structural Concrete for Buildings
   2. 318, Building Code Requirements for Structural Concrete
   3. 347, Recommended Practice for Concrete Formwork

PART 2 - PRODUCTS

2.1 FORMING MATERIALS

A. Unless otherwise indicated, materials for formwork shall be wood, steel, fiber or reinforced plastic and of suitable quality to achieve required finishes. Contractor shall conform with considerations and recommendations in ACI-347, Chapter 3, Materials for Formwork.

B. Unless otherwise indicated, contact surfaces in fabricated forms shall be smooth and uniform without warps, bends, dents, sags or irregular absorptive conditions and imperfections which might telegraph or product objectionable irregularities in the exposed concrete finish.

C. Form ties and spreaders shall leave a hole not larger than 7/8-inch nor less than ½-inch in diameter in the concrete surface. The portion of the tie remaining in the concrete shall be at least 1-inch back from the concrete surface that will be exposed to view, painted, damp proofed or waterproofed.

D. Chamfer strips: Milled from clear straight-grain lumber, surfaced on all sides. Other material of equal quality may be used only as authorized by Architect.

E. Round Column Forms: Sonotube or equal

2.2 FORM COATINGS

A. Form coating and bond breaking materials shall be non-staining and completely compatible with paint materials and other surface treatment materials to be used.

2.3 OTHER MATERIALS

A. Sand Cushion & Membrane: Sand shall be clean, sharp and moist. Membrane shall be 10 mil. polyethylene sheet. Lap joints 6”.

B. Rock Base: Caltrans Class II, ¾" aggregate max.

C. Expansion Joint Material: Preformed expansion joint filler, non-extruding, and resilient bituminous type conforming to ASTM D1751.

PART 3 - EXECUTION

3.1 CONSTRUCTION OF FORMS

A. The forms shall be constructed smooth, mortar-tight, true to the required lines and grade, and with sufficient strength to resist springing out of shape during the placing and vibrating of concrete. All dirt, chips, sawdust and other foreign matter shall be completely removed before concrete is placed. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used.

B. Before reinforcing steel is placed in forms, all inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete or be incompatible with concrete paint.

C. All exposed edges shall be chamfered with triangular fillets ½-inch by ½-inch.

D. Joints in formwork for exposed walls and curbs shall be taped, where directed by Architect.

3.2 EARTH FORMS

A. Earth forms may be utilized where foundation trench walls are stable.

B. Remove loose dirt and debris prior to placement of concrete.

END OF SECTION

SECTION 03 20 00 – CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work under this Section includes the furnishing and installing of all steel reinforcing for cast-in-place concrete, complete, with all related items, accessories and incidentals required, such as ties, spacing devices inserts and all other material required to complete installation.

1.2 APPLICABLE STANDARDS (latest editions apply)

A. ACI – American Concrete Institute:
   1. 301, Specifications for Structural Concrete
   2. 315, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures
   3. 318, Building Code Requirements for Structural Concrete

B. ASTM – American Society for Testing and Materials, Referenced Standards
   1. AWS – American Welding Society
   2. D1.4 Structural Welding Code- Reinforcing Steel.
   3. A5.1 Mild Steel Covered Arc-Welding Electrodes

C. CRSI – Concrete Reinforcing Steel Institute:
   1. Manual of Standard Practice
   2. Recommended Practice for Placing Reinforcing Bars

1.3 SUBMITTALS

A. Shop Drawings of all reinforcing steel shall be submitted for approval

B. Mill Reports for each different heat to be used on the job shall be submitted for approval.

1.4 QUALITY ASSURANCE

A. Welders shall be qualified in accordance with AWS D1.4.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Reinforcing bars: Deformed, new billet-steel bars conforming to ASTM Designation A615, Grade 60 or ASTM A706 unless noted otherwise.

B. Reinforcing mesh: Welded wire fabric conforming to ASTM A185.

C. Tie wires and spirals: ASTM A82.

D. Reinforcement supports
   1. At reinforcing placed over sand or earth, use precast concrete cubes.
   2. At reinforcing placed over forms, provide supports with legs which are hot dip galvanized, stainless steel or plastic protected.

E. Mechanical Bar Splice: Xtender by Headed Reinforcement Corp. or equal to develop a minimum of 125% of yield strength of bar.

2.2 FABRICATION

A. Except where specified otherwise herein or shown otherwise on the plans, reinforcing steel shall be cleaned, fabricated, placed, tied and supported in accordance with ACI 301 and ACI 315.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Reinforcing bars shall be accurately placed and shall be supported and secured against displacement by the use of adequate and proper supporting and spacing devices, tie wire, etc., so that it will remain in its correct location in the finished work. No supporting devices shall be used that will impede the flow of concrete.

B. Do not bend or straighten reinforcing in any manner that will injure the material.

C. Install splices for reinforcing bars in accordance with drawings and ACI 318. Stagger splices in adjacent bars 5’ – 0".

D. Reinforcing mesh shall be laid flat in place. Lap mesh at sides and ends 12 inches. Wire mesh together at 24 inches on center.

3.2 CLEARANCES

A. Where not shown otherwise on the drawings, the minimum concrete coverage for steel reinforcement shall be as follows:
   1. Where concrete is deposited against ground 3”
   2. Concrete in forms exposed to earth or weather 2”

B. The clear spacing between parallel bars shall be not less than 1-1/2 times the normal diameter of the maximum size aggregate, and in no case less than 1-1/2 inches, except at splices which may be wired together.

3.3 WELDING

A. Use ASTM A706 for all Welded reinforcing bars.

B. Perform all welding in accordance with AWS D1.4.

END OF SECTION

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SECTION 03 20 00 - CONCRETE REINFORCING - SITE

PART 1 - GENERAL

1.1 SUMMARY

A. Related Documents:
1. Drawings and general provisions of the Subcontract apply to this Section.
2. Review these documents for coordination with additional requirements and information that apply to work under this Section.

B. Section Includes: Concrete reinforcement and accessories.

C. Related Sections:
1. Division 01 Section "General Requirements."
2. Division 01 Section "Special Procedures."

1.2 REFERENCES

A. General:
1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.

B. ACI – American Concrete Institute:
1. ACI 117 Tolerances for Concrete Construction
2. ACI 301 Specifications for Structural Concrete
3. ACI 315 Standard Practice for Detailing Reinforced Concrete Structures

C. ASTM International:
1. ASTM A185 / A185M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
2. ASTM A615 / A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A706 / A706M Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
4. ASTM A970 / A970M Standard Specification for Headed Steel Bars for Concrete Reinforcement

D. CRSI - Manual of Standard Practice.

E. ICBO - Evaluation Reports.

1.3 SUBMITTALS

A. Submit under provisions of Division 01 Section "General Requirements."

B. Shop Drawings: Prepare placing drawings in accordance with ACI 315. Show size, shape and location of bars and wire fabric in structure. Show splice locations and lengths. Where details are not shown, conform to standards of practice indicated in ACI 315 and submit for approval.
   1. Bill reinforcing bars for walls on elevations. Bill reinforcing bars for slabs on plans. Plans and elevations need not be true views. When more than one wall or slab are identical, only one such wall or slab is required. Take sections to clarify the arrangement of reinforcement. Identify, but do not bill bars on sections.
   2. Unless the location of reinforcing is clear, give dimensions to some structural feature that will be readily distinguishable at time bars are placed.
   3. Make placing drawings complete, including the location of support bars and chairs, without reference to the design drawings.

C. Submit data required to evaluate proposed mechanical splices.

D. Submit manufacturer's certified mill test reports on each heat of reinforcing steel delivered, showing physical and chemical analysis before placing reinforcement.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of ACI 301 CRSI's "Manual of Standard Practice", except where more stringent requirements are shown or specified.

B. Requirements of Regulatory Agencies: Proprietary products, including bar couplers, shall have an active ICBO Evaluation Report.

C. Material Quality Assurance: Mill test reports including chemical analysis, tensile properties and bend test shall be examined for all reinforcing. Conform to one of the following:

D. Maintain positive identification of reinforcing by heat number. Provide certified mill test reports to Testing Laboratory.

E. Where positive identification cannot be made and procedures are not deemed adequate to ensure compliance, Testing Laboratory will randomly sample and make one tensile and one bend test from each 2-1/2 tons or fraction thereof of each size of reinforcement. Subcontractor will bear the cost of testing.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

A. Bar Reinforcement: ASTM A615, Grade 60, deformed billet bars.
   1. ASTM A706, where noted on Drawings.
   2. Recycled content shall be a minimum of 75 percent recycled post consumer steel.

B. Headed Bar Reinforcement: ASTM A970.

C. Spirals: ASTM A82.

D. Welded Wire Fabric: ASTM A185.

E. Threaded Bars: Grade 75, manufactured by DYWIDAY Systems International, Williams Form Engineering Corp. or equal substituted per Division 1.

F. Smooth Dowels, ASTM A615, Grade 40 or 60, smooth; sawcut or grind one end to remove offsets; shop paint with iron oxide zinc chromate primer.

G. Welded Deformed Bar Anchors: ASTM A-108 f_y = 70,000 psi, flux-filled deformed bar anchors welded to structural steel as shown; Nelson D2L, or equal substituted per Division 1.

H. Mechanical Bar Couplers: Provide mechanical couplers with a current ICC evaluation report. Coupler to develop 160% percent of specified minimum yield strength of spliced reinforcement. Subject to compliance with requirements provide one of the following, or approved equal:
   1. Barteck, Dextra Inc.
   2. Lenton Taper Threaded Connection, Erico Inc.
   3. Bar Lock, Dayton Superior Inc.

2.2 ACCESSORIES

A. Tie Wire: Minimum 16-gage black annealed wire.

B. Bar Supports:
   1. At surfaces not exposed to view in completed structure: Precast concrete bar supports with two 16 ga. embedded wires or CRSI Class 2 wire supports.
   2. Supports placed against ground or on top of vapor barrier: Precast concrete blocks not less than 3 inches square (1935 mm²) with two 16 ga. embedded wires.
   3. At Architectural Concrete and surfaces exposed to weather: CRSI Class 2 stainless steel or CRSI Class 1 plastic protected.
   4. Where support is no closer to concrete surface than 1/2 inch (13 mm): CRSI Class 3 wire supports.

2.3 FABRICATION

A. Fabricate reinforcement in accordance with ACI 315 where specific details are not shown.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Surface Condition of Reinforcement: Before placing concrete, clean reinforcement of loose scale, dirt, grease and other substances which would impair bond with concrete.

B. Place reinforcement in accordance with the Drawings and the CRSI Manual.
   1. Steel bars shall be of size and length indicated, accurately bent or formed to shapes detailed or scheduled by experienced shops by methods that will not injure the materials. Reinforcing bars shall be shop fabricated to lengths and bends shown on the drawings. Fabrication tolerance shall be in accordance with the requirements of ACI 315.
   2. Reinforcing bars shall be as long as possible with a minimum number of joints.
   3. Steel reinforcement shall not be bent or straightened in a manner that will injure the material or the embedding concrete. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of reinforcement for bending will not be permitted.
   4. Reinforcement shall be tagged with suitable identification to facilitate sorting and placing.

C. Place reinforcing bars accurately as to spacing and clearance and securely tied at intersections and supports with wire and in such a manner as will preclude displacement during pouring of concrete. Placing tolerances shall be in conformance with the requirements of ACI 117.

D. Place and secure reinforcement to maintain the proper distance and clearance between parallel bars and from the forms. Provide vertical steel with metal spreaders to maintain steel properly centered in the forms. Horizontal reinforcement shall be supported at proper height on concrete pads, chairs or transverse steel bars.

E. After placing, maintain bars in a clean condition until completely embedded in concrete.

F. Bars shall not be spaced closer than 1-1/2 diameters of the largest of two adjacent bars, 1-1/2 times the maximum aggregate size, nor one inch, except at bar laps. Where reinforcement in members is placed in two layers, the clear distance between layers shall be not less than one inch (25 mm) or more than 1-1/2 inches (13 mm) unless otherwise noted on the drawings. The bars in the upper layer shall be placed directly above those in the bottom layer unless otherwise detailed.

G. Coverage of bars shall be as shown and scheduled. Conform to ACI 301 where not indicated.

H. Where obstruction prevents the intended placement of reinforcement, provide additional reinforcement as directed by the Owner around the obstruction.

I. Splice bars as indicated by lapping and securely wiring together. Splices at locations other than those indicated are subject to the approval of the Owner. Splices of reinforcement shall not be made at the point of maximum stress. Splices shall provide sufficient lap to transfer the stress between bars by bond and shear. Bars shall be spread the minimum distance specified. Stagger splices of adjacent bars where possible.

J. Reinforcing bars shall not have welded joints.

K. Mechanical Bar Couplers: Install in accordance with applicable ICC evaluation report. Maintain clearance and coverage at coupler. Stagger couplers wherever practical.

3.2 FIELD INSPECTION

A. Owner's Inspector will:
   1. Review Quality Assurance procedures for maintaining identification of steel. Collect certificates of compliance and test reports for reinforcing steel.
   2. Special Inspect placement of reinforcement for conformance with the Contract Documents and as required by CBC Chapter 17.
   3. Special Inspect installation of mechanical couplers in accordance with requirements of applicable ICC evaluation report.
   4. Special Inspect shop and field welding as required by CBC Chapter 17

END OF SECTION 03 20 01

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SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work under this Section includes the furnishings and installing of all concrete work, complete with all related accessories, items and incidentals required.

B. Coordinate installation of all inserts and embedded items required or indicated.

1.2 APPLICABLE STANDARDS (latest editions apply)

A. ACI – American Concrete Institute
   1. 301, Specifications for Structural Concrete
   2. 305, Guide to Hot Weather Concreting
   3. 306, Guide to Cold Weather Concreting
   4. 318, Building Code Requirements for Structural Concrete

B. ASTM – American Society of Testing and Materials, Referenced Standards

C. ICC – International Code Council:
   1. CBC - California Building Code, 2022

D. ASCE/ SEI – American Society of Civil Engineers:
   1. 07-16 – Minimum Design Loads for Buildings and Other Structures.

1.3 SUBMITTALS

A. Submit mix designs and compressive strength test reports from previous applications for specified types of concrete.

B. Submit test reports for projects within 12 months of this projects contract date.

C. The concrete mixes shall be based on designs of a professional testing laboratory, verified by test.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Materials for cast-in-place concrete shall be set as forth in ACI 301 except as modified herein and as otherwise indicated in project documents.

B. Portland Cement: ASTM C150 Type II modified, with maximum alkali content of 0.6 percent (from only one source).

C. Aggregates: ASTM C33, (from source as approved by the Testing Agency).

D. Water: Clean, Potable and free of injurious materials.

E. Admixtures: Only brand products documented to have not less than five years of satisfactory performance shall be used. Admixtures containing chlorides shall not be used.

F. Air Entraining: ASTM C260

G. Grout: Manufactured pre-mixed. Non-ferrous, non-staining, flowable grout which will not shrink as it cures, 4000 psi @ 7 days.

2.2 CONCRETE MIX

A. Ready-Mix Concrete: ASTM C94.

2.3 PROPORTION AND MIXTURE

A. Proportioning mixtures and production of concrete shall be in accordance with CBC, Section 1905 and shall be in accordance with mix designs submitted by Laboratory and approved by the Owner's Testing Agency.

B. Concrete shall have 3% +- 1%, air entrainment when approved by Testing Agency.

C. Water reducing admixtures may be used in concrete when approved by Testing Agency. Such admixtures shall not interfere with or reduce required air content dosage of air-entrained concrete

D. Use a minimum of 5 sacks of cement per cubic yard for all concrete.

E. Concrete Mix Requirements: The following table presents a schedule of elements of concrete, compressive strength in psi after 28-days when tested in accordance with ASTM C39, maximum aggregate and maximum slump, which shall be as follows:

Concrete Element	Strength	Aggregate Size (Inch)	Slump (Inch)
All Concrete	**Per Drawings**	**Per Drawings**	**Per Drawings**

PART 3 - EXECUTION

3.1 INSPECTION

A. Areas in which concrete is to be placed shall be inspected by Contractor for defects which would prohibit satisfactory placement of concrete or related miscellaneous items. Such defects shall be corrected prior to commencement of work.

B. Concrete shall not be deposited or placed until all forms, reinforcing steel and construction joints have been inspected by Owner's Testing Agency and accepted in advance within the entire extent of the pour. Architect shall be notified 48 hours prior to first pour.

3.2 FIELD QUALITY CONTROL

A. The Owner's Testing Agency will:
   1. Review concrete mix designs.
   2. Perform testing in accordance with ACI 318 and CBC Section 1903 and 1905.
   3. Continuously monitor concrete temperature and inspect concrete placement.
   4. Test concrete to control slumps according to ATSM C143.
   5. Test concrete for required compressive strength in accordance with CBC Section 1905:
      a. Make and cure three specimen cylinders according to ATSM C31 for each 150 cubic yards, or fraction thereof, of each class poured at site each day.
      b. Retain one cylinder for 7-day test and two for the 28-day test.
      c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.
      d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.
      e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.
      f. Base strength value on average of two cylinders taken for 28-day test.

B. The Contractor shall:
   1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:
      a. Design mix number.
      b. Signature or initials of ready mix representative.
      c. Comply with Title 24, CBC Section 1905.

3.3 WORKMANSHIP

A. All concrete shall be placed, finished and cured, and all other pertinent construction practices shall be in accordance with the Specifications for Structural Concrete for Buildings (ACI 301) hereby made a part of these specifications.

B. In addition to the requirements of ACI 301, the following shall prevail:

1. Concrete shall be placed so that a uniform appearance of surface will be obtained.
2. The concrete shall be free of all rock pockets, honeycombs and voids.
3. Concrete shall be deposited as nearly as practical in its final position.
4. The sub-grade shall be slightly moist when the concrete is placed for floor slabs to prevent excessive loss of water from the concrete mix.

C. VIBRATORS AND VIBRATING
1. Employ as many vibrators and tampers as necessary to secure the desired results. Minimum: one per each 20 cubic yards of concrete placed per hour.
2. Eliminate the following applications:
   a. Pushing of concrete with vibrator.
   b. External vibration of forms.
   c. Allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete.
   d. Allowing vibrator to vibrate contact faces of forms.
3. Vibrators shall function at a minimum frequency of 3600 cycles per minute when submerged in concrete.
4. Supplement vibration by forking and spading along the surfaces of the forms and between reinforcing whenever flow is restricted.

D. CURING
1. General: Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete.
2. Initial Curing: Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least overnight. One of the following materials or methods shall be used:
   a. Ponding or continuous sprinkling.
   b. Absorptive mat or fabric kept continuously wet.
3. Final Curing: Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by one of the following materials or methods:
   a. Continuing the method used in initial curing. Slabs to receive finish flooring materials to be continuously wet cured for 7 days.
   b. Waterproof paper conforming to “Specifications for Waterproof Paper for Curing Concrete” (ASTM C171).
   c. Curing compounds conforming to “Specifications for Liquid Membrane-Forming Compounds for Curing Concrete” (ASTM C309). Such compounds shall be applied in accordance with the recommendations of the manufacturer and shall not be used on any surfaces against which additional concrete or other cementitious finishing materials (such as ceramic tile) are to be bonded, nor on surfaces on which such curing is prohibited by the project specifications.
   d. Other moisture-retaining coverings as approved.
4. Duration of Curing: The final curing continues until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50 degrees F., has totaled 7 days.

5. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder of the curing period.

E. CONSTRUCTION JOINTS
1. Joints not shown on the drawing shall be so made and located as to least impair the strength of the structural element and shall be approved by the Owner and Structural Engineer.
2. The surfaces of all concrete at all joints shall be thoroughly cleaned and all laitance removed by sandblasting.
3. Concrete surfaces at designated joints shall be roughened to ¼" relief with rotohammer or similar method.
4. Moisten all joints immediately prior to placement of concrete.

F. EMBEDDED ITEMS
1. All sleeves, inserts, anchors and embedded items required for adjoining work or for its support shall be placed prior to concreting. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.

G. GROUTING COLUMN BASES
1. The grout shall be mixed and placed in strict accordance with manufacturer's instructions.
2. Care shall be taken in the grouting to ensure that there is full bearing between the base plates and the grout.

3.4 DEFECTIVE WORK: Work considered to be defective may be ordered to be replaced, in which case the Contractor shall remove the defective work at their expense. Work considered to be defective shall include, but not be limited to, the following:

A. Concrete in which defective or inadequate reinforcing steel has been placed.

B. Concrete incorrectly formed, or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces of which are out of plumb or level.

C. Concrete below specified strength.

D. Concrete containing wood, cloth or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.5 CORRECTION OF DEFECTIVE WORK

A. The Contractor shall, at their expense, make all such corrections as directed by the engineer.

B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings shall be chipped out until all unconsolidated material is removed.

3.6 SLAB FINISH

A. See Section 03 35 00 “Concrete Finishing”

B. Covered interior slabs shall receive a smooth, steel troweled finish.

END OF SECTION

SECTION 03 35 00 - CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes finishing of cast-in-place concrete, as follows.

1. Finishes at formed concrete walls.

a. Smooth exposed vertical surfaces.
b. Textured surface imparted by form liners at site retaining walls.

2. Interior walking surface finishes and slab finishes.
3. Exterior walking surface finishes, including integral color and scoring.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-In-Place Concrete" for primary requirements for concrete.
3. Section 03 35 43 "Polished Concrete Finishing" for polishing of interior walking surfaces.
4. Section 03 35 53 "Concrete Floor Sealer" for sealer at exposed concrete floors other than integrally colored and scored topping slabs.

C. The Work of this Section supplements requirements of Section 03 30 00 "Cast-In-Place Concrete." If requirements conflict, the more stringent shall govern.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site and according to requirements in Section 03 30 00 "Cast-In-Place Concrete."

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Form liners.
2. Form ties.
3. Color pigments.

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

C. Samples:

1. 12-by-12-inch sample of textured concrete made with specified form-liner pattern.
2. Pigments: Manufacturer's standard samples for initial selection.

D. Field Samples: Architect reserves right to request field samples.

1. Topping Slab: No fewer than three field samples, each a minimum of 24 inches square, demonstrating range of effects expected for integral color and scored finish, and agreed to during pre-installation conference.
2. Textured Finish Site Wall: 4 ft-by-full height of site wall, with joint between forms.

1.4 INFORMATIONAL SUBMITTALS

A. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

C. First-in-Place Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockup of cast-in-place concrete site wall with grape stake texture imparted by forms, having span of not less than 3 form panels, for review by Owner and Architect.
2. Demonstrate curing, cleaning, and protecting of textured cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
3. Obtain Architect's approval of mockups before casting the balance of form-textured concrete.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

~~D. Pre-Installation Conference: Conduct conference at Project site, according to requirements in Section 03 30 00 "Cast-in-Place Concrete."~~

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Textured Finish Imparted by Form Liners: Grape stake texture in typical 2-inch wide segments, with 3/4-inch average relief.

1. Product: Spec Formliners, Inc.; Pattern 1202, Grape Stake.

a. Form Liner Material: As required to produce texture matching accepted Sample. Form liners may be made from any of the 3 materials available from manufacturer, subject to quality of imparted texture being accepted by Architect.-

C. Form Ties: Factory-fabricated, glass-fiber-reinforced plastic internally disconnecting or removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

2.3 CONCRETE MIXTURES AND ACCESSORIES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
2. Color Pigment: Add color pigment to concrete mixture in accordance with manufacturer's written instructions and to result in hardened concrete color consistent with approved field sample panels.

B. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

1. Available Manufacturer: Subject to compliance with requirements, acceptable manufacturers of color pigments include, but are not limited to, the following:

a. Davis Color.

2. Source Limitations: Obtain color pigment from single source, from single manufacturer.
3. Color: As selected by Architect from manufacturer's full range.

C. Curing Compounds: ASTM C 309, Type 1, clear resin type free of oil, wax, grease, or other substances which might prove deleterious to any materials to be applied to concrete. Curing compound shall be approved by Environmental Protection Agency for use in the state of California, and at this Project site.

1. Curing Compound for Integrally Colored Concrete: Complying with ASTM C309 and approved by color pigment manufacturer.

a. Basis-of-Design: Davis Colors; W-1000 Clear Cure & Seal.

2. Multi-Purpose Curing, Hardener, and Sealer: Subject to compliance with requirements, provide one of the following:

a. Floorseal; Mirrorcrete Hardener.
b. Vaporseal 309 Curing/Sealing Membane.

3. Sealer: Subject to compliance with requirements, provide the following:

a. Floorseal; Mirrorcrete Sealer.

D. Weakened Plane Joint Former: Two-part rigid PVC plastic, in minimum depth equal to 1/4 of slab thickness.

1. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following, or approved equal:

    a. Superior Profiles; ZipStrip.
    b. W. R. Meadows; SealTight Speed-E-Joint.

2.4 PATCHING MORTAR

A. Patching mortar shall be prepared of same material and proportions as used for concrete, except coarse aggregate shall not be included. Water in the mix shall be kept to a minimum, and mortar shall not be retempered by adding water.

B. Patching mortar shall be allowed to stand for one hour prior to use, and periodically mixed to prevent setting.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Limit cast-in-place architectural concrete surface irregularities, as follows:

1. Surface Finish-2.0: ACI 117 (ACI 117M) Class B, 1/4 inch (6 mm).

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Chamfer exterior corners and edges of permanently exposed concrete.

D. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

E. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

F. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 CONCRETE PLACEMENT

A. Place concrete according to Section 03 30 00 "Cast-In-Place Concrete."

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

3.3 FINISHING FORMED SURFACES

A. Textured Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly manner, consistent with approved mockups.

1. Architect and Owner to review prior to any sacking, patching,or repair of tie holes and defects.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces to receive a rubbed finish.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where exposed in finished Work:

1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.4 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Flatwork: Unless otherwise noted, slabs shall be finished monolithically. Floor slabs which are indicated as sloped to floor drains shall be sloped uniformly so as to provide positive drainage of the indicated areas. Special care shall be taken that a smooth, even joint is obtained between successive pours.

C. Floor slabs that are indicated to be formed with camber specified on the Drawings shall have concrete placed to maintain the minimum thickness noted on the Drawings, throughout each pour. Set screed spins or other elevation devices to match camber requirements.

D. Slabs to receive concrete wall pours above shall have keys and or roughened surfaces per Structural Drawings.

E. Slab Tolerances: Comply with ACI 117 for local flatness/levelness tolerance measured in accordance with ASTM E 1155. Specified Overall Value (SOV) of F/F=30 and Minimum Local Value (MLV) of F/F=25, per ACI 302, with the following specific requirements:

1. Slabs-on-Grade Designated to Receive Carpet or Mortar Beds:

a. Floor Flatness (F/F): SOV=25, MLV=25.
b. Floor Levelness (F/L): SOV=20, MLV=20.

2. Slabs-on-Grade Left Exposed or Designated to Receive Resilient Flooring or Ceramic Tile:

a. Floor Flatness (F/F): SOV=35, MLV=25.
b. Floor Levelness (F/L): SOV=30, MLV=20.

3. Slabs-on-Grade Designated to Receive Polished Concrete Finish:

a. Floor Flatness (F/F): SOV=45, MLV=30.
b. Floor Levelness (F/L): SOV=35, MLV=24.

4. Concrete Topping Slabs at Wood-Framed Decks:

a. Floor Flatness (F/F): SOV=30, MLV=25.

5. Elevation Tolerance: 80 percent of points taken within individual sets of readings shall fall within 3/8-inch, plus or minus, from design elevation indicated on Drawings.

F. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.

1. Apply scratch finish to surfaces to receive mortar beds for tile.

G. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.

H. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, thinset ceramic tile, paint, or another thin-film-finish coating system, and as scheduled.
2. Concrete indicated to be "stained" (ST-SC in Finish Schedule on Drawings) shall receive trowel finish and shall be sealed with sealer approved by color pigment manufacturer).

I. Scored Finish at Integrally Colored Topping Slabs (ST/SC - CONCRETE in Finish Schedule on Drawings): Apply to hardened trowel-finished integrally colored concrete topping slabs. Use a concrete saw or grinder to cut lines in slabs, consistent with those on approved Sample. Scoring pattern and depth of cuts shall match those of approved Sample. After scoring, topping slab shall be sealed with sealer approved by color pigment manufacturer.

J. Trowel and Fine-Broom Finish: Apply a first trowel finish to exterior concrete surfaces. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Apply to surfaces indicated to receive fine broom finish in Finish Schedule on Drawings, typically exterior concrete walkways and stairs.
2. Coordinate required final finish with Architect before application.
3. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

3.5 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. See Section 03 30 00 "Cast-In-Place Concrete" for general curing requirements.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

3.6 FORMED CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

3.7 UNFORMED CONCRETE REPAIRS

A. Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

B. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.8 FIELD QUALITY CONTROL

A. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION

SECTION 03 35 43 – POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grinding, sealing, and polishing of new concrete floor slabs.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-in-Place Concrete" for concrete slab receiving polished concrete finish.
3. Section 03 35 00 "Concrete Finishing" for exterior walking surface finishing.
4. Section 03 35 53 "Concrete Floor Sealer" for unpolished slabs to be sealed.
5. Section 07 92 00 "Joint Sealants" for sealing control joints.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meetings: Conduct at project site, with applicator and manufacturer's representative present.

1.3 ACTION SUBMITTALS

A. Product Data.

B. Shop Drawings: Plan indicating extent of polished concrete.

C. Manufacturers' Instructions: Application instructions for complete system of specified products and procedures.

D. Applicator Qualification Statements:

1. Manufacturer's Acceptance: Letter of certification from manufacturer of finish product.
2. Experience: Signed statement of applicator experience.
3. Project History: For each project, provide project name and address, Architect, Owner, Contractor.

E. Field Samples: Provide 24 inch square or larger samples of new concrete mixes. Grind, stain, and seal as specified. Provide sufficient samples to demonstrate variations in effects due to concrete mixes, grinds, and stain application techniques.

F. Maintenance Data: Including methods, frequency, and precautions against cleaning products and methods which may harm finishes and performance.

1. Manufacturer's instructions for maintaining polished concrete, including methods and frequency recommended for maintaining optimum condition.
2. Precautions against cleaning products and methods which may harm finishes and performance.

1.4 QUALITY ASSURANCE

A. Applicators:

1. Manufacturer’s Acceptance: Trained, certified, and equipped by manufacturer of finish product.

2. Experience: Not less than 5 years experience with polished concrete work.
3. Project History: No fewer than 3 projects of similar scope and complexity to work of this Section, with record of successful in-service performance.

B. Mock-Up:

1. Provide mock-up of not less than 100 square feet, located where it will be concealed in finished construction, on concrete similar in color, texture, and density to concrete scheduled for polishing.
    a. Schedule mock-up with sufficient time to adjust concrete mix after polishing of mock-up.
    b. Review mock-up location with Architect before polishing.
    c. Maintain portion of mockup as grind reference, without staining or burnishing, until grinding work is completed. Include corner or edge condition in grind reference.
    d. Test DCOF of finished mock-up.
2. Apply mock-up in the presence of a manufacturer's representative.
3. Demonstrate methods used for finishing, using materials, workmanship, equipment, and techniques to be used throughout Project.
    a. Include patching material in mock-up.
    b. Include proposed polishing technique for edges and corners in mock-up.
4. Accepted mock-up provides visual standard for work of Section. Keep mock-up visible until polishing work is complete.
5. Provide up to two additional mock-ups if mock-up does not comply with requirements or is not accepted by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, Storage, and Handling Requirements:

1. Deliver and store liquid products in unopened containers.
2. Do not allow liquid products to freeze.

1.6 FIELD CONDITIONS

A. Ambient Conditions:

1. Fully enclose spaces with polished concrete surfaces within six months of application.
2. Cure new concrete for at least 28 days before application.
3. Cure concrete topping as recommended by topping manufacturer before application.
4. Concrete and concrete topping surfaces shall be clean and dry and shall be free of curing compounds, sealers, or other substances that may impede penetration of dye and densifier.
5. Ambient Temperature and Slab Temperature for Application: 40 to 100 degrees F.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Basis of Design System: Provide a complete system of products and finishing techniques, including certified or approved installers, by the following, or acceptable manufacturer of equivalent system:

1. Sika Scofield; Formula One, Grade One, Low Reflectivity.

B. Manufacturers of Equivalent Systems:

1. Advanced Flooring Products.
2. Bomanite.
3. CureCrete
4. L&M Construction Chemicals.
5. Prosoco.
6. Sika Scofield.

C. System Description:

1. VOC:

a. VOC content of color coating shall not exceed 50 g/L.
b. VOC content of penetrating sealer shall not exceed 100 g/L.

2. Performance: System shall have been proven to enhance the chemical resistance, stain resistance, moisture resistance, and abrasion resistance of concrete.
3. Dynamic Coefficient of Friction (DCOF): 0.42 minimum per ANSI B101.3.
4. Static Coefficient of Friction: 0.6 minimum per ASTM C1028.

D. Finish Designation: CONC-2 in Interior Graphic Appendix - GMP Addendum 1, and in Finish Schedule on Drawings.

2.2 MATERIALS

A. Patching Materials: Cement-based products complying with requirements in Section 03 54 16 "Hydraulic Cement Underlayment" and acceptable to polishing system manufacturer. Match aggregate and cement colors of existing concrete, to extent feasible.

B. Densifier: Recommended in writing by system manufacturer for application indicated.

1. Basis of Design Product: Sika Scofield; Formula One Lithium Densifier MP.

C. Dye: Recommended in writing by system manufacturer for application indicated.

1. Basis of Design Product: Sika; Scofield Formula One Liquid Dye Concentrate.

D. Sealer: Penetrating sealer in a liquid form.

1. Basis of Design Product: Sika Scofield; Formula One Finish Coat.
2. Sheen: Matte.

2.3 MIXING

A. Mix solutions according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Do not proceed with application if field conditions do not meet specified requirements.

B. Preinstallation Testing: As recommended by manufacturer of polishing system, but not less than the following.

1. Alkalinity:

a. Test Method: ASTM F710.
b. Acceptable Results: 8 to 10 pH.

2. Relative Humidity:

a. Test Method: In situ probes, ASTM F2170.
b. Acceptable Results: Maximum 75 percent.

3. Surface Absorptivity: Test as recommended by manufacturer.

3.2 PREPARATION

A. Protect adjacent surfaces from overspray, wetting, and dust.

B. Patch cracks, holes, and low areas prior to grinding and staining.

3.3 APPLICATION

A. Grinding and Polishing:

1. Progressively grind, hone and polish concrete, reaching maximum refinement with each pass before proceeding to finer grit tools.

a. Grind in no fewer than three passes.
b. Apply densifier and dyes or stains during grinding as recommended by system manufacturer.
c. Finish honing and polishing to specified sheen.

2. Surface Cut: Concrete Polishing Association Class C, Medium Aggregate, exposing aggregate heads 1/8 to 3/8 inch diameter.
3. Final Polish: Matte sheen.

B. Surface Preparation:

1. Vacuum clean surfaces to remove dust or other materials that could interfere with absorption of products.
2. Test surface absorbency with a light water spray. If concrete does not wet uniformly, remove any surface contaminants and re-test.
3. Do not proceed with application until surfaces are acceptable.

C. At stages indicated in densifier manufacturer's instructions, apply densifier and sealer according to manufacturer's instructions.

D. Burnishing:

1. Burnish with high-speed burnisher, with pad recommended in writing by sealer manufacturer.

E. Variations in Appearance: As accepted in polished concrete mock up.

3.4 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel to maintain polished concrete according to manufacturer's instructions.

3.5 CLEANING AND PROTECTION

A. For initial cleaning, progress cleanings, and final cleaning, clean polished concrete surfaces with the specified cleaner according to manufacturer's instructions.

B. Protect polished concrete surfaces from damage.

C. Clean floor prior to Substantial Completion.

END OF SECTION

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SECTION 03 35 53 - CONCRETE FLOOR SEALER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Densifying and sealing compound for exposed concrete slabs at utility spaces indicated on Drawings.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-in-Place Concrete."
3. Section 03 35 00 "Concrete Finishing" for floors receiving sealer specified in this Section.
4. Section 03 35 43 "Polished Concrete Finishing" for floor finishes and sealer NOT the Work of this Section.

1.2 COORDINATION

A. Coordinate the use of densifying and sealing compound with curing compounds used in concrete finishing to ensure compatibility of products, especially those indicated as multipurpose curing and hardening or sealing compounds.

1.3 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications, application instructions, and general recommendations. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Maintenance Data: Submit manufacturer's instructions for proper maintenance materials and procedures.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Provide products produced by a company that has successfully specialized in production of this type of work for not less than 5 years.

B. Field Samples: In location selected by Architect, provide 3 by 3 foot samples in the field. Final approval of sealers will be from field samples

1.5 PROJECT CONDITIONS

A. Environmental Requirements: Do not proceed with installation until areas to receive the work have been enclosed and until temperature and relative humidity have been stabilized and will be maintained within values established by the manufacturer for optimum quality control.

PART 2 - PRODUCTS

2.1 SUSTAINABLE DESIGN REQUIREMENTS

A. Products permanently installed on Project shall comply with ingredient limits and emissions testing requirements specified in Section 01 81 13 "Sustainable Design Requirements."

2.2 DENSIFYING AND SEALING COMPOUND

A. High Solids, Now-Yellowing, Water-Based Densifier and Sealer:

1. Basis-of-Design Product: Euclid Chemical Company; Chemstop WB Regular.
2. Subject to compliance with these requirements, products of other manufacturers will be considered.
3. Reduction in Water Absorption: Not less than 90 percent per SS-W-110C.
4. Accelerated Weathering: No change at 1500 hours.
5. Performance Standard: SS-W-110C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation properly may commence. Do not proceed with the work until unsatisfactory conditions have been resolved fully.

3.2 PREPARATION

A. Clean substrate, removing projections and substances detrimental to the work; comply with recommendations of manufacturer of products to be installed for proper preparation procedures.

B. Mask off or otherwise protect adjacent surfaces not scheduled to receive products of this section.

3.3 APPLICATION

A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

3.4 PROTECTION

A. General: Institute protective procedures and install protective materials as required to ensure that work of this section will be without damage or deterioration at substantial completion.

END OF SECTION

SECTION 03 54 13 - GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum-cement-based, self-leveling underlayment at wood subfloors receiving floor coverings.
2. Sound control mat, under gypsum-cement underlayment at hard flooring finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals: Documentation of compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements" as pertain to the Work of this Section.

C. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

C. Fire-Resistance Ratings: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

D. Sound Transmission Characteristics: Where indicated, provide gypsum-cement underlayment systems identical to those of assemblies tested for STC and IIC ratings per ASTM E 90 and ASTM E 492 by a qualified testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place gypsum-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F (10 and 27 deg C).

1.7 COORDINATION

A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 GYPSUM-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Gypsum-cement-based, self-leveling product that can be applied in uniform thickness of 3/4 to 1-1/2 inches (19 mm to 38 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Products: Subject to compliance with requirements, provide the following:

a. Maxxon Corporation; DuraCap or Commercial Topping.

2. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 3,500 psi, when tested according to ASTM C 109/C 109M at 28 days.
4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
5. Depth of Gypsum Cement: 1-1/4 inch.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm); or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

E. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

1. Coating shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D.

2. Coating shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ACCESSORIES

A. Sound Control Mat: Provide at unit living areas, bathrooms, and entries with hard surfacing over wood subfloor. Subject to compliance with requirements, provide the following:

1. Maxxon Corporation; Acoustimat 1/4 Premium.

B. Perimeter Isolation Board (PIB): 1/4 inch thick, product as recommended by underlayment manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

D. Forms: Separate areas receiving sound control mat from areas not receiving sound control mat, using steel angles or wood blocking as temporary forms.

E. Perimeter Isolation Board: Install at perimeters of spaces to receive sound control mat and at all vertical obstructions.

1. Install at walls, at floor penetrations, doorways, and along forms separating sound control mat pours from pours not receiving sound control mat.
2. Where staples are used to secure PIB, staples shall be minimum two inches above final pour height of underlayment.
3. Do not cut PIB back until underlayment is cured.
4. See Section 09 30 13 "Ceramic Tiling" for isolation of tile flooring at PIB.

F. Sound Control Mat: Install sound control materials according to manufacturer's written instructions.

1. Do not install mechanical fasteners that penetrate through the sound control materials.

G. Tape seams, intersections, penetrations, and tears or cuts in sound control mat and PIB liquid-tight.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Total thickness of gypsum cement underlayment, including acoustic underlayment: 1-1/2 inch (38 mm).
2. Apply a final layer without aggregate to product surface.
3. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

G. Cut perimeter isolation board flush with finish floor.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION

SECTION 04 05 16 - MASONRY GROUT

PART 1 GENERAL

1.1 DESCTIPTION

A. Work includes furnishing, installing, calibrating, adjusting, testing, documenting, and starting up materials and/or equipment in accordance with these Specifications, the accompanying Plans, and the directions of the Engineer. The scope of this Section includes the following:

a. Grout for masonry.

1.2 RELATED SECTIONS

A. Section 042223 – Concrete Masonry Unit.

1.3 REFERENCES

A. ASTM C476 - Grout for Masonry.

1.4 SUBMITTALS

A. Grout Design Mix to be utilized for project shall be submitted to the engineer for design sign review prior to usage.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 and ACI 530.1.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature between 50° F (10° C) and 90° F (32° C) prior to, during, and 48 hours after completion of masonry work.

1.7 CODES, ORDINANCES, AND REGULATIONS

A. Do all work and install materials and/or equipment in accordance with the requirements of the applicable Federal, State, County, City, and applicable laws and ordinances having jurisdiction.

B. Conflicts, if any, that may exist among the above items will be resolved at the discretion of the Engineer.

C. Wherever the requirements of the Specifications or Plans exceed those of the items above, the requirements of the Specifications or Plans shall govern.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

1.9 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain major materials, products, equipment, and system components, from one source from a single manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, provide all first-quality new materials, free from any defects, and suitable for the intended use and the space provided. Provide materials approved by UL wherever standards have been established by that organization.

B. Furnish and install all incidental items not specifically shown or specified which are required by good practice to provide the complete systems specified herein.

C. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

2.2 GROUT MIXES

A. Engineered Masonry: 3,000 psi strength at 28 days; 8–10-inch slump; mixed in accordance with ASTM C476 Course grout.

2.3 GROUT MIXING

A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.

PART 3 EXECUTION

3.1INSTALLATION

A. Install grout in accordance with manufacturer's instructions.

3.2 REPAIRS AND PROTECTION DURING CONSTRUCTION

A. Protect all materials, equipment, and systems from weather, damage, and theft until substantial completion. Damaged or compromised products must be replaced by the contractor at no additional cost to the project.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. Follow the manufacturer's installation recommendations unless otherwise indicated. Follow the Engineer's decision, wherever any conflict arises between the manufacturer's instructions, State or other codes and regulations, and these Contract Documents. Keep copy of the manufacturer's installation instructions available on the jobsite for review at all times.

3.4 CUTTING AND PATCHING

A. Do not cut or notch any structural member or building surface without specific approval of the Engineer. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to new condition using skilled craftsmen of the trades involved.

3.5 CLEANING AND TOUCH-UP PAINTING

A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Refinish damaged surfaces to new condition using skilled craftsmen of the trades involved.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A. Measurement and payment for all work shall be in accordance with the contract BID SCHEDULE, refer to Section 004100 and actual work as field measured and verified. No payments will be made for materials on hand. All payments to be made following field verification of work.

END OF SECTION 041000

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SECTION 04 22 23 - CONCRETE MASONRY UNIT

PART 1 GENERAL

1.1 DESCTIPTION

A. Work includes furnishing, installing, calibrating, adjusting, testing, documenting, and starting up materials and/or equipment in accordance with these Specifications, the accompanying Plans, and the directions of the Engineer. The scope of this Section includes the following:

a. Concrete Masonry Units
b. Epoxy Bonding Adhesive
c. Control Joint Materials
d. Joint Reinforcement
e. Reinforcing Steel
f. Precast Beams, Lintels and Copings
g. Mortar
h. Grout
i. Surface Sealer

1.2 RELATED SECTIONS

A. Reinforcing steel for concrete and connecting dowels for grouted unit masonry are specified in Section 033000.

1.3 MEASUREMENT AND PAYMENT

A. General: Measurement and payment for concrete unit masonry will be included in the control building and per Section 004100.

B. Measurement:
1. Vertical and horizontal steel reinforcement, control joints, mortar, grout, anchors, ties, masonry cleaning, sealer, and miscellaneous accessories will not be measured separately for payment; such items will be considered incidental to, and included with, the concrete unit masonry work.

1.4 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 530 Building Code Requirements for Masonry Structures
2. ACI 530.1 Specifications for Masonry Structures

B. American Society for Testing and Materials (ASTM):
1. ASTM C33 Specification for Concrete Aggregates
2. ASTM C90 Specification for Hollow Load-Bearing Concrete Masonry Units

3. ASTM C91 Specification for Masonry Cement
4. ASTM C94 Specification for Ready-Mixed Concrete
5. ASTM C109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
6. ASTM C143 Test Method for Slump of Hydraulic Cement Concrete
7. ASTM C144 Specification for Aggregate for Masonry Mortar
8. ASTM C150 Specification for Portland Cement
9. ASTM C207 Specification for Hydrated Lime for Masonry Purposes
10. ASTM C270 Specification for Mortar for Unit Masonry
11. ASTM C404 Specification for Aggregates for Masonry Grout
12. ASTM C476 Specification for Grout Masonry
13. ASTM C881 Specification for Epoxy-Resin-Base Bonding Systems for Concrete
14. ASTM C979 Specification for Pigments for Integrally Colored Concrete
15. ASTM C1006 Test Method for Splitting Tensile Strength of Masonry Units
16. ASTM C1019 Test Method for Sampling and Testing Grout

1.5 REGULATORY REQUIREMENTS

A. In addition to the foregoing referenced standards, the regulatory requirements that govern the work of this Section include the following governing code: California Code of Regulations (CCR), Title 24, Part 2, California Building Code, Chapter 21, “Masonry,” and Chapter 21A, “Masonry.”

1.6 SUBMITTALS

A. Refer to the Special Provisions and section 013300 for additional submittal guidelines. Before any equipment and/or material is fabricated or shipped, furnish to the Engineer full details, shop drawings, dimensions, catalog cuts, schematic (elementary) diagrams, and other descriptive matter as required to fully describe the equipment and/or material specified under the Section.

B. Shop Drawings: When not indicated in sufficient detail or definition, submit detailed drawings of unit masonry, showing type of mortar joints, bond pattern, reinforcing steel, connecting dowels, joint reinforcement, grouted cells, and control joints.

C. Product Data: Submit manufacturer's product data for block, including available color range, epoxy adhesive, joint reinforcement, and control-joint materials, along with installation instructions where applicable.

D. Samples: Submit full-size sample of block and samples of colored mortar for approval. Block and colored joint mortar require approval of the Engineer before they may be used in the concrete masonry work.

E. Certificates: Submit certification stating that concrete masonry units meet specification requirements and that masonry units conform to the special strength requirements of these Specifications. Each certificate shall be signed by the masonry unit manufacturer and shall contain the

name of the manufacturer, the project location, and the quantity and dates of shipment or delivery to which the certificate applies.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

1.8 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain major materials, products, equipment, and system components, from one source from a single manufacturer.

B. Concrete unit masonry work shall conform to applicable requirements of the California Building Code, Chapters 21 and 21A, ACI 530, and ACI 530.1, except as modified in these Specifications.

C. Construction tolerances for concrete unit masonry shall conform to ACI 530.1.

D. Refer to Section 014500 - Quality Control, for additional requirements and procedures.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, provide all first-quality new materials, free from any defects, and suitable for the intended use and the space provided. Provide materials approved by UL wherever standards have been established by that organization.

B. Furnish and install all incidental items not specifically shown or specified which are required by good practice to provide the complete systems specified herein.

C. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

2.2 MATERIALS

A. Concrete Masonry Units (Concrete Block):

1. Concrete masonry units shall be of modular face dimensions and thicknesses indicated. Furnish necessary shapes and sizes, bond-beam units, and corner units as required to satisfy conditions indicated. Include half-size units were indicated or required.
2. Concrete masonry units shall be hollow load-bearing units conforming to ASTM C90, and shall be No. 1 Normal Weight, No. 2 Medium Weight, or No. 3 Light Weight, as applicable,

Type I - Moisture Controlled Units. Units shall have a maximum linear shrinkage of 0.06 percent, and shall meet water absorption requirements of ASTM C90.

3. Concrete masonry units shall be normal cement-colored units with standard face surfaces. Cinders or ingredients that might stain paint finishes will not be permitted in the manufacture of concrete masonry units.

B. Split-Face Concrete Masonry Units:

1. Split-face concrete masonry units shall conform to ASTM C90, as specified above for concrete masonry units, of modular face dimensions and thicknesses indicated. Face of units shall have special surface texture split-face, scored to dimensional module indicated. Minimum strength requirements shall conform to foregoing specified concrete masonry units.
2. Block shall have integral color as selected by the Owner from manufacturer's standards.

C. Cement: ASTM C150, Type I or Type II Portland cement, low alkali. Provide white cement when required to achieve the mortar color selected by the Engineer. ASTM C91, Type S, masonry cement may be used together with ASTM C150 portland cement as herein specified under "Mortar."

D. Lime: ASTM C207, hydrated, Type S.

E. Mortar Sand: ASTM C144, natural sand, clean and graded.

F. Mortar Coloring Pigment: ASTM C979, manufactured, inert mineral oxides in color or colors as selected and approved by the Owner.

G. Grout Aggregate: ASTM C33 or ASTM C404, clean and graded concrete aggregates, proportioned by volume as follows: 3 parts fine and graded concrete aggregate to 2 parts of graded 3/8-inch maximum size coarse aggregate.

H. Water: Fresh, clean and potable, and free from such amounts of mineral and organic substances as would adversely affect the hardening of cement mortar.

I. Epoxy Bonding Adhesive: Adhesive for bonding of mortar bed to concrete slabs shall be an epoxy-based bonding agent conforming to ASTM C881, Type V, tinted to show by visual inspection where it has been applied.

J. Control Joint Materials: Conform to requirements of ACI 530.1.

K. Joint Reinforcement: No. 9 gage ladder or truss type steel wire conforming to ACI 530.1.

L. Reinforcing Steel: Provide reinforcing steel for grouted block masonry under this Section in accordance with the requirements of Section 032000 - Concrete Reinforcing, and ACI 530.1.

M. Precast Beams, Lintels, and Copings: Precast concrete of configuration indicated, conforming to requirements of Section 033000 - Cast in Place Concrete, and ACI 530.1. Provide exposed surfaces with light sand-blasted finish matching finish of masonry units as closely as possible.

2.3 MORTAR

A. Mortar Type and Mixing Requirements:

1. Mortar for grouted unit masonry shall be Type S mortar in accordance with the California Building Code, Chapter 21 and 21A, ACI 530.1, and ASTM C270, with a minimum compressive strength at 28 days of 1,500 psi. A minimum of two 94-pound sacks of portland cement (ASTM C150) shall be provided per cubic yard of mortar when using ASTM C91 masonry cement.
2. The use of an admixture for the purpose of reducing water content in mortar will be permitted, provided the strength of the mortar is not reduced.
3. Mortar shall be job mixed and, in lieu of specific requirements specified herein, shall conform to ASTM C270, including measurement, mixing, proportioning, and water retention.
4. Accurately measure mortar ingredients and mix a minimum of three minutes after water has been added, in a mechanical batch mixer, using sufficient water to produce a workable and plastic consistency. Hand mixing will be permitted for small quantities only.
5. Use mortar within 2-1/2 hours after mixing when air temperature is 80 degrees or higher, and within 3-1/2 hours when air temperature is below 80 degrees. Discard any mortar that has been mixed longer or that has begun to set. If necessary, mortar may be re-tempered within this time limit, by replacing only water lost due to evaporation and by thorough remixing.

B. Colored Joint Mortar: Provide colored mortar for exposed masonry joints where indicated. Color shall be as approved by the Engineer from samples prepared and submitted by the Contractor. Pigment amount for selected color and mixing of colored mortar shall conform to the pigment manufacturer's instructions.

2.4 GROUT

A. Grout shall be Coarse Grout, as defined in ASTM C476, with a minimum compressive strength at 28 days of 2,000 psi, and shall be proportioned by volume in accordance with ACI 530.1.

B. Grout mix shall be designed in accordance with ASTM C94 for manufacturer designed mixes, and for handling by an approved grout pump. Slump shall be 10 inches.

C. The use of an admixture for the purpose of reducing water content in grout and adding flowability will be permitted, provided the strength of the grout is not reduced. Admixture shall be added to the mix as recommended by the manufacturer for the purpose intended.

2.5 SURFACE SEALER

A. Provide a water-based, VOC-compliant, clear, penetrating water-repellent sealer, designed to provide long-term protection against water absorption, for exterior concrete unit masonry surfaces. Submit sealer performance data and VOC compliance verification for approval.

PART 3 EXECUTION

3.1 LAYING CONCRETE MASONRY UNITS

A. Installation Standards: Comply with applicable requirements of ACI 530.1.

B. Requirements: Construct concrete unit masonry to dimensions indicated. Concrete masonry units shall be dry when laid. Avoid using less than half-size units in exposed locations. Do not expose cells on any surface. Where concealed, spaces not large enough for full or half-size units may be filled with concrete building brick or mortar.

C. Work Quality:

1. Masonry work shall be performed by skilled and experienced masons. Erect walls plumb and true to line, with courses level and joints uniform in width, using specified mortar. Vertical joints shall line up plumb in exposed walls.
2. Concrete masonry units shall be sound and free of cracks and surface defects. Handle units carefully to avoid chipping and breaking. Do not substitute cut units where special shapes are available.
3. Where steel beams or joists frame into masonry, fill spaces with mortar and finish off flush with masonry surface, neatly pointed around steel. Where pipes and ducts penetrate masonry, point neatly and accurately around pipes and ducts.

D. Cutting of Units: Cutting of units shall be kept to a minimum. Perform cutting accurately to accommodate items passing through or embedded in masonry, to meet surfaces that masonry abuts, and to fit various conditions. Cutting of masonry units shall be performed with a power-driven masonry saw. Rub cuts smooth and even with carborundum or emery stone.

E. Bedding and Jointing:

1. Use full mortar bed and coverage on horizontal and vertical face shells of hollow units. Webs also shall be bedded in mortar. Shove vertical joints tight.
2. Top surfaces of concrete foundations or other bed joints shall be clean concrete with aggregate exposed before start of laying. Tops of foundations shall be roughened and cleaned to remove laitance for exposing aggregates in the concrete. Where block is to be laid on slabs, bed joints shall be roughened and cleaned, and an epoxy bonding adhesive shall be applied before laying first course of block.

3.2 REPAIRS AND PROTECTION DURING CONSTRUCTION

A. Protect all materials, equipment, and systems from weather, damage, and theft until substantial completion. Damaged or compromised products must be replaced by the contractor at no additional cost to the project.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. Follow the manufacturer's installation recommendations unless otherwise indicated. Follow the Engineer's decision, wherever any conflict arises between the manufacturer's instructions, State or other codes and regulations, and these Contract Documents. Keep copy of the manufacturer's installation instructions available on the jobsite for review at all times.

3.4 CUTTING AND PATCHING

A. Do not cut or notch any structural member or building surface without specific approval of the Engineer. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to new condition using skilled craftsmen of the trades involved.

3.5 CLEANING AND TOUCH-UP PAINTING

A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Refinish damaged surfaces to new condition using skilled craftsmen of the trades involved.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A. Measurement and payment for all work shall be in accordance with the contract BID SCHEDULE, refer to Section 004100 and actual work as field measured and verified. No payments will be made for materials on hand. All payments to be made following field verification of work.

End Section 04 22 23

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SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Section includes:
1. Structural steel.
2. Reinforcing steel welded to structural steel.
3. Grout for base plates and bearing plates.

B. Products furnished but not installed under this section
1. Anchor bolts and steel fabrications cast into concrete are installed under Section 03 30 00.

1.2 APPLICABLE STANDARDS (latest editions apply) unless otherwise noted.

A. ASTM – American Society for Testing and Materials
1. A6 – Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
2. A36 – Specification for Steel.
3. A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
4. A123 – Specification for Zinc (Hot Dip Galvanized) Coating on Iron and Steel Products.
5. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. A307 – Specification for Carbon Steel Externally Threaded Standard Fasteners.
7. A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
8. A354 – Specification for Quenched and Tempered Steel Bolts and Studs and Other Externally Threaded Fasteners.
9. A449 – Specification for Quenched and Tempered Steel Bolts and Studs.
10. A490 – Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
11. A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. A563 – Specification for Carbon and Alloy Steel Nuts.
13. A572 – Specification for High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
14. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
15. A706 – Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
16. A780 – Specification for Repair of Damaged Hot-Dip Galvanized coatings.
17. A913 – Specification for High Strength Low Alloy Shapes of Structural Quality Produced by Quenching and Tempering Process.

18. A992 – Specification for Steel for Structural Shapes for use in Building Framing.
19. C1107 – Specifications for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
20. F844 – Specification for Washers, Steel, Plain (Flat) Unhardened for General Use.

B. AISC – American Institute of Steel Construction
1. Specification – Steel Construction Manual
2. Specification – ANSI/ AISC 360 Seismic Provisions for Structural Steel Buildings.
3. Code – Code of Standard Practice for Steel Buildings and Bridges. Articles 3.2 and 3.3 and Section 4 and 9 of AISC Code are superseded by requirements of the General Conditions, Special Conditions and Contract Documents.

C. AWS – American Welding Society
1. D1.1 – Structural Welding Code.
2. D1.4 – Structural Welding Code – Reinforcing Steel.

D. ICC – International Code Council:
1. CBC – California Building Code, 2022.

E. ASCE/ SEI – American Society of Civil Engineers:
1. 07-16, Minimum Design Loads for Buildings and Other Structures

F. SSPC – Steel Structures Painting Council's, "Systems and Specifications".
1. SP1 – Solvent Cleaning.
2. SP2 – Hand Tool Cleaning.
3. SP3 – Power Tool Cleaning.
4. SP6 – Commercial Blast Cleaning.

1.3 DEFFINITIONS

A. Architecturally Exposed Structural Steel (AESS).
1. Structural steel framing exposed to view from the building exterior.
2. Structural steel framing noted as AESS on Drawings.

B. Heavy Shapes: ASTM A6, Group 3 shapes with flanges thicker than 1 – ½-inches and Group 4 shapes and Group 5 shapes; welded built-up members with plates exceeding 2-inches in thickness.

C. Seismic Critical Weld:
1. Complete penetration welds in beam to column connections, including flange, flange reinforcement, stiffener plate and doubler plate welds.
2. Complete penetration welds of column splices and of columns to base plates.
3. Other complete penetration welds indicated as "Seismic Critical" on Drawings.

1.4 SUBMITTALS

A. Shop Drawings:
1. Provisions of AISC Code, Section 4, are superseded by requirements of General Conditions, Special Conditions, and Section 01 33 00 of these specifications.

2. Show size and location of structural members; give complete information necessary for the fabrication of members including cuts, copes, holes, stiffeners, camber, type and size of bolts and welds, surface preparation and finish; show methods of assembly.
3. Indicate welded connections using standard AWS symbols and clearly distinguish between shop and field welds.
4. Identify high strength bolted connections (snug-tight or slip-critical).

B. Certificates of compliance with specified standards.
1. All steel.
2. Fasteners, including nuts and washers.
3. Welding electrodes.
4. Studs.
5. Nonshrink Grout.
6. Reinforcing steel.
7. Primer Paint.

C. Certified manufacturer's test reports: Submit to Testing Laboratory for record purposes.
1. All Steel: Tensile tests and chemical analysis, welds. Include all trace elements for steel to receive Seismic Critical Welds.
2. High Strength bolts: As per ASTM A325, Section 1.4; or A490, Section 1.6.
3. Reinforcing Steel: Chemical, tensile and bend tests.
4. Heavy Shapes: Charpy V-Notch

D. Product Data
1. Welding Electrodes

E. Welder Certification

F. Written Welding Procedure Specification (WPS) in accordance with AWS D1.1 requirement for each different welded joint proposed for use, whether prequalified or qualified by testing.
1. Indicate as-detailed configuration and also the maximum and minimum fit-up configurations.
2. Identify specific electrode and manufacturer.
3. List actual values of welding parameters to be used so that clear instruction is provided to welders.

G. Procedure Qualification Record (PQR) in accordance with AWS D1.1 for all procedures qualified by testing.

H. Samples: As requested by the Testing Laboratory.

1.5 QUALITY ASSURANCE

A. Code and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC 303 "Code of Standard Practice for Steel Buildings and Bridges". Articles 3.2 and 3.3 and Sections 4 and 9 of AISC Code are superseded by requirements of the General Conditions, Special Conditions and Contract Documents.
2. AWS D1.1 "Structural Welding Code – Steel."
3. ANSI/ AISC 360 “Specifications for Structural Steel Buildings."
4. Research Council in Structural Connections – “Specifications for Structural Joints Using ASTM A325 or A490 Bolts."

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS D1.1, "Qualification" requirements.
1. Qualify welders in accordance with AWS D1.1 for each process, position and joint configuration.
2. WPS's for each joint type shall indicate proper AWS qualification and be available where welding is being performed.
3. Welders who have not performed the required welding procedure for a period of six or more months shall be requalified.
4. Welders whose work fails to pass inspection shall be requalified before performing further welding.
5. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Field Measurement: Field verify all existing conditions affecting steel members and steel member placement prior to fabricating and installation of steel members.

D. Pre-Fabrication/Pre-Erection Conferences: Contractor shall schedule meeting with Structural Engineer, Testing Laboratory and the Steel Fabricator and Erector's personnel supervising shop and field welding to review welding procedures and inspection requirements for "Seismic Critical Welds."

E. Welding Inspector Qualifications: All welding inspectors shall be AWS certified welding inspectors (CWI) as defined in AWS Standard and Guide for Qualification and Certification of Welding Inspectors, latest edition. Welding inspector's qualifications shall be submitted to the Structural Engineer for approval. Inspectors shall be trained and thoroughly experienced in inspecting welding operations. Comply with AWS section 6.1.3.

1.6 SCHEDULING AND SEQUENCING

A. Ensure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: All steel shall be identified as required by CBC Section 2203.1. Steel which is not properly identified shall be tested to show conformance with requirements of applicable ASTM Standard at Contractor's expense.

B. Exposed Surfaces: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and applying surface finishes.

C. Steel W Shapes: ASTM A992
   1. Heavy Shapes (see "Definitions" in this Section) shall be supplied with Charpy V-Notch testing in accordance with ASTM A6 Supplementary Requirement S5. The impact test shall meet a minimum average value of 20 ft-lbs absorbed energy at +70 degrees Fahrenheit and shall be conducted in accordance with ASTM A673, frequency H, with the following exceptions:
      a. The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and the center of the flange thickness at the intersection with the web mid-thickness.
      b. Tests shall be conducted by the producer on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

D. Steel Channels and Angles: ASTM A36; or dual certified ASTM A36/A572.

E. Steel Plates and Bars:
   1. ASTM A572, Grade 50, unless indicated otherwise.
   2. ASTM A36 where designated on Drawings.

F. Steel Pipes: ASTM A53, Type S, Grade B.

G. Hollow Structural Sections: ASTM A500, Grade B.

H. Standard Threaded Fasteners: ASTM A307, Grade A, bolts with ASTM A563 hex nuts.

I. High Strength Bolts:
   1. ASTM A325, type 1; unless indicated otherwise.
   2. ASTM A490 where designated on Drawings.
   3. Nuts and washers conforming to AISC Part 7.

J. Anchor Bolts (unless otherwise indicated on Drawings):
   1. 1-inch diameter and small bolts: ASTM A307, Grade A.
   2. Larger than 1-inch diameter bolts: ASTM A449.
   3. Washers: ASTM F844; 5/16-inch minimum thickness.
   4. Nuts: ASTM A563, heavy hex.

K. Anchor Bolts (where designated on Drawings):
   1. ASTM A354, Grade BD, externally threaded rod; form head with ASTM F436 hardened washer between double ASTM A563, DH, heavy hex nuts.
   2. Plate washer: ASTM F844; ½-inch minimum thickness.
   3. Nuts: ASTM A563, Grade DH, heavy hex.

L. Welding Materials: AWS D1.1; type required for base metals being welded.

1. Electrodes shall be low hydrogen.
2. Electrodes for "Seismic Critical Welds" shall have a minimum Charpy V-notch toughness of 20 ft-lbs at –20 degrees Fahrenheit.

M. Shop Primer:
1. Type A Primer: Conforming to federal, state and local v.o.c. regulations; containing no lead or chromates; Tnemec Series 88HS, or approved equal.
2. Type B Primer: Organic zinc-rich urethane; conforming to federal, state and local v.o.c. regulations; Class A coating, Tnemec "90-97 Tneme-Zinc", or approved equal.

N. Studs
1. Headed Shear Connector Studs; AWS D1.1, Type B; as-welded size as shown on Drawings.
2. General Purpose Studs; AWS D1.1, Type A; as-welded size and configuration as shown on Drawings.

O. Reinforcing Steel: ASTM A706, deformed.

P. Nonshrink Grout: Premixed, nonmetallic, noncorrosive product, complying with ASTM C1107, Class B or C, at flowable consistency for 30 minutes for temperature extremes of 45 degrees F to 90 EF.
1. Products: Subject to compliance with requirements, provide one of the following:
2. Euco N.S., Euclid Chemical Co. Masterflow 928, Master Builders. Five Star Grout, U.S. Grout Corp. Sika Grout 212, Sika Corp.

2.2 FABRICATION

A. Fabricate structural steel in accordance with AISC Specification and AISC Code.
1. Architecturally Exposed Structural Steel conform to Section 10 of AISC Code.
2. Fabricate joints in heavy shapes in accordance with additional requirements of Section A 3.1(c) of AISC Specification.

B. Connections: Where connection is not shown, design in accordance with standard practice unless otherwise directed by the Architect.

C. Drill, not punch, holes centered 6" or less from an edge to be complete penetration welded.

D. Assembly with High Strength Bolts
1. Construct connections in accordance with CBC, Section 1704 and AISC, using provisions for slip-critical joints, unless snug-tight bolts are indicated on Drawings.
2. Use standard holes, unless otherwise indicated on Drawings.

E. Assembly with Standard Threaded Fasteners
1. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.
2. Provide beveled washers under bolt heads or nuts resting on surfaces exceeding five percent slope with respect to head or nut.

F. Welded Construction
1. Examine fit-up of joint for conformance with welding procedure specification. Do not proceed with welding until fit-up is inspected by Testing Laboratory.
2. Weld in accordance with AISC Specification using manual shielded arc method or flux cored arc method in accordance with AWS D1.1. Weld only in accordance with welding procedure specifications (WPS) for joint, which are to be available to welders and inspectors during the production process.
3. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings. Groove preparation is at Contractor's option, subject to qualification in accordance with AWS D1.1. Runoff plates shall be in accordance with AWS D1.1; end dams shall not be used.
4. Remove back-up plates for complete joint penetration wields where indicated in Contract Documents or when requested by Testing Laboratory to perform nondestructive testing. Remove at no additional cost to Owner
5. Complete penetration groove weld Heavy Shapes in accordance with AISC Specification Section J1.7 for tension splices.
6. The following additional requirements apply to "Seismic Critical Welds":
    a. Use electrodes specified for Seismic Critical Welds.
    b. At beam flange to column welds, remove back-up plates, back gouge, clean by grinding and back weld with reinforcing fillet, unless Drawings specifically indicate that back-up bar may remain. Do not place reinforcing fillet until Testing Lab has inspected groove weld.
    c. Cut off runoff plates 1/8-inch from edges and grind smooth (not flush).
7. Weld reinforcing steel to structural steel in accordance with AWS D1.4 using prequalified procedures.
8. Grind exposed welds of Architecturally Exposed Structural Steel smooth and flush with adjacent finished surface.

G. Column Bases: Finish in accordance with AISC Specification. Lack of contact bearing with column shall not exceed 1/16 inch.

H. Bearing Plates: Provide for attached or unattached installation under beams, and girders resting on footings, piers, and walls.

I. Headed Studs: Automatically end weld in accordance with AWS D1.1 and manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and steel member.

2.3 FINISHES

A. Preparation of Surfaces
1. All surfaces shall be cleaned per SSPC-SP1 "Solvent Cleaning" to remove oil and grease prior to any other surface preparation.
2. After fabrication, prepare the following steel surfaces in accordance with SSPC-SP2 "Hand Tool Cleaning":
    a. Steelwork to be spray-fireproofed.
    b. Steelwork to be encased in concrete.
    c. Steelwork to be hot-dip galvanized.

d. Treat faying surfaces of slip-critical high strength bolted connections to achieve Class C surface in accordance with AISC 303-05.

2.4 SOURCE QUALITY CONTROL

A. The Testing Laboratory will:
1. Review manufacturer's test reports for compliance with specified requirements.
2. Verify material identification.
3. Inspect high-strength bolted connections as required by CBC Section 1704 for conformance with CBC Chapter 22.
4. Inspect welding as required by CBC Section 1704 in accordance with AWS D1.1. The following should be performed with each weld:
   a. Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.
   b. Verify fit-up meets tolerances of WPS and mark joint prior to welding.
   c. Verify welding consumables per Contract Documents and WPS.
   d. Verify welder qualification and identification.
   e. Verify amperage and voltage at the arc with hand-held meters.
   f. Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.
5. For Seismic Critical Welds, inspect removal of back-up and run-off plates, preparatory grinding and execution of reinforcing fillet.
6. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld quality and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.
7. Ultrasonically inspect base metal thicker than 1/2 inch for discontinuities behind welds in accordance with CBC Section 1704.3.
8. Periodically, inspect and test stud welding as required by CBC Section 1704 in accordance with AWS D1.1; except that test studs shall be subjected to a 90° bend test by striking them with a hammer. Review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine existing structure to support construction and verify the following:
1. Location and elevation of bearings and anchor bolts are correct.
2. Other conditions adversely affecting erection of steel are absent.

B. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts.

3.3 ERECTION

A. Erect structural steel in accordance with AISC Specification and AISC Code.

B. Grouting Baseplates and Bearing Plates: Prior to erection, clean and roughen concrete surface beneath baseplate to full ¼" amplitude; clean bottom surface of baseplate of bond-reducing materials. After columns have been positioned and plumbed, flow nonshrink grout solidly between bearing surfaces to ensure no voids remain. Comply with manufacturer's recommendations for mixing, placing, finishing and curing of grout.

C. Where erection requires performing work of fabrication on site, conform to applicable standards of Fabrication Article.

D. Field corrections of major members will not be permitted without the Architect's prior approval.

E. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will not be visible in finished work.
   1. Make cuts smooth and regular in contour.
   2. To determine effective width of members so cut, deduct 1/8-inch from least width at cut edge.
   3. Make radius of cut fillet as large as practical, but in no case less than one inch.
   4. Do not use flame cutting torch to align bolt holes.

F. Field Touch-Up Painting: After erection, touch-up or paint field connections and abrasions in shop paint with same paint used for shop painting. Touch up galvanized surfaces in accordance with ASTM A780.

3.4 CLEANING

A. After erection, thoroughly clean surfaces to foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fire-retardant coating, paint or concrete.

3.5 FIELD QUALITY CONTROL

A. The owner’s Testing Laboratory will:
   1. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.
   2. Inspect high-strength bolted connections as required by ICBC Section 1704 for conformance with CBC Chapter 22.

3. Inspect welding as required by CBC Section 1704 in accordance with AWS D1.1. The following should be performed with each weld:
   a. Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.
   b. Verify fit-up meets tolerances of WPS and mark joint prior to welding.
   c. Verify welding consumables per Contract Documents and WPS.
   d. Verify welder qualification and identification.
   e. Verify amperage and voltage at the arc with hand-held meters.
   f. Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.
4. For Seismic Critical Welds, inspect removal of back-up and run-off plates, preparatory grinding and execution of reinforcing fillet.
5. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld qualify and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.
6. Periodically, inspect and test stud welding as required by CBC Section 1704 in accordance with AWS D1.1; except that test studs shall be subjected to a 90° bend test by striking them with a hammer. Review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel ~~framing and~~L-bracket supports, partially concealed within walls, for cantilevered countertops~~, including partially concealed wall bracket~~.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Steel weld plates and knife brackets.
5. Elevator hoistway beam.
6. Metal ladder at elevator pit.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-In-Place Concrete" for concrete to receive embedded anchors or sleeves and for concrete fill at pipe bollards, where required.

1.2 COORDINATION

A. Coordinate requirements for framing and supports with assemblies that require them.

B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Ladders.
2. Paint products.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Metal ladders.
2. Support framing for Work of other Sections. Including, but not limited to, steel supports at the following:
    a. Overhead sectional doors.
    b. Coiling counter doors.
3. Weld plates with knife brackets.

C. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. See "Performance Requirements" article for engineering by manufacturer's engineer, and use of span charts in delegated design.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

1. Manufacturer's qualified professional engineer is acceptable. Manufacturer's span chart may serve as design if Project's ladder spans are clearly indicated as being within published spans.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls and for exterior use, finished to match fastened fabrications. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

B. Separation for Dissimilar Metals:

1. Zinc-rich barrier coating, in paste form.

a. Available Product: Van Nay, LLC; Eck Corrosion Prevention Coating.

2. Neoprene spacers and washers.

C. Nonshrinking, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous steel framing and supports, except leave mill finish at miscellaneous supports for weathering steel.

2.7 COUNTERTOP BRACKETS

A. Provide semi-concealed steel L-brackets, with legs drilled for surface mounting. Designed to be screw-attached through one leg at exposed wall studs (prior to wall being enclosed with gypsum board) and through the other into the underside of cantilevered countertops.

1. Configuration: As detailed on Drawings.
2. Basis-of-Design Product: Federal Brace; Versa Hidden Support Bracket.

a. Thickness: 0.18 inch (7 gage, 4.6 mm).
b. Load Capacity: 500 lbs per bracket.
c. Pre-Drilled Holes: 0.26 inches, straight holes.
d. Finish: Manufacturer's standard black baked enamel or powder coat.

3. Manufacturer of Comparable Products: Iron Supports

2.8 WELD PLATES AND KNIFE BRACKETS

A. Design weld plates with knife brackets and welded studs to transfer loads imposed by supported construction. Dimensions indicated in Drawings are minimums.

1. Provide weld plates with no fewer than 2 integrally welded steel strap anchors for embedding in concrete.
2. Fabricate knife bracket sizes, configurations, and fastener holes in coordination with supported fabrications indicated in Drawings.
3. Except as otherwise indicated, prime exposed surfaces of brackets; do not prime surfaces to be embedded in concrete.

2.9 METAL LADDERS

A. General: For elevator pit ladder, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 3/4-inch- (19-mm-) square steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.

2.10 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Mill Finish: At uncoated steel items supporting weathering steel.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion where items are scheduled for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Separate dissimilar metals with neoprene gaskets and spacers. Coat fasteners and contact surfaces with corrosion prevention coating.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for and overhead gates securely to, and rigidly brace from, building structure.

3.3 INSTALLING STEEL WELD PLATES AND KNIFE BRACKETS

A. General: Install embeds, weld plates, and knife brackets to comply with requirements of items being supported, including manufacturers' written instructions (for manufactured items) and requirements indicated on Shop Drawings.

B. Anchor or securely attach weld plates and knife brackets securely to building structure.

3.4 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 05 52 00 - METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel tube picket railings at exterior stairs and ramps ~~exit stair~~.
2. Steel pipe handrails at exterior ~~exit~~ stairs and ramps.
3. Steel handrails ~~and guardrails~~ at interior stair

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. ~~Section 05 51 13 "Metal Pan Stairs" for exterior exit stair assembly to receive metal railings.~~
2. Section 05 73 00 "Decorative Metal Railings" for perforated panel railings at exterior stairs, and at terraces, balconies, and walkways.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Railing brackets.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and intermediate rails.
2. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.

    a. Show method of connecting and finishing members at intersections.

D. Delegated-Design Submittal: For engineering design of metal railings , including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of railing from single source, from single manufacturer or fabricator.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings.

1. Steel tube picket railings, including anchorages and attachments to ~~stairs and buildings~~site construction.
2. Steel pipe handrails mounted to guardrails, with continuous extension to ground mount, where indicated.

B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m)
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

E. Configuration Requirements:

~~1. Guards at Stair Railings: Space between pickets, and between bottom rail and stringers shall be such that a 4-inch sphere cannot pass between pickets or under guard.~~

1. Extensions of continuous handrails at stair landings shall comply with height, angle of post, length of extension continuous with stair angle, and length of horizontal extension, as detailed on Drawings.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.4 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.5 FASTENERS

A. General: Provide the following:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Shop Primer for Exterior Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated in ~~Section 09 96 00 "High-Performance Coatings."~~Section 09 91 13 "Exterior Painting."

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Form Changes in Direction as Follows:

1. As detailed.
2. By flush bends.

J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Fittings and Anchors: Provide miscellaneous fittings and anchors to interconnect railing members to other work unless otherwise indicated.

M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

N. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth. To greatest extent feasible, weep holes shall be hidden from view in final installation.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime exterior galvanized railings with primers specified in ~~Section 09 96 00 "High-Performance Coatings."~~Section 09 91 13 "Exterior Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Anchor posts as shown in Drawings.

1. Exterior Concrete: Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
2. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.

3.5 ATTACHING RAILINGS

A. Attach railings to posts as shown in Drawings.

B. Secure handrail brackets to posts by welding or tamper-proof fasteners.

3.6 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

2. See Sections 09 91 13 "Exterior Painting" ~~and 09 91 23 "Interior Painting"~~ for painting of railings.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

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SECTION 05 73 00 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Perforated aluminum panel railings ~~with continuous top rail,~~ at terraces and walkways.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 05 52 00 "Metal Railings" for exit stair railings with vertical picket infill.
3. Section 06 10 13 "Exterior Finish Carpentry" for continuous thermally modified wood cap rail at perforated aluminum panel guardrails

1.2 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages. Deliver items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Railing components.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish required.

1. Perforated aluminum panels, not less than 12 inches square.
2. Top rail, not less than 12 inches long.
3. Fittings and brackets.
4. Assembled Samples of railing systems, made from full-size components. Samples need not be full height.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator, or installer approved by manufacturer.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

C. First-Installed Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of perforated metal railing, not less than 10-ft total length.

a. Include a corner where railing changes direction.
b. Include continuous top rail with mitered corner, installed on perforated metal guardrail.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 DELEGATED DESIGN

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Control of Corrosion: Provide means of preventing galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Configuration Requirements:

1. Bottom rails of guardrails shall be configured such that a 4-inch sphere is unable to pass between bottom rail and stringers at any point.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors:

1. Provide railing manufacturer's system-standard knife bracket, unless otherwise indicated.

2.4 STEEL AND IRON

A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. For stanchions supporting perforated aluminum panel railings, unless otherwise indicated.

2.5 PERFORATED ALUMINUM PANEL RAILINGS

A. Perforated Panels: Flat-faced, rigid guardrail panels with laser-cut perforations and formed bent-edge profiles, designed to be fastened to adjacent panels without need for stanchions or other intermediate framing. Provide panels in sizes, profiles, and configurations indicated on Drawings, as part of delegated-design bolt-on balcony assemblies.

1. Basis-of-Design Manufacturer:

a. BOK Modern, Inc.

2. Aluminum Plate: ASTM B 209 (ASTM B 209M), Alloy 5005-H32 or Alloy 6061-T6.
3. Thickness: As required to meet performance requirements, but not less than 3/16 inch (4.5 mm).
4. Panel Dimensions: As indicated on accepted Shop Drawings.
5. Panel Depth: 2 inches, unless otherwise indicated.
6. Perforation Pattern: Custom; digital artwork provided by Owner.
7. Configurations: As indicated on accepted Shop Drawings. Orient perforated metal with pattern parallel to top rail.
8. Fabricate panels with bent edges for panel rigidity for postless installation at stanchions and knife plates, as required.

2.6 PERFORATED ALUMINUM PANEL MOUNTING BRACKETS AND FASTENERS

A. Mounting Brackets: As indicated on accepted Shop Drawings.

1. Manufacturer's standard knife-plate brackets, fabricated from galvanized steel, primed and coated with high-performance coating, where exposed.

a. Thickness: 3/8-inch thick.

2. Manufacturer's standard universal stainless steel bracket with stainless steel hex bolts, washers, and nylon insert lock nuts.

    a. BOK Modern, Inc.; Universal Bracket, "B" style.
    b. Finish: Mill or manufacturer's standard powdercoat finish in color selected by Architect from manufacturer's full range.

B. Fasteners:

1. Bracket to Substrate: Bolts, per delegated design.
2. Panel to Bracket: 1/2-inch Type 304 stainless steel bolt assembly with plate washers.
3. Panel to Panel: 1/2-inch Type 304 stainless steel bolt assembly with plate washers.

2.7 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
2. Aluminum, Stainless Steel, and Dissimilar Metals: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.

C. Provide tamper-resistant fasteners for interconnecting railing components and for attaching railings to other work, unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

E. Provide washers and spacers as recommended by aluminum perforated panel fabricator for applications indicated.

1. Including panel fabricator's standard 1/8-inch spacer between bent edges of panels secured together.

2.8 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.9 FABRICATION, GENERAL

A. Drawings indicate aesthetic intent and functional requirements. Minor variations from configurations in Drawings will be considered, to allow use of manufactured products or systems complying with requirements.

B. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

C. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

E. Form work true to line and level with accurate angles and surfaces.

F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

I. Mechanical Connections: Connect members with mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

J. Form changes in direction as detailed in Drawings.

K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow or channel railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

N. Brackets, Fittings, and Anchors: Provide brackets, fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.11 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.12 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.

B. Powder-Coat Finish for Galvanized Metal: Prepare, treat, and coat galvanized metal to comply with resin manufacturer's written instructions and as follows:

1. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
2. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.
3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness of not less than 1.5 mils (0.04 mm).
4. Color: As selected by Architect to match guardrail panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

3.3 ANCHORING POSTS OR STANCHIONS

A. Weld stanchions to embed plates, where indicated on Drawings.

B. Install perforated aluminum panel railings with bent edges through-fastened at stanchions, as indicated on accepted Shop Drawings.

3.4 FIELD QUALITY CONTROL

A. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.

B. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

C. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

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SECTION 05 75 00 - DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Brake-formed metal panels, as follows:

1. Aluminum spandrel panels and trim between, and at corners adjacent to, aluminum storefront and nail-on windows and exterior doors as indicated.
2. Miscellaneous trim shapes.

1.2 COORDINATION

A. At exterior installations, coordinate formed metal panel installation with drainage provisions, weather barrier, flashing, trim, siding, windows, and trim to provide a leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation. See Section 01 40 00 "Quality Requirements."

1. Build mockup of aluminum panels as part of storefront mockup, or as otherwise directed by Architect.
2. Build mockup of aluminum spandrel panels adjacent to aluminum windows as part of window mockup. Coordinate with Section 08 51 13 "Aluminum Windows."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store formed metal panels and accessories in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1. Store perforated metal panels vertically. Do not stack pallets of perforated panels.

D. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface daman.

E. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with perforated metal panel screening by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design decorative formed metal panels for functions indicated, including anchorages and attachments to building construction.

B. Structural Performance: Formed metal panels, including attachment to building, shall withstand the effects of gravity and wind loads indicated in Structural Drawings.

C. Seismic Performance: Formed metal panels, including mounting brackets, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior assemblies by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 FORMED METAL WALL PANELS, GENERAL

A. Provide factory-formed, metal plate wall panels fabricated from single sheets of metal formed into profile for installation method indicated. Include attachment assembly components and panel stiffeners or supports.

1. Where panels are installed as part of the building envelope, provide accessories required for weathertight system.

B. Panel Depths: As indicated on Drawings.

C. Aluminum Sheet: Tension-leveled, smooth aluminum sheet, ASTM B 209 (ASTM B 209M), in thickness adequate to ensure oil canning does not occur.

D. Attachment Assembly: As indicated in Drawings.

2.3 FORMED METAL PANELS AS INFILL BETWEEN WINDOWS

A. Available Panel Systems:

1. SAF Southern Aluminum Finishing Company, Inc.; Series 3000.
2. Protean Construction Products, Inc.; AP-1125 Series.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements as demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.5 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze to match adjacent aluminum windows.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, framing or supports, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on accepted Shop Drawings. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install flashing and trim as metal panel work proceeds.
4. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align formed metal wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 06 05 73.13 – FIRE RETARDANT WOOD SHEATHING

PART 1 - GENERAL

1.1 SECTIONS INCLUDE

A. Fire retardant wall sheathing.

B. Fire retardant roof sheathing.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

B. Section 06 20 00 – Finish Carpentry

1.3 APPLICABLE STANDARDS (latest editions apply)

A. ASTM International (ASTM):
1. ASTM D 1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
2. ASTM D 5516 - Standard Test Method for Evaluating the Flexural Properties of Fire Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.
3. ASTM D 6503 - Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant- Treated Plywood Roof Sheathing.
4. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
5. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
6. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
7. ASTM E 661 - Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads.
8. ASTM E 2126 - Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for buildings.

B. California Department of Forestry & Fire Protection - Office of State Fire Marshal Fire Engineering (CSFM):
1. CSFM 12-7A-1 - Fire Resistive Standard for Exterior Wall Siding and Sheathing.
2. CSFM 12-7A-3 - Fire Resistive Standard for Soffited Eaves of Exterior Walls.
3. BML No. 8140-2027:0005 - LP FlameBlock & LP SmartSide Siding.
4. BML No. 8140-2027:0006 - LP FlameBlock & solid wood siding.
5. BML No. 8140-2027:0007 - LP FlameBlock & cedar or redwood siding

C. ICC Evaluation Service (ICC-ES):
1. ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12).
2. ICC-ES Acceptance Criteria for Wood Structural Panels Laminated with an Inert, Inorganic Fire Shield (AC264)

3. BML No. 8140-2027:0005 - LP FlameBlock & LP SmartSide Siding.

D. National Fire Protection Association (NFPA):
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
2. NFPA 286 - Standard Test Method of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth, National Fire Protection Association.

1.4 SUBMITTALS

A. Product Data:
1. Manufacturer's data sheets on each product to be used.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Typical installation methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Transport and store in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: LP Building Products, which is located at:

414 Union St. Suite 2000; Nashville, TN 37219; Toll Free Tel: 888-820-0325; Fax: 877-523-7192; Email: customer.support@lpcorp.com ; Web: https://lpcorp.com

B. Substitutions: Not permitted unless approved by Architect and Engineer.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements. Must meet or exceed criteria within this specification section and be Min. 7/16” fire rated cementitious coated OSB - Category LP FlameBlock or equal, with pyrotite on both faces.

2.2 PERFORMANCE REQUIREMENTS

A. Flame Spread and Smoke Developed Performance:
1. Flame Spread: Less than 25 when tested in accordance with ASTM E 84, UL 723, or NFPA 255.
2. Smoke Developed: Less than 100 when tested in accordance with ASTM E 84, UL723, or NFPA 255.
3. Advance of Flame: Not to exceed 10.5 feet (3200 mm) after 30 minute test duration.

B. Thermal Barrier Index: Minimum 20 minutes when tested in accordance with ASTM E 119 UBC 26.2, and UL 1715.

C. Structural Performance:
1. Meet or exceed structural and Exposure 1 requirements for Category indicated.
2. Meet or exceed bond durability and weather resistance requirements of ICC Acceptance Criteria AC264

2.3 FIRE-RETARDANT WALL SHEATHING

A. Basis of Design: Basis of Design: LP FlameBlock; as manufactured by LP - Building Products. Fire-rated OSB sheathing certified to meet building code requirements for fire resistant construction and provide designs values greater than or equal to FRT plywood of the same thickness

2.4 FIRE-RETARDANT ROOF SHEATHING

A. Basis of Design: Basis of Design: LP FlameBlock; as manufactured by LP - Building Products. Fire-rated OSB sheathing certified to meet building code requirements for fire resistant construction and provide designs values greater than or equal to FRT plywood of the same thickness

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALATION

A. Install in accordance with manufacturer's instructions approved submittals and in proper relationship with adjacent construction.
   1. Accurately fit, align, securely fasten, and install free from distortion or defects.
   2. Impose no loads other than the weight of the erectors on the structure before it is permanently sheathed.
   3. Exercise caution when removing temporary bracing to apply sheathing.
   4. After sheathing, do not exceed design loads on members with construction materials.

3.4 CLEANING AND PROTECTION

A. Clean products in accordance with the manufacturer’s recommendations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work Included:
1. Wood framing and sheathing systems.
2. Wood furring, blocking and nailers.
3. Backing for wall mounted equipment, railings, toilet partitions, toilet accessories, etc.
4. Rough hardware, including tie-downs, post caps, etc.
5. Acoustical sealant, where indicated, at wood plates and plywood.
6. Prefabricated wood products.

1.2 APPLICABLE STANDARDS (latest editions apply)

A. AITC – American Institute of Timber Construction Standards
1. 110 – Standard Appearance Grades for Structural Glued Laminated Timber
2. 111 – Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection.
3. 113 – Standard for Dimensions of Structural Glued Laminated Timber
4. 115 – Standard for Fabricated Structural Timber.
5. 103 – Standard for Structural Glued Laminated Timber

B. ANSI – American National Standards Institute
1. ANSI/AITC A190.1 Structural Glued Laminated Timber
2. ANSI/ASME B18.2.1 Square and Hex Bolts and Screws (Inch Series)
3. ANSI/ASME B18.6.1 Wood Screws (Inch Series)

C. APA – American Plywood Association Product Standard PS 1.

D. ASTM – American Society for Testing and Materials: D05055-90, Establishing and monitoring Structural Capacities of Prefabricated Wood I Joists.

E. AWPA – American Wood Preservers Association Standards

F. AWPI – American Wood Preservers Institute LP-2

G. ICC – International Code Council
1. CBC – California Building Code, 2022.

H. FS – Federal Specifications

I. TPI – Truss Plate Institute: Design Specification for Metal Plate Connected Wood Trusses.

J. WCLIB – West Coast Lumber Inspection Bureau, Grading Rule No. 17

1.3 SUMBITTALS

A. Shop drawings of glued laminated beams plus AITC or equal certificate of conformance with product standard ANSI/AITC 190.1

B. Shop drawings of prefabricated wood I joists including:
1. Plan layout of members and bridging, design loads and installation instructions.
2. Details of member connections, stiffeners, blocking and web openings.
3. Structural calculations stamped and signed by California Registered Civil Engineer.

C. Shop drawings of prefabricated wood trusses and supporting calculations signed by a California Registered Civil Engineer.

D. Product information for rough hardware.

PART 2 - PRODUCTS

2.1 Wood: Wood Materials shall conform to grades and grading rules as hereinafter specified. Each piece of lumber and plywood shall be grade-stamped or certified by a competent agency approved by the Owner.

A. Plywood: (APA Grade) Structural I, CD with exterior glue, 5-ply construction, all Group 1 wood, Identification Index 32/16. No OSB allowed on any exterior portion of the building. All framed stairs shall be constructed with plywood only, no OSB allowed.

B. Framing Lumber: Douglas Fir – Larch conforming to “WCLIB Standard Grading and Dressing Rules No. 17” as follows:
1. Structural Light Framing: 2” to 4” thick 2” to 6” wide D.F. No. 2
2. Structural Joists & Planks: 2” to 4” thick, 6” and wider D.F. No. 2 or better
3. Beams & Stringers: 5” and thicker, Rectangular width more than 2” greater than thickness D.F. No. 1, free of heart centers
4. Posts & Timbers: 5” x 5” and larger, width not more than 2” greater than thickness D.F. No. 1 free of heart centers.
5. Sills: Pressure treated D.F. No. 2, AWPB Stamped, Ammoniacal Copper Zinc Arsenate (ACZA) treated AWPA Standard C2, minimum 4/10” penetration, incised.

C. Glued Laminated Timber
1. Lumber; Douglas Fir (Laminating Grades), Grade Combination No. A (FB = 2,400 psi) graded in accordance with the Standard Grading and Dressing Rules of WCLIB.
2. Glues: Exterior type adhesive conforming to ASTM D2559, resin adhesive of phenol, or melamine base applied in accordance with the manufacturer's recommendation.
3. Fabrication shall comply with the Standards established by the American Institute of Timber Construction, (AITC 103, 110, 113, 115 and ANSI / A190.1)
4. Provide extra length of at least six (6) inches at each end for field trim of all members, or verify field dimensions prior to fabrication of members to ensure p
5. Glulam beams should be “Premium Appearance” (PREM) Classification

D. Prefabricated Wood I-joists: Truss-Joist by Weyerhaeuser Company or an approved equal manufacturer. Fabrication of I-joists to take place under the supervision of an independent inspection agency. Refer to Section 06 17 40.
   1. Flanges: Continuous Laminated Veneer Lumber (LVL) proof loaded per ANSI A-190.1, moisture content not to exceed 15 percent; Ft = 2000 psi, E = 2.0 x 106 psi.
   2. Webs: CD Structural I plywood with exterior glue, grade marked by APA, in accordance with Product Standard PS1-83 or other recognized equal which complies with APA standards as substantiated by performance verification data and verified by an independent testing agency.
   3. Adhesive: adhesives shall comply with ASTM D2559
   4. Metal Bridging: Metal bridging shall be 20 gauge "TB-tension bridging" (nail type) as manufactured by Simpson Strong-Tie, or approved equal.

E. Prefabricated Wood Trusses
   1. Lumber used shall be Douglas Fir and uniform in color and density.
   2. Connector plates shall be a minimum thickness of 0.036" and shall be manufactured from steel meeting the requirements of ASTM A446 Grade A or higher, and shall be hot dip galvanized according to ASTM A525, Coating Designation G60.

F. Laminated Veneer Lumber (LVL): "Microlam" as manufactured by Weyerhaeuser Co. or approved equal.

G. Additional Grading Requirements
   1. In order to qualify as “structural lumber”, each piece including plywood, shall be marked with the grade of the lumber by some competent and reliable organization whose regular business is to establish lumber grades and whose trade-mark shall also appear on each piece; except that, a certificate from such an organization may be accepted in lieu of such grade and trade-marks. All plywood must be grade stamped on each piece with the APA trade-mark.
   2. All 2x lumber used for floor framing shall be air dried to a 19% maximum moisture content. 2x lumber used for joists shall be stamped “S-DRY”. The moisture content of all lumber is subject to verification by the Testing Laboratory prior to incorporation into the structure.
   3. There shall be no boxed heart in any framing lumber 4” and larger in the least dimension.

2.2 PRESERVATIVE TREATMENT

A. Use waterborne preservatives complying with AWPB Stamped, Ammoniacal Copper Quat (ACQ) treated AWPA Standard C2, minimum 0.40-in. penetration, incised.

B. All preservative treated lumber shall be field-applied with preservative where cut and drilled on site with copper naphthenate (2% copper as metal).

2.3 ROUGH HARDWARE

A. Nails, bolts, nuts, washers, lag bolts, screws, anchor and other fastenings as shown or as required for complete installation. Galvanized or cadmium-plate for exterior work. Comply with the following specifications:
   1. Wire Nails: Common. Plywood nails are acceptable at diaphragms and walls. Provide minimum penetration as required for common nails.
   2. Bolts, Nuts, ASTM A307.
   3. Lag Screws and Lag Bolts: FF-B-561.
   4. Wood Screws: FF-S-111.
   5. Framing Clips, Boots, Hangers, hold-downs etc.: by Simpson Strong Tie or approved equal.
   6. 3 inch by 3 inch by 0.209 inch steel plate washers at all sill plates.
   7. All hardware in contact with preservative treated members shall be protected by hot-dipped galvanizing.

2.4 GLUE

A. AFG – 01 approved. PL Premium" polyurethane construction adhesive by Chem Pex, Inc., or equal.

PART 3 - EXECUTION

3.1 GENERAL FRAMING

A. Joists, rafters and beams shall be cut as required to provide a full even and horizontal seating on the support, unless otherwise shown. Do not overcut.

B. Notches and bored holes in joists and beams shall be limited as shown on the drawings.

3.2 FRAMING OF PIPES

A. Frame members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore framing members for passage of pipes or conduits without architect's authorization.

B. B. Pipes 1” diameter or less may pass through a neatly bored hole in the center of the plates. Hole location is subject to the Architect’s acceptance.

3.3 Firestops: Provide 2" nominal firestops in conformance with CBC.

3.4 Blocking: Provide solid blocking in all walls for wall mounted items.

3.5 Furring: Provide furring, stripping, blocking, backing and grounds where indicated or where necessary to support, or to furnish suitable spacing for finish materials and accessories.

3.6 NAILING

A. All nailing shall conform to CBC, except where more stringent requirements are shown on drawings.

B. Penetration of nails or spikes into piece receiving point shall be not less than 1/2 length of nail or spike, except, that 16 penny nails may be used to connect pieces of 2" thickness.

C. Drive nails and spikes no closer together than 2/3 their length nor closer to edge of member than ½ their length, except when detailed otherwise.

D. Place nails without splitting wood. Predrill holes whenever nailing tends to split wood or plywood. Replace split members.

E. Use of machine nailing is subject to a satisfactory job site demonstration. Acceptance is subject to continued satisfactory performance. If nail heads penetrate the outer ply of plywood more than would be normal for a hand hammer or if the minimum allowable edge distances are not maintained the performance will be deemed unsatisfactory.

F. Use hot dipped galvanized hardware per ASTM A153 for all attachment to ACQ or CBA treated members.

3.7 BOLTS AND LAG SCREWS

A. Provide bolts and lag screws, bearing on wood, with malleable iron or steel plate washers of sizes indicated under heads and nuts. All nuts and screws shall be tightened when placed and re-tightened at completion of the job or immediately prior to closing with finish construction. Nuts shall be secured against loosening.

B. Except where otherwise indicated on the details, bore holes for bolts with a bit 1/32" to 1/16" larger than nominal diameter as the bolt.

C. Bore lag screw holes the same diameter and depth as shank, continue hole to depth equal to length of lag screw and with a diameter equal to 75% of the diameter of the shank.

D. Screw all lag screws; do not drive into place. Embed threaded portion of lag screws in each timber a minimum of seven (7) times their shank diameter.

E. Use hot dipped galvanized hardware per ASTM A153 for all attachment to ACQ or CBA treated members.

3.8 FIELD-APPLIES PRESERVATIVE TREATMENT

A. Treat all framing in direct contact with concrete or masonry construction with wood preservative, as follows:

B. Use brush, dip, or spray method as recommended by manufacturer.

3.9 GLUING OF FLOOR SHEATHING

A. Glue plywood floor sheathing to supporting members.

3.10 PREFABRICATED WOOD

A. Install prefabricated wood products in accordance with the recommendations of the manufacturer. All trusses and I-joists must be securely braced during erection and after permanent installation. Erection bracing shall hold trusses and I-joists straight and plumb and in safe condition until decking and permanent bracing has been fastened forming a structurally sound framing system. All erection and permanent bracing shall be installed and all trusses permanently fastened before application of any loads. Do not impose construction loads which cause stresses beyond design limits. Materials used in bracing are to be furnished by the erection contractor.

3.11 REMOVAL OF DEBRIS

A. Remove all wood, including form lumber, chips, shavings and sawdust in or on the ground from the area under the floor. No wood shall be buried in any fill.

END OF SECTION

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Wood furring and grounds.
3. Plywood backing panels.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NHLA: National Hardwood Lumber Association.
2. NLGA: National Lumber Grades Authority.
3. WCLIB: West Coast Lumber Inspection Bureau.
4. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Sustainable Design Submittals:

1. Low-Emitting Materials: Product data or manufacturer declaration, indicating compliance with requirements for composite wood products and field-applied coatings, adhesives, and sealants indicated in Section 01 81 13 "Sustainable Design Requirements."

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Compliance with requirements for preservative-treated wood and fire-retardant-treated wood shall be substantiated by ICC-ES reports.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawl spaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated or required by code, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664, and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

E. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Roof framing and blocking.
3. Wood nailers blocking, and similar members in connection with roofing.
4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber and any of the following species:

1. Western woods; WCLIB or WWPA.
2. Northern species; NLGA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Northern species, No. 3 Common grade; NLGA.
2. Western woods, Standard or No. 3 Common grade; WCLIB or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Wood Screws: ASME B18.6.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency. Compliance with requirements shall be substantiated by ICC-ES report.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal-size (19-by-38-mm actual-size) furring vertically at 16 inches (406 mm) o.c.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

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SECTION 06 16 43 - GYPSUM SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.
3. Division 07 for weather barrier applied over gypsum wall sheathing.
4. Section 09 29 00 "Gypsum Board" for interior gypsum board.

1.2 COORDINATION

A. Where gypsum board sheathing is indicated to be installed with structural wood panel sheathing, the structural wood panel shall be layer attached directly to structural framing.

B. Coordinate gypsum sheathing joint treatment as required by air barrier manufacturer for installation of air barrier.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product, provide manufacturer's product data. Indicate component materials and dimensions and include construction and application details.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly as indicated on Drawings, incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.

   a. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
   b. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

A. Exterior Gypsum Board Sheathing: ASTM C1396/C1396M, with moisture-resistant core and moisture-resistant paper on both faces.

1. Product: Subject to compliance with requirements, provide the following:

a. Georgia Pacific Gypsum LLC; ToughRock Fireguard X.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

B. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Product: Subject to compliance with requirements, provide the following:

a. Georgia Pacific Gypsum LLC; DensGlass.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Screws for Fastening Gypsum Sheathing to Wood Framing: ASTM C 1002.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.4 JOINT TREATMENT MATERIALS

A. Gypsum sheathing manufacturer's standard joint treatment system, as required to comply with weather barrier manufacturer's requirements for installation on gypsum sheathing substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Double-Layer Installations: Where two layers of gypsum sheathing are scheduled to be installed, install glass-mat gypsum sheathing at exterior layer and moisture-resistant sheathing at interior layer.

B. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

C. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

D. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

E. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

F. Coordinate wall and parapet sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

G. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

H. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with nails.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.

2. For sheathing under adhered thin brick cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

END OF SECTION

SECTION 06 17 40 – I JOIST

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Wood-chord and wood-web I joists with bridging, bracing, and anchorage, complete.

B. Related Sections:
   1. Section 06 10 00 - Rough Carpentry.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating framing system, sizes and spacing of joists, loads and joist cambers, bearing and anchor details, accessories, bridging, bracing, and framed openings.

B. LEED Submittals:
   1. Credit EQ 4.4 - Low-Emitting Materials, Composite Wood & Agrifiber Products: Submit composite wood manufacturer's product data for web joists indicating that bonding agent used and the assembly adhesive used contains no urea formaldehyde.
   2. Credit MR 7 - Certified Wood: Submit certificates of chain-of-custody signed by manufacturers certifying that wood for joist webs was obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria". Indicate percentage of wood that is FSC-compliant. Include evidence that mill is certified for chain-of-custody by an FSC-accredited certification body.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of plywood web joists with three years minimum experience, and approved by International Code Council (ICC). Design joists under direct supervision of a professional engineer experienced in structural framing design and registered in State of California.

B. Regulatory Requirements: Conform to latest California Building Code (CBC) for loads, seismic zoning, and other governing criteria. Manufacturer's quality control shall be monitored by an ICC approved agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Transport and store joists in vertical position resting on bearing ends. Protect joists from moisture, ground contact, warpage, and distortion during transit and when site stored.

B. Do not install joists which have been damaged in any way without specific approval of the manufacturer. Do not field repair or modify joists without written approval of the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide FSC-certified wood I-joists manufactured by Standard Structures, Inc., Roseburg Forest Products, or equal.

2.2 MATERIALS

A. Wood Chord Members: Single top and bottom chord, machine stress-rated, maximum moisture content of 19 percent.

B. Wood Web Members: APA Rated EXP 1 oriented strand board, containing no urea-formaldehyde, and FSC-certified. Fabricate with the grain of the face plies in the vertical direction. Web panels shall be joined with a machined and glued structural vee-joint to form a continuous member.

C. Joint Adhesive: Exterior type adhesive as described in CBC Standards, and containing no urea-formaldehyde.

D. Joist Bridging: Type, size and spacing required by joist manufacturer.

E. Wood Blocking, Plating, Support Members, and Framing for Openings: In accordance with Section 061000.

F. Fasteners: Galvanized steel, type to suit application, in accordance with CBC requirements.

2.3 FABRICATION

A. Verify dimensions and site conditions prior to fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that supports and openings are ready to receive joists. Verify sufficient end bearing area. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate placement of bearing and support items. Coordinate placement of joists to minimize cutting of decking placed over joists.

3.3 INSTALLATION

A. Install joists in accordance with manufacturer's instructions. Place joists true to line and level.

B. Provide temporary bracing to position joists in place until permanently secured. Do not field cut joists.

C. Place permanent bridging, bracing, and anchors to maintain joists straight and in correct position before installation of decking or inducing loads.

D. Place headers and supports to frame openings required.

E. Frame openings between joists with lumber in accordance with Section 06 10 00. Coordinate placement of decking with work of this Section.

F. Holes may be cut in the joist web only in accordance with the manufacturer's recommendations.

3.4 TOLERANCES

A. Tolerances of Framing Members: Within 1/2 inch from true position.

END OF SECTION

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SECTION 06 20 13 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Post-supported redwood trellis.
2. Redwood fascias and trim where indicated on Drawings.
3. Thermally modified wood cap rails for exterior decorative metal guardrails.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 05 73 00 "Decorative Metal Railings" for perforated aluminum panel railings to receive thermally modified cap rails specified in this Section.
3. Section 06 12 00 "Rough Carpentry" for blocking and concealed supports.
4. Section 06 20 23 "Interior Finish Carpentry" for redwood wainscot and trim.
5. Section 07 46 23 "Wood Siding" for exterior redwood siding and soffits.
6. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing installed with redwood trellises and fascias.
7. Section 08 80 00 "Glazing" for laminated glass covers at wood trellises.
8. Section 09 54 26 "Suspended Wood Ceilings" for wood slat or plank ceiling with finish emulating redwood used at wainscot and trim.
9. Structural Drawings for concrete post base, post framing anchor and cross-column cap, wood trellis posts and beams.

1.2 DEFINITIONS

A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. WWPA: Western Wood Products Association.

a. In January, 2017 the Redwood Inspection Service (RIS) and Western Wood Products Association entered into an agreement for WWPA to assume RIS's function as the rules-writing agency for Redwood lumber and provide mill supervisory services and grading and inspection of Redwood lumber previously provided by RIS. WWPA is granted the exclusive license to use RIS grade marks and to issue RIS grade stamps to Redwood producers who enter into agreements to use WWPA inspection service.

1.3 COORDINATION

A. Trellises:

1. Coordinate requirements for anchorage of trellis posts and structural attachments of trellis beams to posts and building construction per Structural design, as indicated on Structural Drawings.

2. Coordinate requirements for glazed trellis covers with Section 08 80 00 "Glazing."

B. Fascias:

1. Coordinate requirements for concealed blocking to receive fasteners for redwood fascias.
2. Coordinate installation of galvanized steel sheet base flashing with drip edge below fascias, and galvanized steel sheet drip flashing above fascias, at termination of standing seam roofing.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and the following grading rules:

1. Western Wood Products Association, Redwood Inspection Service's "The Standard Specifications for Grades of California Redwood Lumber."

B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

C. All exterior carpentry lumber and boards, including fascias, trim and trellis members, shall be fire-retardant treated.

D. Fire-Retardant Treatment: One of the following.

1. Factory-Treatment System: Factory-impregnated fire retardant treatment, applied and kiln-dried after treatment.

a. Product: Hoover Treated Wood Products; ExteriorFireX.
b. Species and Grade: As specified herein.

2. Post-Treatment Systems: Provide water-based, post-treatment fire retardant and wood preservative appropriate for exterior use, providing not less than Class A fire performance, as tested according to ASTM E 84.

a. Product: One of the following:

1) Flame Seal, LLC; Wood Seal A.
2) Flame Stop Inc.; Flame Stop II.
3) Fire Retardant Coatings of Texas; FX Lumber Guard XT.

2.2 TRELLISES

A. Posts: Clear, air-dried redwood posts of profile and dimensions indicated.

1. Grade: Heart B.
2. Surfaces: Smooth lumber, 4 sides.

B. Beams and trellis members: Clear, air-dried redwood boards and lumber of dimensions indicated, installed in configuration indicated.

1. Grade: Heart B.
2. Surfaces: Smooth lumber, 4 sides.

2.3 FASCIAS

A. Fascia Boards: Air-dried redwood boards, 2-by-10 inches or as shown on Drawings, with kerf base to create a drip.

1. Grade: Clear.
2. Surfaces: Resawn at exposed sides.

2.4 CAP RAILS

A. Cap Rails: Fabricated from thermally modified wood for installation over perforated aluminum panel guardrails.

1. Themally Modified Wood Product:

a. Thermory; Benchmark Pine Trim.

2. Profile: 2-by-6 inches, with underside routed to receive bent edge of aluminum panel guardrail. Top surface shall slope to the exterior, with a slope equivalent to 1/4-inch in 12 inches.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide fasteners of types indicated, or if not indicated, types appropriate for load and application, and of sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. Provide stainless steel fasteners at redwood.
2. Provide hot-dip galvanized steel fasteners at all other applications, unless otherwise noted.

B. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed with exterior finish carpentry.

C. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 03 30 00 "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size.

D. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M and specifically recommended by manufacturer for exterior applications.

2.6 METAL FRAMING ANCHORS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:

1. Simpson Strong-Tie Co., Inc.
2. USP Structural Connnectors, a MiTek Company.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on Drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Compliance with requirements shall be substantiated by ICC-ES report.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G90 (Z270) coating designation.

D. Post Bases: As indicated on Drawings.

2.7 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Kerf base of redwood fascia boards to create drip, as indicated on Drawings.

C. Miter outside corners of fascias.

D. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Apply fire-retardant treatment to wood members indicated, complying with fire retardant manufacturer's written instructions, prior to installing wood in specified assemblies. Allow to dry and fully cure.

B. Clean substrates of projections and substances detrimental to application.

C. Prime lumber and trim to receive transparent finish, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 09 93 00 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 TRELLIS INSTALLATION

A. Posts: Install trellis posts as indicated on Drawings.

1. Install redwood posts to concrete stem wall and footings, using post anchors with through-bolts.

B. Trellis Beams: Install trellis beams as indicated on Drawings.

1. Secure redwood trellis beams to redwood posts using cross-column (cross-post) cap with through-bolts.

3.5 FASCIAS INSTALLATION

A. Fasten fascias to blocking at perimeter of roof as indicated on Drawings. Countersink and plug any fasteners at face.

3.6 FINISHING

A. Finish exterior finish carpentry within 14 days of installation.

3.7 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior trim.
2. Tongue-and-groove board paneling at wainscots.
3. Wood-framed interior stair at Common Building with wood picket railings.
4. Wood handrails at interior stair.
5. Wood wall rails at Clinic walls.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 10 00 "Rough Carpentry" and Structural Drawings for exposed interior structural columns and beams.
3. Section 06 10 53 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
4. Section 09 65 13 "Resilient Base and Accessories" for rubber stair treads with integral risers.
5. Section 09 93 00 "Staining and Transparent Finishing" for finish at interior finish carpentry.
6. Structural Drawings for framing for wood stair landings and stringers.

1.2 DEFINITIONS

A. MDF: Medium-density fiberboard.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Interior trim.
2. Board paneling.
3. Wood-framed stair components.
4. Wood-framed stair components.
5. ~~Wood cap rails for perforated aluminum panel guardrails.~~
6. Wood handrails.
7. Handrail brackets.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

C. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no ~~urea~~ added formaldehyde.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
3. Product Data: For installation adhesives, indicating VOC content.

D. Samples: For each exposed product and for each color and texture specified.

E. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

~~1. Provide 5 samples of chiseled bevel at top of boards to be installed as wainscot paneling, indicating range of expected variation. Samples shall be not less than 6 inches long by full width and thickness of boards, and shall be finished after chiseling.~~

F. Samples for Verification:

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 9-inch (230 mm) length of trim and railing profiles, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels. Items include, but are not limited to, the following:

a. Wall base.
b. Stair skirt board.
c. Wood railings.
d. Wood handrails.
e. Wall rails.

~~2. For 1-inch (25 mm) quarter-round base at wainscot, not less than 9-inch length (229 mm) of profile.~~
~~3. For 1-by-6-inch (25-by-152 mm) base, not less than 9-inch length (229 mm) of profile.~~

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber and board paneling flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. WWPA: Western Wood Products Association.

a. In January, 2017 the Redwood Inspection Service (RIS) and Western Wood Products Association entered into an agreement for WWPA to assume RIS's function as the rules-writing agency for Redwood lumber and provide mill supervisory services and grading and inspection of Redwood lumber previously provided by RIS. WWPA is granted the exclusive license to use RIS grade marks and to issue RIS grade stamps to Redwood producers who enter into agreements to use WWPA inspection service.

2. Factory mark each piece of lumber with grade stamp of grading agency.
3. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

C. Softwood Plywood: DOC PS 1.

D. MDF: ANSI A208.2, Grade 130.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC1.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.
6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
7. Application: Stair framing, where indicated.

a. Surfaces to receive rubber finish shall NOT be preservative treated, as treatment might discolor finish.

2.3 INTERIOR TRIM

A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish): As indicated in Finish Schedule on Drawings.

1. Species and Grade:

a. Douglas Fir (DF) Vertical Grain at vertical siding and running trim.
b. Redwood RIS Clear at running trim where indicated.

2. Maximum Moisture Content: 19 percent.
3. Finger Jointing:

a. Allowed at wall base.
~~b. Allowed at quarter-round wainscot base.~~
b. Not allowed at horizontal band trim.

4. Face Surface: Surfaced (smooth).
5. Profiles: With nominal dimensions.

a. 1-by-10-inch redwood horizontal band at wainscot, surface mounted over paneling; cut to accommodate post trim.
b. 1-by-10-inch redwood horizontal band at residential floor hallways.
c. 1-by-6 Douglas fir base at other miscellaneous profiles as indicated on drawings, wainscot and where shown on Drawings.

B. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Douglas fir larch or Douglas fir south, WWPA Superior or C& Btr finish.
2. Maximum Moisture Content for Softwoods: 19 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Allowed.
4. Face Surface: Surfaced (smooth).
5. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.
6. Profiles: Skirt board, 1-by-10-inches (25-by-250 mm), terminating at and contiguous with 1-by-4-inch (25-by-100 mm) landing wall base.

2.4 PANELING

A. Board Paneling Wainscot: As indicated in Finish Schedule on Drawings (WDP-1).

1. Species and Grade: DF Vertical Grain 1x4 T&G, smooth.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Pattern: Tongue and groove.
4. Top Edge Bevel: Boards shall have ~~chiseled~~ bevel at top edge, per accepted Sample.
5. Wainscot Height: As shown on Drawings.

2.5 WOOD-FRAMED STAIR

A. Wood-framed circulation stair in Common Building, as detailed on Drawings.

B. Framing: LSL stringers and lumber or glulam beams, with engineered wood I-joists and plywood subfloor at landings, and lumber ledgers, blocking, and nailers.

1. See Structural Drawings for landing framing, stringers, and anchorages.
2. Stringers shall not be nailed to walls.

C. Treads and Risers: Fabricated from plywood of thicknesses indicated on Architectural Drawings, to dimensions and in configurations indicated.

1. Include 1/4-inch chamfer at top front edge of treads.
2. At top landing, include solid wood nosing above top riser, to match gypsum cement underlayment thickness beneath landing flooring.

D. Skirtboard and Landings Wall Base: As detailed on Drawings and as specified in "Interior Trim" article in this Section.

E. Soffits: Type X gypsum board soffits, as detailed on Drawings and as specified in Section 09 29 00 "Gypsum Board."

2.6 WOOD GUARDRAILS

A. Guardrails: Vertical-grained Douglas fir picket railings with alternating 1x6-inch and 2x4-inch pickets indicated on Drawings, with smooth surface and penetrating oil finish.

2.7 CAP RAILS AND HANDRAILS

A. Cap Rails: Clear, straight-grained Douglas fir rails of dimensions indicated on Drawings, routed at the bottom to receive 2-inch (50 mm) wide bent edge at top of perforated aluminum panel guardrails.

1. Cap rails shall be continuous across panels.
2. Cap rails shall be installed on decorative metal guardrails, and shall be mitered at changes of plane or direction.
3. Finishes: Penetrating oil stain, interior or exterior, as specified in Section 09 93 00 "Staining and Transparent Finishing."

B. Handrails: Clear, vertical-grained Douglas fir with circular profile and 1-1/2 inches (38 mm) outside diameter, for installation on brackets.

1. Fabricate wood handrails to be continuous, where indicated, and to return to wall at terminations.
2. Handrails at interior stair shall be mounted at both guards and walls.
3. Handrail Brackets: As indicated on Drawings. Cast-iron, with curved or L-shaped arm and curved saddle supporting circular rail and providing 1-1/2 inches (38 mm) clearance between rail surface and wall, and 1-1/2 inches (38 mm) clearance between bottom surface of rail and arm.
4. Finish: Interior clear waterborne acrylic finish, as specified in Section 09 93 00 "Staining and Transparent Finishing."

C. Wall Rails at Clinic: Clear, vertical-grained Douglas fir with circular profile and 1-3/8 inches (35 mm) outside diameter over 1x running trim, as detailed on Drawings.

1. Finish: Interior clear waterborne acrylic finish, as specified in Section 09 93 00 "Staining and Transparent Finishing."

2.8 MISCELLANEOUS MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use hot-dip galvanized anchors and inserts at floors.

B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Use stainless steel fasteners for redwood interior finish carpentry.
2. All fasteners in contact with preservative-treated, pressure-treated, or fire-retardant-treated wood shall be galvanized.

C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.9 FABRICATION

A. ~~Chisel b~~Bevel top edges of boards to be installed as wainscot. Match Architect's accepted sample(s).

B. Back out or kerf backs of the following members, except those with ends exposed in finished work:

1. Board paneling.
2. ~~Quarter-round wainscot base.~~
2. Wall base.
3. Horizontal band trim.

C. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

D. Wainscot Boards: Bevel top edges of boards to be installed as wainscot. Match Architect's accepted sample(s).

E. Wood Stairs:

1. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

a. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

b. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

2. Cut stringers to accurately fit treads and risers. Glue treads to risers, screw risers to concealed nailers, and glue and screw treads and risers to carriages.

a. House wall and face stringers and glue and wedge treads and risers.
b. Fabricate stairs with treads and risers no more than 1/8 inch (3 mm) from indicated position and no more than 1/16 inch (1.5 mm) out of relative position for adjacent treads and risers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Ensure concealed blocking has been installed where required.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Before installing wood stairs, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF INTERIOR TRIM

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.

1. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
2. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
3. Use scarf joints for end-to-end joints.
4. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
5. Install trim after gypsum-board joint finishing operations are completed.
6. Install trim without splitting; drill pilot holes before fastening where necessary to prevent splitting.
7. Fasten to prevent movement or warping.
8. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 INSTALLATION OF PANELING

A. Board Paneling: Install according to manufacturer's written instructions.

1. Install in full lengths without end joints.
2. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
3. Install with uniform tight joints between boards.
4. Fasten paneling by blind nailing through tongues.

3.6 INSTALLATION, WOOD EXIT STAIRS

A. Grade: Install wood stairs to comply with same grade as item to be installed.

B. Assemble wood stairs and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Stairs: Securely anchor carriages to supporting substrates. Install stairs with treads and risers no more than 1/8 inch (3 mm) from indicated position.

D. Touch up finishing work specified in this Section after installation of wood stairs. Fill nail holes with matching filler where exposed.

3.7 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic sheet paneling at exam rooms, janitors closets, waste handling rooms and other locations indicated on Drawings.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.

1. Basis-of-Design Product:

a. Marlite; Standard FRP.

2. Manufacturer of Comparable Products: Subject to compliance with requirements, comparable products by the following will be considered in lieu of basis of design:

a. Crane Composites; Glasbord.

3. Low-Emitting Materials: Paneling shall comply with the testing requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Paneling shall comply with the VOC limits set forth in Section 01 81 13 "Sustainable Design Requirements."

4. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
    a. Flame-Spread Index: 200 or less.
    b. Smoke-Developed Index: 450 or less.
5. Nominal Thickness: Not less than 3/32 inch (2.2 mm) inch (3.0 mm).
6. Surface Finish: Pebbled, glossy.
7. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
    1. Color: Match panels.

B. Adhesive: As recommended by plastic paneling manufacturer and with a VOC content complying with limits set forth in Section 01 81 13 "Sustainable Design Requirements."

C. Sealant: Mildew-resistant, single-component, neutral-curing or acid-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants" and with VOC limits set forth in Section 01 81 13 "Sustainable Design Requirements."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare gypsum board substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

B. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

D. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.
    1. Mark plumb lines on substrate at trim accessory locations for accurate installation.
    2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

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SECTION 07 14 16 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modified polyurethane membrane waterproofing system where indicated on Drawings.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 05 51 13 "Metal Pan Stairs" for exterior metal pan stairs receiving waterproofing that is the Work of this Section.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including, but not limited to, the following:

a. Surface preparation specified in other Sections.
b. Minimum curing period.
c. Forecasted weather conditions.
d. Special details and sheet flashings.
e. Repairs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Metal Pan Stair Waterproofing System: Obtain waterproofing materials from single source, from single manufacturer.

2.2 MODIFIED POLYURETHANE WATERPROOFING AT METAL PAN STAIRS AND LANDINGS

A. Waterproofing System: High-solids, cold fluid-applied modified polyurethane waterproofing.

1. System: Subject to compliance with requirements, provide the following:

a. Tremco Incorporated; Vulkem 350/951NF.

B. Primer: Liquid polyurethane primer as recommended for substrate and conditions by waterproofing manufacturer.

C. Base Coat: Single-component aromatic urethane.

1. Product: Vulkem 350, roller grade.

D. Second Coat: Two-component aliphatic polyurethane.

1. Product: Vulkem 951NF.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.

C. Membrane-Reinforcing Fabric: Manufacturer's recommended fiberglass mesh or polyester fabric, manufacturer's standard weight.

D. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION, GENERAL

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Ensure metal pans have been drilled to provide weep holes.

C. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

3.3 INSTALLATION AT METAL PAN STAIRS

A. Install fluid-applied modified polyurethane waterproofing to interior surfaces of metal pans according to manufacturer's written instructions, applying each coat in thickness recommended by manufacturer for applications and conditions, and allowing coats to cure before the installation of subsequent coats or concrete fill.

3.4 PROTECTION

A. General: Protect waterproofing from damage and wear during remainder of construction period.

END OF SECTION

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SECTION 07 16 17 - CRYSTALLINE WATERPROOFING ADMIXTURE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Permeability-reducing hydrophobic waterproofing admixture for concrete to be added to concrete mix at batch plant.
2. Swellable bentonite water stops for installation at construction jointswhere.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-in-Place Concrete" for concrete mixes and for placing of concrete walls and slabs.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site, as part of conference for Section 03 30 00 "Cast-In-Place Concrete."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and installation instructions.
2. Include concrete mixes as specified in Section 03 30 00 "Cast-In-Place Concrete."

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator.

B. Product Certificates: For each type of waterproofing, patching, and plugging material.

C. Product Test Reports: For each product formulation, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying crystalline waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F (4.4 deg C) or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

A. Hydrophobic Pore Blocking Concrete Admixture: Admixture that reacts chemically to develop hydrophobic pore-blocking growth within substrate capillaries to produce an impervious, dense, waterproof substrate; with properties complying with or exceeding the criteria specified below.

1. Products: Subject to compliance with requirements, provide one of the following, as recommended by manufacturer for Project conditions:

a. Xypex Chemical Company; Xypex Crystalline Waterproofing:

1) C-500, formulated to have no effect on setting time.
2) C-1000, formulated for normal or mildly delayed set.

2. Dosage Rate: 2 to 3 percent by weight of Portland cement, unless otherwise indicated.

a. Comply with manufacturer's dosage recommendations for concrete mix specified in Section 03 30 00 "Cast-In-Place Concrete."

3. Water Permeability: No water leakage at 150 psi, when tested according to US Army COE CRD-C 48.
4. Compressive Strength: Minimum 10 percent improvement in compressive strength compared to same concrete mix without admixture.

2.2 ACCESSORY MATERIALS

A. Provide patching and plugging compounds by same manufacturer as admixture and compatible with admixture.

B. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; and compatible with substrate and other materials indicated.

C. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); and compatible with substrate and other materials indicated.

D. Swellable Bentonite Water Stops: Composite waterstops featuring expandable bentonite as sealing ingredient. Provide any primers, adhesives, or mechanical fasteners required or recommended by water stop manufacturer for complete installation.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Henry, a Carlisle Company; MiraSTOP BW Bentonite Waterstop.
b. W. R. Meadows; Waterstop EC.
c. Tremco Construction Products Group; Superstop Waterstop, self-adhering.

E. Water: Potable.

2.3 MIXES

A. Hydrophobic Waterproofing: Prepackaged dry ingredients shall be added to concrete at batch plant, according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 APPLICATION

A. Locations: Below-grade foundation walls and retaining walls, and where indicated in Drawings.

B. Coordinate with Section 03 30 00 "Cast-in-Place Concrete" for use of concrete with crystalline waterproofing admixture in concrete mix at specified locations.

3.2 PATCHING

A. Engage factory-authorized service representative of waterproofing manufacturer to inspect cured concrete for conditions requiring patching and plugging.

B. Comply with manufacturer's written instructions for application of patching and plugging compounds.

C. Do not allow patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

D. Repair damaged or unsatisfactory substrate with patching compound.

1. At holes and cracks 1/16 inch (1.6 mm) wide or larger in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and minimum 1 inch (25 mm) deep. Fill reveal with patching compound flush with surface.

E. Install swellable bentonite waterstops at joints in concrete treated with admixture and at joints between treated and untreated concrete, according to water stop manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed application of waterproofing.

B. Prepare test and inspection reports.

END OF SECTION

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SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fiberglass batt insulation at at stud and joist cavities, and where indicated at interior wood frame walls.

B. Related Sections:

1. Section 07 41 13.16 "Standing-Seam Metal Roofing" for insulation as part of standing seam roofing assemblies.

1.2 COORDINATION

A. Coordinate installation of continuous insulation with air barrier installation and sealing.

B. Coordinate installation of continuous insulation in subframing system.

C. Coordinate installation of firestopping insulation specified in Section 07 84 13 "Penetration Firestopping."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Continuous Insulation:

a. Examine construction of wall cladding subframing system over substrate indicated for proper drainage, flashing, trim, back-up support, soffits, and other related Work.
b. Review wall cladding details, wall penetrations, openings, and condition of other construction that affects this Work.
c. Review and finalize construction schedule.
d. Verify availability of materials, installer's personnel, equipment, and facilities needed to maintain schedule.
e. Review means and methods related to installation, including manufacturer's written instructions.
f. Review temporary protection requirements for during and after installation of this Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Insulation recycled content, indicating postconsumer and preconsumer recycled content.
2. Insulation formaldehyde and other VOC content.

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Documentation of Greenguard Gold Certification for each glass-fiber insulation product.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original unopened containers and packaging with labels clearly identifying product name and manufacturer.

B. Deliver components and other manufactured items or accessories without damage or deformation.

C. Storage: Store materials in clean, dry, and level interior areas or outdoor areas for limited duration in accordance with manufacturer's written instructions.

D. Protect components and auxiliary accessories during transportation, handling, and installation from moisture, excessive temperatures and other construction operations in accordance with manufacturer's written instructions.

E. Handle components in strict compliance with manufacturer's written instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface, edge or corner damage. Protect materials from physical damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Performance: Insulation shall be installed to provide R-values indicated with assemblies on Drawings.

B. Fire Performance:

1. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.

C. Sustainability Requirements:

1. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
2. Insulation shall contain no fire retardants.
3. Insulation shall contain no formaldehyde or hydrochlorofluorocarbons (HCFCs).
4. Recycled Content: Insulation shall contain at least 30 percent postconsumer recycled content OR at least 60 percent preconsumer recycled content.
5. Glass-fiber insulation shall meet Greenguard Gold Certification.
6. Materials shall meet California Quality Standards for Insulating Material, Title 24, Part 12, Chapter 4, Article 3, listed in the California Department of Consumer Affairs Consumer Guide and Directory of Certified Insulating Materials.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning.

B. Polypropylene-Scrim-Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).

C. Unfaced Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

D. Acoustical Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced with non-rated membrane). Kraft-faced glass fiber acoustic batt insulation designed to absorb sound vibrations in wall, floor, and ceiling installations, for noise control.

1. Thickness: 3-1/2 inches.
2. Unfaced acoustic batts are acceptable in lieu of acoustical insulation. Contractor's option.

2.3 LOOSE-FILL INSULATION

A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application or Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.4 SILL GASKETS

A. Sill Gaskets: Polyethylene closed-cell foam with waterproofing membrane to form gasket seal between top of foundation and bottom of sill.

1. Products: One of the following.

a. Protecto Wrap Company; Protecto Premium Energy Sill Sealer.
b. Dow Corning Corporation; Sill Seal R-1.
c. Owens Corning; FoamSealR.
d. Gasket Width: Corresponding to sill plate width.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections that interfere with insulation attachment.

B. For interior installations, provide for adequate ventilation during installation by opening a door or window. Cover ventilation ducts to reduce particulate in ducts.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to systems, products, and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Keep insulation a minimum of 3 inches away from heat emitting devices, uscha s recessed light fixtures, and a minimum of 2 inches from sidewalls of chimneys and vents.

E. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BATT INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions.

B. Batt Insulation, Including Acoustic Batts: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated.

C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in, or compression of, insulation using the following materials:

1. Loose Fill Glass-Fiber Insulation: Apply at voids greater than 1/4-inch in the insulating plane according to ASTM C 1015 and manufacturer's written instructions. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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SECTION 07 25 00 - WEATHER BARRIERS

This Section has been replaced in its entirety for Addendum E.

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes weather barriers providing water resistance and air barrier at exterior cladding. Components include:

1. Water-resistive air barrier.
2. Flexible flashing.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 41 13.16 "Standing-Seam Metal Roof Panels."
3. Section 07 46 23 "Wood Siding."
4. Section 07 54 19 "Polyvinyl Chloride (PVC) Roofing."
5. Section 07 92 00 "Joint Sealants."
6. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts."
7. Section 08 51 13 "Aluminum Windows."

1.2 COORDINATION

A. Coordinate installation of fenestration with installation of flexible flashing and weather barriers to ensure a waterproof interface.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review weather barrier requirements and installation, special details, mockups, air-leakage and bond testing, weather barrier protection, and work scheduling that covers weather barriers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.

a. Include data on air and water-vapor permeance based on testing according to referenced standards.

2. Include evidence of compliance with sustainable design requirements, whether within product data or in separate declarations or letters from manufacturer. Do not submit Safety Data Sheets as evidence of compliance.

B. Sustainable Design Submittals: Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For weather barrier assemblies.

1. Show locations and extent of weather barrier materials, accessories, and assemblies specific to Project conditions.

2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of weather barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: From weather barrier manufacturers, certifying compatibility of weather barriers and accessory materials with Project materials that connect to or that come in contact with weather barriers.

B. Product Test Reports: For each weather-barrier assembly, for tests performed by a qualified testing agency.

C. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.03 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.2 WEATHER BARRIER

A. Vapor-Permeable Building Wrap: Compliant with ICC AC38. Non-woven, non-perforated polyolefin weather barrier with proprietary coating, for mechanical fastening to sheathing.

1. Basis of Design Product: Henry Company; WeatherSmart Commercial.

B. Physical and Performance Properties:

1. Thickness: 11 mils (0.28 mm).
2. Tear Strength: Minimum 15 lbs, as tested per ASTM D1117.
3. Vapor Permeance: Minimum 15 perms (860 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method, Procedure A.
4. UV Resistance: Can be exposed to sunlight for 6 months prior to cladding installation, according to manufacturer's written instructions.

C. Acrylic Seam Tape: Composite tape consisting of a pressure-sensitive acrylic adhesive, bonded to a polyethylene or polypropylene film for sealing joints and penetrations in building wrap. Provide tape from same manufacturer as approved wrap product.

1. Basis of Design Product: Henry Company; Henry Sheathing Tape.

2.3 FLEXIBLE FLASHING

A. Foil-Faced SASM Detail Flashing: At all rough openings, windows, doors, and storefronts, bracket/embed penetrations.

1. Product: Subject to compliance with requirements, provide the following:

a. Berry Plastics; Polyken Foilastic 626-35, with Nashua 357SA Spray Adhesive primer.

B. Window and Door Head SASM Flashing: Butyl rubber adhesive with woven polyethylene carrier, black, for a total thickness of 20 mils.

1. Product: Subject to compliance with requirements, provide the following:

a. Berry Plastics; Polyken Shadowlastic Plus, 627-20.

C. High-Temperature, High Performance Self-Adhering Flexible Flashing: Composite, self-adhesive flashing product consisting of a pliable butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 30 mils.

1. Product: Subject to compliance with requirements, provide the following:

a. GCP Applied Technologies; Ultra.

2.4 ACCESSORY MATERIALS

A. Self-Adhering Plastic Sheet Air Barrier Accessories, General: In addition to products and accessories specified in this Section, provide accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

1. Manufacturer recommended accessories may include, but are not limited to, primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, and lap sealants.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch (0.5 mm) thick, and Series 300 stainless-steel fasteners.

PART 3 - EXECUTION

3.1 GENERAL

A. Weather barrier components specified in Part 2 shall be installed in configurations indicated in Waterproofing Schedules and detailed on Drawings.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.4 INSTALLATION, BUILDING WRAP WEATHER BARRIER

A. Install building wrap over dry framing and sheathing, before window and door installations.

B. Affix weather barrier extending at least 6 inches (152 mm) around a building corner. Unroll horizontally (with print side facing out) around the building, covering rough window and door openings.

C. Fasten to studs or nailable sheathing material with galvanized construction grade staples a maximum of 18 inches (457 mm) in the vertical and horizontal direction.

D. Attach weather barrier so that it is taut and flat. Overlap vertical seam a minimum of 6 inches (152 mm) and tape seam.

E. Ensure that the bottom edge of the weather barrier extends over the sill plate and foundation interface by at least 1 inch (25 mm).

F. Overlap upper layers of weather barrier (in shingle lap fashion) by a minimum of 6 inches below the horizontal edge, and tape the horizontal seam line.

G. At roof-to-wall intersection (or wall-to-deck), affix wrap to the wall so that it overlaps step flashing already in place on wall by at least 2 inches (51 mm).

3.5 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches (100 mm) except at flashing flanges of other construction, where laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.6 FIELD QUALITY CONTROL

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to train installers and observe installations.

B. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed.

7. Laps in sheet materials have complied with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Air barrier has been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

D. Tests: As determined by testing agency, from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 07 26 16 – BELOW-GRADE VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes below-grade vapor retarders for slabs below enclosed space, in contact with earth, not otherwise designated to receive waterproofing.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 03 30 00 "Cast-In-Place Concrete" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include independent test data for permeance.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Samples: For vapor retarder.

PART 2 - PRODUCTS

2.1 VAPOR BARRIERS

A. Sheet Vapor Barrier: Minimum 10-mil thick polyolefin manufactured from virgin resins.

1. ASTM E 1745, Class A.
2. Permeance of less than 0.03 perms before and after conditioning (per ASTM E 1745) when tested in accordance with ASTM F 1249/E96, complying with ACI 302.2R-06.
3. Puncture resistance not less than 2,200 grams (5 lb) per ASTM D 1709.
4. Tensile strength not less than 45 lbf/in per ASTM D882 or ASTM E154.
5. Include manufacturer's recommended adhesive or pressure-sensitive tape.
6. Basis-of Design Product: Subject to compliance with requirements, the following or equivalent:

    a. Stego Industries; Stego Wrap 10 Mil Vapor Barrier.

7. Comparable Products: Subject to compliance with requirements, the following will be considered in lieu of basis of design product:

    a. Henry Company; Moistop Ultra 10.
    b. Raven Industries, Inc.; VaporBlock 10.

B. Seam Tape: As recommended by manufacturer for vapor barrier indicated.

C. Perimeter Seal: Textured tape designed to form mechanical key interlock with concrete as recommended by manufacturer for product indicated, or termination bar and mechanical fasteners.

1. Basis-of-Design Product: Stego Industries; Crete Claw Tape.

D. Pre-Cut Pipe Boots: Vapor barrier manufacturer's pre-cut boots or sealing around permanent penetrations in vapor barrier. Fabricated from same polyolefin membrane as vapor barrier, 18-by-18-inches, 15 mils thick.

E. Mastic: Vapor barrier manufacturer's water-based, polymer-modified anionic bituminous/asphalt emulsion for sealing utility and pipe penetrations in vapor barrier. Used in conjunction with pre-cut pipe boots.

F. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

PART 3 - EXECUTION

3.1 VAPOR RETARDERS

A. Granular Course: Cover base drainage layer with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

1. Depth of capillary break shall be per Geotechnical Report.
2. Do not place granular course above vapor retarder.

B. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E 1643 and manufacturer's written instructions.

1. Place perimeter seal according to manufacturer's instructions.

    a. Perimeter Tape: Adhere to edge of vapor barrier.
    b. Termination Bar: Terminate vapor barrier with mechanical attachment through termination bar to grade beam or other adjacent construction. Do not interfere with concrete joint surfaces.

2. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
3. Seal penetrations and blockouts with detail patches of additional sheet vapor barrier, manufacturer’s recommended tape, and manufacturer’s recommended mastic according to manufacturer’s instructions and Drawings.
4. Seal damaged areas with patches and tape according to manufacturer’s instructions.

END OF SECTION

SECTION 07 41 13.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standing-seam roof panels and installation accessories.
2. High-temperature self-adhering underlayment.
3. Glass-mat-coated cover board.
4. Rigid extruded polystyrene (XPS) board insulation.
5. Sheet metal flashing and roof drainage provisions fabricated from same metal as roofing panels.

B. Related Work:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Division 07 weather barrier section for weather-resistive barrier interfacing with roofing system, providing a continuous weather-tight building enclosure.
3. Metal framed skylights.
4. Photovoltaic panels for mounting to standing seam roofing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of standing seam metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of standing seam metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Standing Seam Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For standing seam metal panels, to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. First-in-Place Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for typical roof, wall, and window area specified in Section 01 40 00 "Quality Requirements," including accessories.
2. Build mockup of roof edge flashing and drainage, including gutter and downspout.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980.

B. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for low -slope roof products.

C. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged solar reflectance of not less than 0.55 and emissivity of not less than 0.75.
2. Three-year, aged Solar Reflectance Index of not less than 64 when calculated according to ASTM E 1980.

D. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

E. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General:

1. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
2. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
3. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or approved comparable:

    a. AEP Span; Span-Loc hp.

2. Prefinished Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Nominal Thickness: 0.034 inch (22 gauge, 0.86 mm).
    b. Panel Height: 2 inches (51 mm).
    c. Panel Coverage: 16 inches.
    d. Exterior Finish: Three-coat fluoropolymer.
    e. Color: Metallic silver.

3. Clips: Manufacturer's standard two-piece floating clip for use with mechanically seamed panels.
4. Minimum Slope: 1/4-inch per foot.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (1.02 mm) thick, consisting of slip-resistant, UV-resistant polyethylene-film top ply laminated to a layer of polymer-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, provide the following:

    a. GCP Applied Technologies, Inc.; Ice & Water Shield.

~~B. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.~~

~~1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.~~
~~2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.~~
~~3. Products: Subject to compliance with requirements, provide one the following:~~

~~a. GCP Applied Technologies; Grace Ultra.~~

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 ROOF INSULATION

A. Extruded Polystyrene (XPS) Board, Type VI: ASTM C578, Type VI, 40-psi (276-kPa) minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.

1. Foam shall contain no prohibited hydrofluorocarbons, in compliance with CA SNAP regulation.
2. Product: Subject to compliance with requirements, provide the following:

   a. Owens Corning; FOAMULAR 400 Extruded Polystyrene (XPS) Rigid Foam Insulation.

3. Size: 48 by 96 inches (1219 by 2438 mm).
4. Aged R-Value: Not less than 4.15 per inch.
5. Thickness: As indicated on Drawings, in two or more layers with joints offset.
6. Tapered Boards: Where indicated, provide boards with taper as indicated on Drawings.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

1. Self-drilling, self-tapping screw with low-profile head, as required to penetrate through thickness of insulation and 3/4-inch into deck. Carbon steel with fluoropolymer finish.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum board.

1. Basis of Design Product: Subject to compliance with requirements, provide the following:

   a. Georgia-Pacific Gypsum, LLC; DensDeck Roof Board.

2. Thickness: 5/8 inch.

2.6 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual."

1. Profile: As indicated on Drawings.
2. Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters.
3. Provide wire ball strainers of compatible metal at outlets.
4. Finish gutters to match metal roof panels, unless otherwise indicated.

E. Downspouts: 3 inch diameter GSM with stand off brackets as indicated on Drawings. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

F. Splash Block: Provide precast concrete splash block, approximately 12-by-20-by-3 inches thick, for installation at base of downspout.

G. Panel Fasteners: Self-tapping screws designed to withstand design loads.

H. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.7 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.8 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the roof area indicated below:

a. Roof perimeter for a distance up from eaves of 36 inches (914 mm) beyond interior wall line.
b. Valleys, from lowest point to highest point, for a distance on each side of 18 inches (460 mm). Overlap ends of sheets not less than 6 inches (152 mm).
c. Rake edges for a distance of 18 inches (460 mm).

d. Hips and ridges for a distance on each side of 12 inches (305 mm).
e. Roof-to-wall intersections for a distance from wall of 18 inches (460 mm).
f. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of 18 inches (460 mm).

B. Felt Underlayment: Apply at locations indicated below, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).

1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.

C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.

D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Watertight Installation:

    a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

J. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

SECTION 07 42 46 - FIBER-CEMENT SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fiber cement soffit panels at typical eave conditions and where indicated on Drawings

B. Related Requirements:

1. Section 01 23 00 "Alternates."
2. Section 01 81 13 "Sustainable Design Requirements."
3. Section 06 16 43 "Gypsum Sheathing" for sheathing.
4. Section 07 25 00 "Weather Barriers" for base-bid weather barrier and flexible flashing behind fiber-cement panels.
5. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing standards and materials, including parapet cap.
6. Section 09 91 13 "Exterior Painting" for field-applied paint finish.

1.2 COORDINATION

A. Coordinate installation of furring strips over 6-inch strips of SASM over weather barrier, to receive fiber-cement cladding.

B. Coordinate panel installation with flashings and other adjoining construction to ensure proper sequencing and continuous air barrier envelope.

C. Coordinate field finishing of fiber-cement cladding within 180 days of installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show elevations, sections, and installation details of fiber-cement board and batten cladding. Include the following:

1. Transitions to adjacent cladding.
2. Transitions at fenestration.
3. Required flashing and sealants, including self-adhered flashing strips reinforcing weather barrier where fasteners for fiber-cement panels penetrate the weather barrier.
4. Provide installation details showing required framing and attachment of panels to furring.

C. Samples for Initial Selection: For fiber-cement panels and trim, including related accessories.

1. 24-inch- (600-mm-) wide-by-36-inch- (900-mm-) high Sample panel.
2. 12-inch- (300-mm-) long-by-actual-width Samples of trim and accessories.

D. Samples for Verification: For each type required.

1. 24-inch- (600-mm-) wide-by-36-inch- (900-mm-) high Sample of panel.
2. 12-inch- (300-mm-) long-by-actual-width Samples of trim and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement panels.

B. Research/Evaluation Reports: For each type of fiber-cement panel system required, from ICC-ES.

C. Sample Warranty: For special warranty.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish full size panels and trim pieces, including related accessories, in a quantity equal to 2 percent of amount installed.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, set quality standards for materials, fabrication, and installation, and to use for preconstruction testing.

1. Build mockup of typical soffit area clad with fiber-cement panels as directed by Architect or as included in integrated exterior mockup.

a. Include panels and accessories for a complete installation.
b. Mockup shall incorporate backup construction, fiber-cement panels, trim, insulation, wall penetrations, and flashing, weather-resistive barriers, and sealing of gaps, terminations, and penetrations.
c. Coordinate sequencing and installation requirements with installers of other components of building enclosure.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Integrated exterior mockup may be tested for water and air infiltration using tests specified in fenestration Sections.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT PANELS, GENERAL

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Factory Priming: Fiber-cement panels and trim shall be primed for field painting with manufacturer's standard acrylic primer.

2.3 FIBER CEMENT SOFFIT PANELS

A. Fiber cement soffit panels at eaves and ceiling at exterior porch unless otherwise noted.

B. Basis of Design: HardieGroove Lining with V rustic pattern, field painted.

2.4 ACCESSORIES

A. Panel Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as standard for panel system, where indicated in Drawings.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Furring: Fire-retardant-treated, preservative-treated exterior glue plywood furring strips, not less than 3 inches wide, 3/4 inch thick.

1. Available Fire-Retardant Product: Includes, but not limited to, the following:

a. Hoover; Exterior Fire-X.

C. Flashing: Provide aluminum flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" where indicated.

1. Finish for exposed flashing: Primed for field painting.

D. Fasteners:

1. Control length of fasteners for fiber cement panels to prevent penetration of weather barrier with face fasteners.
2. For fastening to wood, use Type 316 stainless steel ribbed bugle-head screws of length recommended by cladding manufacturer.
3. For fastening fiber cement, use smooth head stainless steel fasteners.

4. Fasteners shall be field-painted at same time as panels.

E. Fiber Cement Trim: Manufacturer's standard edge and corner trims, in profiles indicated in Drawings.

1. Finish: Matching adjacent panels.
2. Texture: Smooth.

F. Fiber cement soffit panels at eaves, with grooved pattern: Hardi Soffit 1/4" thick, unvented, factory finished.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement panels and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Plan venting and cut boards accordingly, prior to installation.

1. Prime/reseal all field-cut edges with 100 percent acrylic latex paint.
2. Install panels with fasteners spaced according to Drawing details.
3. Ensure separation of incompatible materials.
4. Avoid penetrating weather barrier except with fasteners attaching furring to substrate.

3.3 INSTALLATION

A. Install panel system according to manufacturer's written installation instructions and approved Shop Drawings, unless more stringent requirements apply.

B. Install panels in patterns indicated on Drawings.

C. Comply with fastening pattern indicated on Drawings.

1. Install panel perimeter fasteners no more than 4 inches (100 mm) o.c. and panel field fasteners no more than 8 inches (200 mm) on center, and at each batten.

D. Do not install damaged components.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 46 23 – WOOD SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Redwood board-and-batten siding installed over wood-framed walls and concrete walls.
2. Fire retardant treatment of redwood siding.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 25 00 "Weather Barriers" for weather-resistive barrier behind redwood siding.
3. Section 07 42 46 "Fiber-Cement Soffit Panels" for related soffits.

1.2 COORDINATION

A. Coordinate products specified in other Sections to match Work of this Section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1. Samples of redwood plank, not less than 6-by-8 inches, with half of exposed surface treated with fire-retardant and having penetrating oil finish.

C. Samples for Verification:

1. For rift-sawn redwood siding products, with half of exposed surface finished; 18-inch length by full width.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.

1.5 MAINTENANCE SUBMITTALS

A. Furnish extra pieces of siding, milled from the same wood at the same time as installed siding.

1. Provide 5 percent of each type and profile installed, in full lengths.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For penetrating oil finish, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build minimum 50 sq ft mock-up of each type of siding, including fasteners, joints, and corners.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle and store wood according to manufacturer's written instructions. Store in a dry, well-ventilated, weathertight place, preferably indoors.

B. Store materials under cover on elevated platforms and protected from weather and contact with damp or wet surfaces. Stack board paneling flat, with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with requirements for exterior wall siding and sheathing for wildland urban interface (WUI), per California Office of the State Fire Marshal, listing for American Wood Council, as follows:

1. Design: Solid-sawn "Wood" siding with no through holes or loose knots, installed over exterior gypsum sheathing or structural sheathing as indicated on Drawings, and complying with Voluntary Product Standard PS1 or Voluntary Product Standard PS2, with the following interlocking designs when installed in accordance with industrial technical guide. Refer to the manufacturer's installation instructions and product data sheets.

    a. Vertical Board Siding: When applied in a vertical orientation with minimum nominal 8" wide and nominal 1" thick boards, with varying width planks overlapping 1 1/2 inches or as indicated on drawings, with planks fastened to the wood frame with not less than 3" long fasteners at a schedule not more than 24" on center, and boards and battens made of a wood species "Redwood", having a Flame Spread Rating not greater than 75 (Class B) when tested in accordance with ASTM E84.

        1) All nominal board sizes shall comply with the applicable provisions of American Softwood Lumber Standard DOC PS 20.
        2) Edge and end glued siding is permitted to be used interchangeably with solid sawn members.

2. The recommended installation practice for solid wood siding in wall construction regarding butt and overlapping joints is: butt joints between pieces should be staggered a minimum of 12" and all butt joints should be flush with no gap. Nail joints into the studs or blocking members. One nail at each crossing with the wood frame support member shall be used for nominal 6" siding and 2 nails for nominal 8" or wider siding. Refer to the manufacturer's installation instructions and product data sheets.

2.2 WOOD SIDING

A. Source Limitations: Obtain each type of siding, including related accessories, from single source, from single manufacturer.

B. Redwood Siding:

1. Species: Redwood.
2. Grade: Clear All Heart, RIS.
3. Profile: Square, for installation in board-and-batten configuration.
4. Nominal Sizes:

    a. Planks: 1 x siding planks with 8-, 10-, and 12-inch-wide faces. See Drawings for pattern where indicated.
    b. Battens: 1-1/4 inch thick x 4 inches wide.

5. Edge Style: Square.
6. Cut: Rift Sawn.
7. Fire Retardant Treatment: See "Accessories" article.
8. Finish: Penetrating oil finish.
9. Installation Method: Install directly over weather barrier, except as follows.

    a. At Concrete Walls: Hat channel.

2.3 FINISHING PRODUCTS

A. Penetrating Oil Finish: Waterborne penetrating oil, formulated for exterior use, and recommended by oil manufacturer for use on redwood.

1. Available Product: WOCA Exterior Oil.

2.4 ACCESSORIES

A. Fire-Retardant Treatment: Provide water-based, post-treatment fire retardant and wood preservative appropriate for exterior use, providing not less than Class A fire performance, as tested according to ASTM E 84.

1. Product: One of the following:

    a. Flame Seal, LLC; Wood Seal A.
    b. Flame Stop Inc.; Flame Stop II.
    c. Fire Retardant Coatings of Texas; FX Lumber Guard XT.

B. Hat Channel: Galvanized steel hat channel, not less than 18 gauge, 7/8 inch depth, with slotted perforations on sides. Hot-dip galvanized per ASTM A653/A653M, with G90 coating.

C. Fasteners for Metal: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

D. Fasteners for Siding: #9 x minimum 3-inch bugle-head stainless steel, square drive (Robinson Head).

E. Provide for separation of dissimilar materials by providing elastomeric washers, bushings, or spacers where required.

F. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

G. Joint Sealant: Polyurethane sealant, ASTM C 920, Type S, Grade NS, minimum Class 50.

1. See Section 07 92 00 "Joint Sealants" for specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine siding before installation.

1. Reject materials that are wet, moisture damaged, and mold damaged.
2. Ensure mill-finishing complies with requirements.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Apply fire retardant to wood siding for locations indicated in Drawings, according to retardant manufacturer's instructions.

B. Finish wood siding prior to installation, applying number of coats recommended by finish manufacturer. Seal cut ends of wood prior to any other finishing.

C. Clean substrates of projections and substances detrimental to application.

D. Siding at Concrete Walls: Install perforated hat channel horizontally over thermally broken Z-girts encapsulating continuous insulation, as detailed on Drawings and at spans indicated on accepted Shop Drawings.

E. Siding at Wood Framed Walls: Install perforated hat channel horizontally over self-adhered flashing strips reinforcing weather barrier, with fasteners penetrating through gypsum sheathing and plywood sheathing into wood studs.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install siding level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut wood siding to fit adjoining work.
3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
5. Coordinate siding with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior wood siding.

3.4 INSTALLATION OF SIDING

A. Comply with WUI requirements and siding manufacturer's installation instructions and recommendations.

B. Layout spacing for siding prior to start of installation. Use full-length boards and stagger joints between boards.

1. Butt joints shall be staggered a minimum of 12 inches.
2. All butt joints shall be flush, with no gap.

C. Pre-drill all fastener holes. Fasteners shall be countersunk.

1. Boards shall be installed with a gap not more than 1/2 inch.
2. Battens shall be fastened through plywood sheathing and gypsum sheathing to the wood framing members not more than 24 inches o.c., using fasteners a minimum of 3 inches long; longer if needed to accommodate the gypsum sheathing layer.
3. Use 2 nails at each board crossing with wood frame support member.

D. Install trim and accessories according to manufacturer's recommendations.

E. Isolate dissimilar metals.

F. Seal joints between ends of boards.

G. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

3.5 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Re-apply finish coat to completed installation.

C. Clean finished surfaces according to manufacturer's written instructions and maintain in clean condition during construction.

END OF SECTION

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SECTION 07 54 19 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered polyvinyl-chloride (PVC) roofing/waterproofing system at low slope crickets, at equipment wells, as waterproofing at terraces, and where indicated on Drawings.
2. Cover board.
3. PVC-coated sheet metal for field-fabricated flashing.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 21 00 "Thermal Insulation" for fiberglass batt insulation in framing cavity beneath roof terrace to receive PVC membrane waterproofing.
3. ~~Section 07 21 29 "Foamed-in-Place Insulation" for polyurethane foam insulation directly below sheathing of roof terrance to receive PVC membrane waterproofing.~~
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings other than PVC-coated metal flashings.
4. Section 07 76 16 "Roof Decking Pavers" for pedestal paver system installed over PVC waterproofing and for resilient pads protecting PVC membrane and providing sound-damping.
5. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Roof plan showing orientation of roof deck and orientation of roofing.
3. Details of roofing and flashing.

C. Samples for Verification: For the following products:

1. Sheet roofing membrane, of color required.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For components of roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Research/Evaluation Reports: For components of roofing system, from ICC-ES.

C. Contractor will submit a letter from the manufacturer stating approved applicator status and qualification for the specified warranty.

D. Warranties: Submit a sample of two warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Global approved for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special No-Dollar-Limit warranty includes membrane roofing, base flashings, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of PVC roofing such as PVC roofing membrane cover boards, and base flashing, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Tested by a qualified testing agency to resist the corner (corner zone), perimeter (edge zone), and field-of-roof (middle zone) uplift pressures, as indicated on the Drawings.

D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 PVC ROOFING

A. PVC Sheet: ASTM D 4434/D 4434M, nonwoven-polyester reinforced.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or comparable product:
    a. Sika Corporation; Sarnafil G410 - EnergySmart Roof Membrane.
2. Comparable Products:
    a. FiberTite Roofing; FiberTite SM-FB (KEE-PVC).
    b. Johns Manville, a Berkeshire Hathaway Company; JM PVC.
3. Membrane Thickness: ~~80 mils (2.03 mm), nominal~~60 mils, minimum.
4. Exposed Face Color: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
    1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. PVC Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.

C. Metal Sheet Flashing: For field fabrication of roof penetration flashing.
    1. PVC-Coated Metal Sheet: Roofing membrane manufacturer's standard heat-weldable PVC coated metal sheet, consisting of 24-gage G90 galvanized steel sheet laminated on one side with 20-mil PVC membrane of same formula as PVC roofing membrane.
        a. Product: Sika Sarnafil, Inc; Sarnaclad.
    2. See Section 07 62 00 "Sheet Metal Flashing and Trim" for galvanized steel sheet and stainless steel sheet flashing, where indicated.

D. Liquid-Applied Flashing: Self-terminating, reinforced, liquid-applied flashing compatible with roofing.

E. Prefabricated Pipe Flashings (Penetration Boots): Supplied by the roof membrane manufacturer, 60 mils (1.5 mm) thick, minimum, of same color as PVC membrane sheets.

F. Bonding Adhesive: Manufacturer's standard.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates providing corrosion resistance and designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

H. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick.
    1. Products: Subject to compliance with requirements, provide the following:
        a. At Roof: Georgia-Pacific Corporation; DensDeck.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of wood roof deck complies with requirements in Structural Drawings.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Start of work indicates acceptance of substrate.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

1. Install sheet according to ASTM D 5036.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering roofing membrane, mechanically fasten ~~roofing~~membrane securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Flash penetrations and field-formed inside and outside corners with flashing materials indicated.

C. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

D. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed sheet metal wall flashing to extent not provided with cladding systems.
3. Formed sheet metal deck flashing.
4. Formed roof-drainage sheet metal fabrications, including scuppers and downspouts.
5. Formed low-slope roof sheet metal fabrications, including parapet cap.
6. Preformed flashing panels for utility penetrations at exterior walls.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Division 07 weather barrier section for SASM and liquid flashing.
3. Section 07 41 13.16 "Standing-Seam Metal Roof Panels" for flashing and roof drainage provisions by manufacturer of roofing panels.
4. Section 07 54 19 "Polyvinyl-Chloride (PVC) Roofing" for PVC-coated metal for field-formed and manufactured flashing at terraces with PVC waterproofing.
5. Section 07 71 00 "Roof Specialties" for parapet copings and roof drainage accessories at low-slope and steep-slope roofing.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing, parapet, and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special details, roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof- or deck-penetration flashing.
9. Include details of special conditions.
10. Include details of connections to adjoining work.
11. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
12. Distinguish between PVC-coated metal flashing and coil-coated or mill-finish flashing specified in this Section.

D. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. First-in-Place Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation. Build mockups as follows:

1. Build mockups of flashings at one window head and one door and at floor-line drip flashing at transition from one type of cladding to another. Coordinate sequencing and installation requirements with installers of other components of building enclosure.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved first-in-place mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 (Z275) coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.

1. Surface: Smooth, flat and mill phosphatized for field painting, unless otherwise indicated.
2. Exposed Coil-Coated Finish, where indicated:

a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Color: As selected by Architect from manufacturer's full range.
c. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering Underlayment: Nominal 30 mils thick, consisting of a slip-resistant high-density cross-laminated polyethylene film laminated to a layer of butyl adhesive with release-paper backing. Provide primer if required according to written recommendations of underlayment manufacturer.

1. Product: Subject to compliance with requirements, provide the following:

a. GCP Applied Technologies; Grace Ultra.

B. Detailing Membrane: Foil-faced butyl rubber self-adhering membrane, 35 mil nominal thickness.

1. Product: Polyken; Foilastic Flashing Tape 626-35.

C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 PREFORMED FLASHING PANELS

A. Preformed flashing panels for weatherproofing plumbing and electrical penetrations in exterior walls:

1. Manufacturer: Subject to compliance with requirements, provide products by the following:

a. Quickflash Weatherproofing Products, Inc.; Quickflash Weatherproofing Flashing Panels.

2. Materials for Plumbing Flashing Panels:

a. Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
b. Seal: Thermoplastic elastomer.

3. Materials for Electrical Flashing Panels:

a. Panel: Thermoplastic elastomer.

2.5 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured itemunless otherwise indicated.

1. Materials shall comply with low-emitting materials requirements, including VOC limits, set forth in Section 01 81 13 "Sustainable Design Requirements."

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, with maximum lead content of 0.2 percent.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

G. Neoprene Separators: Fabricated from uncured neoprene. Provide sheet, strips, and washers, as detailed on Drawings.

1. Typical sheet thickness, 60 mils.

2.6 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Fry Reglet Corporation.

2. Material: Galvanized steel, 0.022 inch (0.56 mm) thick.
3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:

a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

6. Finish: Mill.

2.7 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Do not use graphite pencils to mark metal surfaces.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. General: Unless otherwise indicated, fabricate sheet metal flashing for low-slope roofs from the following material:

1. Galvanized Steel: 0.034 inch (22 ga, 0.86 mm).

B. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Overlapped, 4 inches (100 mm) wide.
2. Fabricate with scuppers spaced 10 feet (3 m) apart, to dimensions required with 4-inch- (100-mm-) wide flanges and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

C. Copings (Parapet Cap): Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.

2.9 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate downspouts of profiles and dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricate downspouts from the following materials, unless otherwise indicated:
    a. Galvanized Steel: Not less than 0.022 inch (0.56 mm) thick.

B. Parapet Scuppers: Fabricate scuppers to dimensions and profile required, with closure flange trim to exterior, wall flanges to interior, and base extending beyond cant or tapered strip into field of roof; flanges and base shall be of dimensions detailed on Drawings. Fasten gravel guard angles to base of scupper. Fabricate from the following materials:

1. Galvanized Steel: Not less than 0.028 inch (0.71 mm) thick.

C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows, as detailed on Drawings. Fabricate from the following materials:

1. Galvanized Steel: Not less than 0.028 inch (0.71 mm) thick.

2.10 WALL SHEET METAL FABRICATIONS

A. Do not install metal pan flashing at nail-fin windows.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch-(50-mm-) high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.034 inch thick, except at door sill pans.
2. Galvanized Steel: 0.040 inch thick at door sill pans.

C. Storefront Pans: Fabricate from the following materials:

1. Galvanized Steel: 0.034 inch thick.

2.11 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Knife Plate Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

B. Drip Flashing / Kick-Out Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

C. Utility Box Cap Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

D. Equipment Support Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.

E. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Galvanized Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Provide neoprene pads and washers of thicknesses indicated, where shown on Drawings.
2. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
3. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws .

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering.
2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 DECK FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

1. Provide preformed membrane boots or liquid-applied flashing membrane as base flashing. See Section 07 54 23 "Thermoplastic Polyolefin (TPO) Roofing."

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

D. Deck-Penetration Flashing: Coordinate installation of deck-penetration flashing, including pipe sleeves, with installation of PVC membrane waterproofing and other items penetrating deck. Seal with butyl sealant and clamp flashing to pipes that penetrate deck.

3.5 ROOF FLASHING AND TRIM INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Parapet coping and substrate shall be installed to slope toward the roof at 1/2-inch per foot.
2. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch (600-mm) centers.
3. Anchor interior leg of coping using screw fasteners with bonded neoprene washers set on the vertical through slotted holes at 24-inch (600-mm) centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints minimum of 4 inches (100 mm). Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal and clamp flashing to pipes that penetrate roof.

3.6 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.

1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
2. Provide elbows at base of downspout to direct water away from building.
3. Connect downspouts to underground drainage system where indicated.

C. Splash Pans: Install where downspouts discharge on low-slope roofs. Set in elastomeric sealant compatible with the substrate.

D. Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and solder or seal with elastomeric sealant to scupper.
2. Loosely lock front edge of scupper with conductor head.
3. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below scupper or gutter discharge.

F. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.7

3.8 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

C. Preformed Flashing Panels at Utility Penetrations: Install preformed flashing panels as detailed and according to flashing panel manufacturer's written instructions.

1. Installed panel shall have label facing exterior.

3.9 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.10 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.11 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.12 FLASHING SCHEDULE

FLASHING SCHEDULE			
ITEM	GAUGE	FINISH	LAPS OR SEAMS
Window and Door Head Flashing	22	GSM 90	
Window and Window Wall Sill Pan	22	GSM 90	
Door Sill Pan	22	GSM 90	
Storefront Pan	22	GSM 90	
Knife Plate Flashing	24	GSM 90	
Wall Penetration Collar Flashing	22 large 24 small	GSM 90	
Siding Drip Flashing (Hemmed)	24	GSM 90	
Base Flashing at Foundation	22	GSM 90	
Utility Box Cap Flashing	24	GSM 90	
Louver Collars	22	GSM 90	
Wall Exhaust Vent Caps	22	GSM 90	
Storefront Curb Flashing (independent of pan)	22	GSM 90	
Counter Flashing and Reglets	24	GSM 90	
Copings	20	GSM 90	
Boot Flashing	24	GSM 90	
Conductor Heads	24-20	Prefinished	
Gutters	24	Prefinished	

Downspouts	24	Prefinished	
Mechanical Unit Platform Covers and Curbs	22	GSM 90	
Mechanical Condensing Hoods	22	GSM 90	
Saddle Flashing	24	GSM 90	
UV Protection Flashing over Waterproofing	22	GSM 90	
Custom Waterproofing Termination Bars	24	GSM 90; stainless steel when client budget allows	
Electrical J-Boxes	Quickflash Products	Plastic	Supplied by Electrical; installed by WRB Subcontractor
Pipe Penetrations	Quickflash Products	Plastic	Supplied by MEPF; installed by WRB Subcontractor

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, and miscellaneous sheet metal trim and accessories.

1.2 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

D. Delegated-Design Submittal: For roof curbs and equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

A. Warrant roof accessories against failure of materials and workmanship for two years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design roof curbs, equipment supports, and rack for photovoltaic panel array to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.

B. Galvanized Steel Tube: ASTM A 500 / A 500M, round tube, hot-dip galvanized according to ASTM A 123 / A 123M.

C. Steel Pipe: ASTM A 53 / A 53M, galvanized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Garde 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

D. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Underlayment: As detailed on Drawings. From the following:

1. Self-Adhering Underlayment: Nominal 30 mils thick, consisting of a slip-resistant high-density cross-laminated polyethylene film laminated to a layer of butyl adhesive with release-paper backing. Provide primer if required according to written recommendations of underlayment manufacturer.

   a. Product: GCP Applied Technologies; Grace Ultra.

2. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
3. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
4. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

G. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

H. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

I. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

J. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

2.4 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units with integral spring-type vibration isolators and capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.

1. Provide where not integral with mechanical equipment.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch (1.32 mm) thick minimum.

1. Finish: Mill phosphatized.

E. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
4. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.
5. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.

2.5 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced perimeter metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, and integrally formed structure-mounting flange at bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.079 inch (2.01 mm) thick.

1. Finish: Mill phosphatized.
2. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
4. Nailer: Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide at tops of equipment supports.
5. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
6. Vibration Isolation: As specified with equipment supported.
7. Fabricate equipment supports to minimum height of 12 inches (305 mm) above roofing surface unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 07 76 16 - ROOF DECKING PAVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: ~~Paver system set in sand at waterproofed common area terrace.~~Pedestal paver system at waterproofed common area terrace.

1. Precast concrete pavers.
2. Adjustable pedestal system.
3. Neoprene shock-absorbing pads for installation under pedestals.
4. ~~Drainage layer and protection board over waterproofing membrane.~~

B. Related Requirements:

1. Section 07 54 19 "Polyvinyl Chloride (PVC) Roof Membrane" for waterproofing assembly at terrace(s) to receive pavers system.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing installed adjacent to pavers.

1.2 COORDINATION

A. Coordinate installation of flashing at perimeter of pedestal paver system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Include construction details, material descriptions, and tested physical and performance properties of pavers and pedestals.

C. Include manufacturer's written instructions for evaluating, preparing, and protecting deck and roofing systems.

D. Shop Drawings:

1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
2. Include details for perimeter of installation and penetrations in the paver plane.

E. Samples:

1. For each exposed product and for each color and texture specified, including the following products:

a. Concrete paver, full sized, in each color and texture required.
b. Paver pedestal assembly.
c. ~~Aggregate.~~

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

B. Build to demonstrate deck preparation, edge and corner treatment, and surface protection.

1. Size: 100 sq. ft. (9.3 sq. m) in area.

C. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Pavers:

1. Obtain paver pedestals from single source, from single manufacturer.
2. Obtain concrete pavers from single source, from single manufacturer.

2.2 CONCRETE PAVERS

A. Concrete Pavers: Solid, hydraulically pressed, reinforced, standard-weight concrete units, with top edges beveled 1/4 inch (6 mm), manufactured for use as plaza-deck pavers; 5000-psi (34-MPa) minimum compressive strength, ASTM C 140; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products of the following or comparable manufacturer:

1. Tile Tech Pavers.

C. Pavers shall have flush underside.

D. Face Size: 24 inches (610 mm) square.

E. Thickness: 2 inches (51 mm).

~~2.3 AGGREGATE SETTING BED MATERIALS~~

~~A. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.~~

~~B. Sand for Leveling Course: Sound, symmetrical, and washed natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.~~

~~C. Sand for Joints: Fine, symmetrical, and washed natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.~~

~~1. Provide sand of color needed to produce required joint color.~~

~~D. Edge Restraints: Perimeter trim or restraints as indicated on Drawings.~~

~~E. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:~~

~~1. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D4751.~~
~~2. Permittivity: 0.5 per second, minimum; ASTM D4491.~~
~~3. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.~~

2.3 PEDESTALS

A. Paver Pedestals: Manufacturer's recommended paver support assembly for height and pavers indicated, including adjustable or stackable pedestals, shims, and spacer tabs for joint spacing of 1/8 to 3/16 inch (3 to 5 mm).

B. Basis-of-Design Product: Subject to compliance with requirements, provide products of the following or comparable manufacturer:

1. Bison Innovative Products; Versadjust with VB Base Leveler and JT Joist Top Attachment.

C. Pedestal Protection Pads: 3/4-inch thick resilient rubber or neoprene waffle pads.

1. Available Product: Mason Industries; Mason Super W pads.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the pedestal paver walkway system.

B. Pavers over Waterproofing: Exercise care in placing pavers and setting materials over waterproofing so protection materials are not displaced and waterproofing is not punctured or otherwise damaged. Carefully replace protection materials that become displaced and arrange for repair of damaged waterproofing before covering with paving.

3.2 PAVER INSTALLATION

A. Install pavers in locations indicated according to manufacturer's written instructions.

B. Accurately install paver pedestals and accessories in locations and to elevations required. Adjust for final level and slope.

C. Cavity Heights: As indicated on Drawings; minimum 2 inches (51 mm).

D. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.

E. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

F. Install pavers to vary not more than 1/16 inch (1.6 mm) in elevation between adjacent pavers or more than 1/16 inch (1.6 mm) from surface plane elevation of individual paver.

G. Limit variation in paving installation to within 1/4 inch in 10 feet (6 mm in 3 m) of surface plane in any direction; noncumulative.

~~H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.~~

~~I. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.~~

~~J. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).~~

~~K. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.~~

~~L. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base.Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.~~

~~M. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.~~

~~1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches (900 mm) of uncompacted pavers adjacent to temporary edges.~~
~~2. Before ending each day's work, compact installed concrete pavers except for 36-inch (900-mm) width of uncompacted pavers adjacent to temporary edges (laying faces).~~
~~3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches (90 mm) of laying face.~~
~~4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.~~

~~N. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.~~

~~O. Do not allow traffic on installed pavers until sand has been vibrated into joints.~~

~~P. Repeat joint-filling process 30 days later.~~

~~Q. Limit variation in paving installation to within 1/4 inch in 10 feet (6 mm in 3 m) of surface plane in any direction; noncumulative.~~

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Assembly Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

    a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Classification markings on penetration firestopping correspond to designations listed by the following:

        1) UL in its "Fire Resistance Directory."
        2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
        3) FM Global in its "Building Materials Approval Guide."

C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: To the extent possible, penetration firestopping sealants and caulks shall be by a single manufacturer.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.
6. NUCO Inc.
7. Passive Fire Protection Partners.

8. RectorSeal Corporation.
9. Specified Technologies Inc.
10. 3M Fire Protection Products.
11. Tremco, Inc.; Tremco Fire Protection Systems Group.
12. USG Corporation.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Penetration firestopping at sound-rated partitions requires sound-rated fire caulking over mineral wool or other permanently resilient forming material; intumescent caulk and fire foam sealant are not acoustically acceptable.
2. Penetration assemblies indicated in Drawings are Basis of Design assemblies. Provide assemblies with same or better performance, complying with specified requirements.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with limits for VOC content set forth in Section 01 81 13 "Sustainable Design Requirements."

1. Interior sealants shall not exceed 30 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

a. Slag-wool-fiber or rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mineral Wool: Batt insulation, of minimum density according to tested assembly.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Submit schedule of firestopping assemblies proposed for Project. Assemblies indicated in Drawings are Basis of Design assemblies.

B. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

C. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."

D. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

END OF SECTION

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 25 00 "Weather Barriers" for foil-faced SASM, flexible flashing, and weather barrier membranes.
3. Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing installed in conjunction with joint sealants.
4. Section 08 80 00 "Glazing" for glazing sealants.
5. Section 09 29 00 "Gypsum Board" for sealing perimeter joints.

1.2 COORDINATION

A. Coordinate the installation of foil-faced self-adhered sheet membrane (SASM) flashing at rough openings and concrete sills to receive joint sealants. See Section 07 25 00 "Weather Barriers."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendees: Contractor, sealant installers, and subcontractors whose work requires sealants applied to the weather barrier system or outside the weather barrier.
2. Review joint widths for sealants at exterior cladding and fenestration with Installers.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
    a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.5 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Sustainable Design Submittals: Product data or manufacturer declaration, indicating compliance with low-emitting materials requirements for field-applied coatings, adhesives, and sealants indicated in Section 01 81 13.34 "Sustainable Design Requirements - CALGreen."

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants

E. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion Test Reports: For each sealant application tested.

G. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source, from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Coordinated Mockups: Where mockups of assemblies in other Sections require joint sealants, use materials and installation methods specified in this Section.

E. Preinstallation Conference: Conduct conference at Project site.

1. Attendees: Contractor, sealant installers, and subcontractors whose work requires sealants applied to the weather barrier system or outside the weather barrier.

1.8 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which exterior joint-sealant manufacturer agrees to furnish exterior joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Sealants: Sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for joints that will be continuously immersed in liquids (Use I), provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant, ASTM C 920 compliant, for non-traffic uses.

1. Products:

a. Dow Corning Corporation; DOWSIL 795.

1) Plus/minus 50 percent joint movement (medium modulus).

b. Sika Corporation; Sikasil WS295 Silicone.

1) Primerless.
2) Plus/minus 50 percent joint movement (medium modulus).

c. Dow Corning Corporation; DOWSIL 790.

1) Plus 100 percent/minus 50 percent joint movement (ultra-low modulus).

d. Sika Corporation; Sikasil WS295 Silicone.

1) Plus 100 percent/minus 50 percent joint movement (ultra-low modulus).

e. Tremco Incorporated; Spectrem 1.

1) Plus 100 percent/minus 50 percent joint movement (ultra-low modulus).

f. Dow Corning Corporation; DOWSIL 758 Weather Barrier Sealant.

1) Plus/minus 25 percent joint movement (medium modulus).

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products:

a. Dow Corning Corporation; DOWSIL 786.

1) Mildew-resistant.
2) Plus/minus 25 percent joint movement.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Non-Sag, Traffic-Grade, Polyurethane Sealants, ASTM C 920 compliant.

1. Products:

a. Sika Corporation; Sikaflex-1A+.

1) Plus/minus 35 percent joint movement.
2) Can be applied to green or damp concrete.

b. Sika Corporation; Sikaflex-1A.

1) Plus/minus 35 percent joint movement.

c. Tremco Incorporated; Dymonic 100.

1) Plus/minus 50 percent joint movement (medium modulus).

B. Multi-Component, Non-Sag, Traffic-Grade Urethane Joint Sealant, ASTM C 920 compliant.

1. Products:

a. Sika Corporation; Sikaflex 2C NS.

1) Plus/minus 25 percent joint movement.

b. Tremco Incorporated; Vulkem 116.

1) Requires manufacturer recommended primer.
2) Plus/minus 25 percent joint movement.

c. Pecora Corporation; Dynatred.

1) Requires manufacturer recommended primer.
2) Plus/minus 25 percent joint movement.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; AC-20+Silicone.

1) Plus/minus 7.5 percent joint movement.

b. Tremco Incorporated; Tremflex 834.

2. Locations: Interior locations not indicated to receive other sealants.

2.5 HYBRID SEALANTS

A. Single-Component, Elastomeric Hybrid Joint Sealant, ASTM C 920 compliant.

1. Products:

a. Tremco Incorporated; Dymonic FC.

1) Fast-curing, silane polymer.
2) Plus/minus 35 percent joint movement (low modulus).

b. Sika Corporation; SikaHyflex-150 LM.

1) Fast-curing, UV-resistant.
2) Plus/minus 50 percent joint movement (low modulus).

2.6 ACOUSTICAL JOINT SEALANTS

A. Exposed Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:

a. Pecora Corporation; AC-20 FTR AIS-919.
b. USG Corporation; SHEETROCK Acoustical Sealant.

B. Concealed Acoustical Joint Sealant: Single-component, non-skinning, non-hardening synthetic rubber (butyl) sealant.

1. Products:

a. Pecora Corporation; BA-98 Acoustical Sealant.
b. Tremco Incorporated; Tremco Acoustical Sealant.

2.7 JOINT SEALANT PRIMERS

A. Use sealant manufacturer's recommended primer for the sealant and substrate, unless otherwise indicated. Scheduled sealant primers are included in this article.

B. Products for Joint Sealants at Non-Porous Substrates:

1. The Dow Corporation; DOWSIL 1200 OS Primer.

C. Products for Porous or Masonry Substrates:

1. The Dow Corporation; DOWSIL Construction Primer P.

D. Products for Sika Corporation Urethane Sealants: If needed or as required based on field-adhesion testing.

1. Sika Corporation; Sikaflex Primer 260/205.

a. Promotes adhesion of urethane sealants to metallic, non-metallic, and plastic substrates.

2. Sika Corporation; Sikaflex Primer 429/202.

a. Promotes adhesion to clean, sound , and dry concrete, masonry, EIFS, and wood.

3. Sika Corporation; Sikaflex Primer 449/203.

a. Promotes adhesion to PVC, fluoropolymer finish, certain plastics, and solvent-based enamel.

2.8 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C, or either of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.9 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. See Section 07 25 00 "Weather Barriers" for foil-faced self-adhered flashing membranes at rough openings and non-metal surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Portland cement plaster.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal, including foil-faced flexible flashing.
    b. Glass.

c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Depth of the sealant should be half the width of the joint.
2. Do not leave gaps between ends of sealant backings.
3. Do not stretch, twist, puncture, or tear sealant backings.
4. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.

5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Hold gypsum board back from intersecting surfaces at perimeter and at penetrations to allow for continuous, airtight sealant joint. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.
    b. Perform 1 test for each 1000 feet (300 m) of joint length thereafter or 1 test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT SEALANT SCHEDULE

A. Storefront Sealants:

1. Primers:

a. Metal to Metal and Non-Porous Substrates:

1) DOWSIL 1200 OS.

b. Porous or Masonry Surfaces:

1) DOWSIL Construction Primer P.

2. Setting Sealants:

a. Aluminum and GSM Thesholds and Door Pans to Foil-Faced SASM over Concrete: One of the following:

1) Tremco Vulkem 116, with manufacturer's recommended primer.
2) Sikaflex 1A+

a) Requires painting.

b. Aluminum Storefront to Foil-Faced SASM over Concrete:

1) Tremco Vulkem 116, with manufacturer's recommended primer.

3. Final Sealants:

a. Exposed Joints within Aluminum Framing Systems: One of the following:

1) DOWSIL 795.
2) Sikasil WS295.

a) Primerless.

3) DOWSIL 790.
4) Sikasil WS290.

a) Primerless, unless testing indicates primer required.

B. Concrete Joint Sealants:

1. Primers: Per joint sealant manufacturer's recommendations.
2. Final Sealants:
    a. Horizontal Concrete-to-Concrete Surfaces of Cast-in-Place Concrete and Concrete Pavers: One of the following:
        1) Sikaflex 2C NS.
            a) Professionally installed.
        2) Pecora Dynatred.
    b. Vertical Concrete-to-Concrete: Exterior control, expansion, and isolation joints, etc. One of the following:
        1) Sikaflex 2C NS.
            a) Professionally installed.
        2) Pecora Dynatred.
    c. Exterior Horizontal Surfaces of Cast-in-Place Concrete:
        1) Sikaflex 2C NS.
            a) Professionally installed.

C. Window Sealants:

1. Primers:
    a. DOWSIL 1200 0S.
    b. Sikaflex primers for Sikaflex 1A and Sikaflex 2C NS sealants, as required. See "Joint Sealer Primers" article.
2. Setting Sealants:
    a. Metal Windows to Foil-Faced SASM: One of the following:
        1) DOWSIL 795.
        2) Sikasil WS295.
    b. Nail-Fin Aluminum Windows to Foil-Faced SASM:
        1) Tremco Dymonic FC.
            a) Requires painting.
    c. Stucco J-Mold to Metal Window Frame: One of the following:
        1) Tremco Dymonic FC.
            a) Requires painting.
        2) Sikaflex 2C NS.
            a) Professionally installed.
        3) Sikaflex-1A.

a) Requires painting.

d. Sealant in Contact with Weather Barrier and Sheet Membranes:

1) DOWSIL 758.

3. Final Sealants:

a. Frames of Windows to Concrete: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) DOWSIL 795.
3) Tremco Spectrem 1.
4) Sikaflex-1A.

a) Requires painting.

b. Wood Trim to Fiber-Cement Board:

1) Tremco Dymonic FC.

a) Requires painting.

c. Metal Components to PVDF Fluoropolymer-Finished Metal: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) Tremco Spectrem 1.

D. Door Sealants:

1. Primers:

a. Sikaflex primers for Sikaflex 1A and Sikaflex 2C NS sealants, as required.

2. Setting Sealants:

a. Aluminum and GSM Thresholds and Door Pans to Concrete: One of the following:

1) Tremco Vulkem 116, with manufacturer's recommended primer.
2) Sikaflex 1A+

a) Requires painting.

b. Sealant in Contact with Weather Barrier and Sheet Membranes:

1) DOWSIL 758.

3. Final Sealants:

a. Frames of Doors to Concrete: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) Tremco Spectrem 1.
3) Sikaflex-1A.
    a) Requires painting.

b. Stucco J-Mold to Metal Door Frame: One of the following:
    1) Tremco Dymonic FC.
        a) Requires painting.
    2) Sikaflex 2C NS.
        a) Professionally installed.

c. Metal Components to PVDF Fluoropolymer-Finished Metal: One of the following:
    1) Tremco Dymonic FC.
        a) Requires painting.
    2) Tremco Spectrem 1.

E. Exterior Carpentry and Cladding Sealants:
1. Primers: Per joint sealant manufacturer's recommendations.
2. Setting Sealants: Per manufacturer's recommendations.
3. Final Sealants:
    a. Fiber-Cement to GSM Flashing:
        1) Tremco Dymonic FC.
            a) Requires painting.
    b. Wood to Metal: One of the following:
        1) Tremco Dymonic FC.
            a) Requires painting.
        2) Sikaflex-1A.
            a) Requires painting.

F. Flashing and Sheet Metal Sealants:
1. Primers: Per joint sealant manufacturer's recommendations.
2. Setting Sealants:
    a. Aluminum and GSM Thresholds and Door Pans to Foil-Faced SASM over Concrete: One of the following:
        1) Tremco Vulkem 116, with manufacturer's recommended primer.
        2) Sikaflex 1A+
            a) Requires painting.

b. GSM to Foil-Faced SASM over Concrete:

1) Tremco Vulkem 116, with manufacturer's recommended primer.

c. Sealant in Contact with Weather Barrier and Sheet Membranes:

1) DOWSIL 758.

3. Final Sealants:

a. GSM to Concrete: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) Sikaflex-1A.

a) Requires painting.

b. Exterior Metal to Concrete or CMU: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) Tremco Spectrem 1.

c. Metal Components to PVDF Fluoropolymer-Finished Metal: One of the following:

1) Tremco Dymonic FC.

a) Requires painting.

2) Tremco Spectrem 1.

d. Metal Panel to Metal Panel Joints: One of the following:

1) DOWSIL 795.
2) DOWSIL 790
3) Tremco Dymonic FC.

a) Requires painting.

4) Sikaflex-1A.

a) Requires painting.

G. Interior Joints in Vertical Surfaces and Horizontal Nontraffic Surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors,windows and elevator entrances.

2. Joint Sealant Type: Latex.

    a. Pecora Corporation; AC-20+Silicone.
    b. Tremco Incorporated; Tremflex 834.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Mildew-Resistant Interior Joints in Vertical Surfaces and Horizontal Nontraffic Surfaces:

1. Joint Sealant Location:

    a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    b. Tile control and expansion joints where indicated.

2. Joint Sealant:Mildew resistant silicone.

    a. Dow Corning Corporation; DOWSIL 786.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

I. Joint-Sealant Application: Perimeter joints at toilet fixtures.

1. Joint Sealant: Mildew-resistant silicone.

    a. Dow Corning Corporation; DOWSIL 786.

J. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

    a. Acoustical joints where indicated.

2. Exposed Joint Sealant:

    a. Pecora Corporation; AC-20 FTR AIS-919.
    b. USG Corporation; SHEETROCK Acoustical Sealant.

3. Concealed Joint Sealant:

    a. Pecora Corporation; BA-98 Acoustical Sealant.
    b. Tremco Incorporated; Tremco Acoustical Sealant.

4. Exposed Joint Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow-metal doors and door frames, interior and exterior.
2. Hollow metal framing for interior transoms and sidelights.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 08 14 16 "Flush Wood Doors" for solid-core wood doors installed in hollow metal frames.
3. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
4. Section 08 80 00 "Glazing" for glazing installed in hollow metal framing, included rated glazing at vision panels and sidelights.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION

A. Coordinate door weights with closers specified in Section 08 71 00 "Door Hardware" to ensure doors shall comply with ADA requirements for operating force of 5 lbs or less, where applicable.

B. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Delegated-Design Submittal: For fire-rated framing systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of fire-rated hollow metal framing systems.
2. Include design calculations.

C. Shop Drawings: Include the following:

1. Elevations of each door type.

2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of conduit and preparations for power, signal, and control systems.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule. Where framing is for windows, indicate on schedule, the type and rating of glazing to be installed.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 WARRANTY

A. Warrant hollow metal doors and frames against failures of materials and workmanship for two years following date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Door Products Manufacturers: Subject to compliance with requirements, provide hollow metal door products by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Door Components, Inc.
3. Steelcraft; an Allegion company.

B. Source Limitations: Obtain hollow-metal doors and frames from single source, from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[and temperature-rise limits] indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated Sidelites and Transoms: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

C. Accessibility: At doors required to be accessible, coordinate door weight with closer to ensure operating force does not exceed 5 lbs.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors: ANSI/SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches (44.5 mm).
c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
d. Edge Construction: Model 1, Full Flush.
e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
f. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Acoustic Performance: STC, as scheduled on Drawings.
3. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches (44.5 mm.)
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
d. Edge Construction: Model 2, Seamless.
e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

4. Frames:

    a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
    b. Construction: Full profile welded.

        1) Provide frames with fully welded continuous flanges, with backbend coordinated with depth of adjacent cladding.

5. Exposed Finish: Prime.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 ACCESSORIES

A. Perimeter Seals: Silicone bulb seals at hinge jambs, strike jambs, and headers.

1. Product: Subject to compliance with requirements, provide the following:

a. Pemko Manufacturing Co., an ASSA ABLOY Group company;
Pemko Siliconseal, S88.

B. Acoustical Seal Thresholds: Fully-gasketed lap-joint type threshold, or other type with gasket that contributes adequately to acoustical performance indicated.

1. Basis-of-Design Products: Subject to compliance with requirements, provide the following or other approved product with equivalent performance.

a. Pemko Manufacturing Co., an ASSA ABLOY Group company;
Pemko No. 411 PKL or No. 412 PKL.

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Mullions: Join to adjacent members by welding or rigid mechanical anchors.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

6. Head Anchors: Two anchors per head for frames more than 42 inches (1067 mm) wide and mounted in metal-stud partitions.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow-metal work.

4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. At fire-rated openings, install frames according to NFPA 80.
b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable stops located on secure side of opening.

d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

   a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
   c. At Bottom of Door: 5/8 inch (15.8 mm) plus or minus 1/32 inch (0.8 mm).
   d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal door manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish in accordance with manufacturer's written instructions.

END OF SECTION

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SECTION 08 12 16 - ALUMINUM FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section ~~i~~Includes: ~~i~~

1. Interior aluminum frames (interior storefront) for doors and glazing installed in gypsum board partitions.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 08 14 16 "Flush Wood Doors" for doors installed in aluminum frames.
3. Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" for exterior storefront.
4. Section 08 71 00 "Door Hardware" for hardware installed with aluminum-framed doors.
5. Section 08 80 00 "Glazing" for glazing installed in aluminum frames.

1.2 DEFINITIONS

A. For purposes of this Project, "aluminum frames," as specified in this Section, shall be understood to correspond to framing designated as "interior storefront" on the Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, fire-resistance rating, and finishes.

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

C. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcements and preparations for hardware.
3. Details of each different wall-opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Details of conduits and preparations for power, signal, and control systems.

D. Samples for Verification: For interior aluminum frames, prepared on Samples of size indicated below:

1. Framing Member: 12 inches (300 mm) long.
2. Corner Fabrication: 12-by-12-inch- (300-by-300-mm-) long, full-size window corner, including full-size sections of extrusions with factory-applied finish.

E. Schedule: For interior aluminum frames. Use same designations indicated on Drawings. Coordinate with door hardware schedule and glazing.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of interior aluminum frame.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For interior aluminum frames to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as selected by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver interior aluminum frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic. Store interior aluminum frames under cover at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Provide aluminum framing and from a single source, from a single manufacturer.

B. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products by the following:

1. Wilson Partitions, a division of Arcadia, Inc.

C. Manufacturers of Comparable Framing Systems: Subject to compliance with requirements, systems by the following will be considered:

1. Frameworks.
2. Western Integrated Materials.
3. Wolf & Waters.

2.2 COMPONENTS

A. Aluminum Framing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or alloy and temper required to suit structural and finish requirements, not less than 0.062 inch (1.6 mm) thick.

B. Door Frames: Extruded aluminum, reinforced for hinges, strikes, and closers.

C. Glazing Frames: Extruded aluminum, for glazing thickness indicated.

1. Provide perimeter frames where butt-glazed glass panels are indicated.

D. Ceiling Tracks: Extruded aluminum.

E. Trim: Extruded aluminum, not less than 0.062 inch (1.6 mm) thick, with removable snap-in casing trim, glazing stops, and door stops without exposed fasteners.

1. Product: Wilson Partitions; Series 500 Snap-On Trim, with 4-7/8-inch throat.
2. Trim Style: Rectilinear, with sightline and depth indicated on Drawings.

2.3 ACCESSORIES

A. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

B. Accessory Colors: Standard with manufacturer for product indicated; if multiple colors are available, as selected by Architect.

C. Door Silencers: Manufacturer's standard continuous mohair, wool pile, or vinyl seals.

D. Mineral Wool: ASTM C 665, Type I, minimum density of 6 lb/cu. ft.

E. Glazing Gaskets: Manufacturer's standard extruded or molded plastic, to accommodate glazing thickness indicated.

F. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

G. Hardware: Comply with requirements in Section 08 71 00 "Door Hardware."

2.4 FABRICATION

A. Provide concealed corner reinforcements and alignment clips for accurately fitted hairline joints at butted or mitered connections.

B. Factory prepare interior aluminum frames to receive templated mortised hardware; include cutouts, reinforcements, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware."

1. Locate hardware as required by fire-rated label for assembly.

C. Fabricate frames for glazing with removable stops to allow glazing replacement without dismantling frame.

1. Locate removable stops on the inside of spaces accessed by keyed doors.

D. Fabricate components to allow secure installation without exposed fasteners.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. General: Provide anodized finish indicated on Drawings.

B. Clear Anodic Finish: AAMA 607.1 AA-M12C22A21, Class II, 0.010 mm or thicker.

C. Color Anodic Finish: Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

1. Color: As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and ceilings, with Installer present, for conditions affecting performance of the Work.

B. Verify that wall thickness does not exceed standard tolerances allowed by throat size indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install interior aluminum frames according to manufacturer's written instructions.

B. Set frames accurately in position and plumbed, rigid, properly aligned, and securely anchored to substrates. Firmly pack frames with mineral wool insulation.

C. Install frame components in the longest possible lengths; components up to 96 inches (2450 mm) long must be one piece.

1. Fasten to suspended ceiling grid on maximum 48-inch (1220-mm) centers, using sheet metal screws or other fasteners approved by frame manufacturer.
2. Use concealed installation clips to produce tightly fitted and aligned splices and connections.
3. Secure clips to extruded main-frame components and not to snap-in or trim members.
4. Do not leave screws or other fasteners exposed to view when installation is complete.

3.3 CLEANING

A. Clean exposed frame surfaces promptly after installation, using cleaning methods recommended by frame manufacturer and according to AAMA 609 & 610.

B. Touch up marred frame surfaces so touchup is not visible from a distance of 48 inches (1220 mm). Remove and replace frames with damaged finish that cannot be satisfactorily repaired.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with veneer faces for stain finish.
2. Solid-core doors for paint finish.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 01 81 13 "Sustainability Requirements."
2. Section 08 11 13 "Hollow Metal Doors and Frames" for door frames to receive flush wood doors.
3. Section 08 12 16 "Aluminum Frames" for interior aluminum framing to receive flush wood doors.
4. Section 08 71 00 "Door Hardware" for door hardware.
5. Section 08 80 00 "Glazing" for glazing at flush wood doors.

1.2 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction.

1. Product Data for Low-Emitting Wood Products: For adhesives and composite wood products, documentation indicating that product contains no urea formaldehyde.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Undercuts.

C. Samples:

1. Corner sections of doors, approximately 12 by 12 inches (300 by 350 mm), with door faces and edges representing actual materials to be used.

D. Sample Warranty: For special warranty.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 MANUFACTURERS

A. Basis-of-Design Manufacturer and Collection:

1. Lynden Doors; Architectural Series.

B. Manufacturers of Comparable Products: Subject to compliance with requirements, products by one of the following will be considered in lieu of those by basis-of-design manufacturer:

1. Graham Wood Doors; an Assa Abloy Group company.
2. Marlite.
3. Marshfield Door Systems, Inc.
4. Mohawk Doors; a Masonite company.
5. VT Industries, Inc.

C. Source Limitations: Obtain flush wood doors from single manufacturer.

2.3 FLUSH WOOD DOORS, GENERAL

A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

B. Certified Wood Products: Doors shall be FSC-certified.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware. Where exit devices or full light doors are indicated, provide structural composite lumber core doors.

D. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.4 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Custom, with Grade A faces.
2. Species and Cut: Birch, rift cut.
3. Match between Veneer Leaves: Slip match, unless otherwise indicated.
4. Edge Construction: Edge Type B, Wood veneer band matching faces, covering face edges.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core for Fire-Rated Doors: As required to achieve fire-protection rating and acoustical rating indicated on Drawings.

a. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
b. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

8. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, Grade LD-1 or Grade LD-2 particleboard, except as follows:

1) Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware."

b. WDMA I.S. 10 structural composite lumber.

1) Screw Withdrawal, Door Face: 475 lbf (2110 N).
2) Screw Withdrawal, Vertical Door Edge: 475 lbf (2110 N).

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
10. Thickness: 1-3/8 inches (35 mm).
11. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
12. Stain Finish: As selected by Architect from manufacturer's full range.

2.5 FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Interior Doors, Solid-Core Five-Ply for Opaque Finish:

1. Grade: Custom.
2. Faces: Hardboard or MDF.
    a. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
    b. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
    a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
    b. Fire-Rated Pairs of Doors:
        1) Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
    c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
4. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
    a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
5. Core for Non-Fire-Rated Doors:
    a. ANSI A208.1, Grade LD-1 or Grade LD-2 particleboard, except as follows:
        1) Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 71 00 "Door Hardware."
    b. WDMA I.S. 10 structural composite lumber.
        1) Screw Withdrawal, Door Face: 475 lbf (2110 N).
        2) Screw Withdrawal, Vertical Door Edge: 475 lbf (2110 N).
6. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.
7. Thickness: 1-3/8 inches (35 mm).
8. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
9. Finish: Factory primed on all sides and edges, for field painting.

2.6 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Species compatible with door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.7 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Opening: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."

2.8 FACTORY PRIMING

A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 09 91 23" Interior Painting."

2.9 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors that are indicated to receive transparent finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish or System 11, catalyzed polyurethane.
3. Effect: Open-grain finish.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 34 23 - INTERIOR SLIDING BARN DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes sliding interior doors with wall-mounted top-hung sliding tracks (barn doors).

1.2 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data, including installation instructions.

B. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, components, hardware, finish, options, and accessories. Shop Drawings to show required blocking by others.

C. Samples: Submit manufacturer's samples of the following sliding door components:

1. Door veneer or laminate sample.
2. Aluminum Frame finish sample.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

B. Warranty Documentation: Submit manufacturer's standard warranty for complete system

C. Test Reports: Submit acoustical reports or UL1784 as applicable.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of interior aluminum frames and doors.

B. Source: Obtain sliding aluminum framed doors and hardware from single source.

C. Manufacturer's Qualifications: Manufacturer regularly engaged for past 5 years in manufacture of sliding doors similar to that specified.

D. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Notify manufacturer immediately of shipping damage.

C. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Store materials in clean, dry area indoors.

4. Protect materials and finish during storage, handling, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Soft-closing mechanism at both sides of door integrated with top track. Soft Closers tested to a minimum of 150,000 cycles.

2.2 INTERIOR SLIDING BARN DOORS

A. Product: AD Systems; ExamSlide High Performance Barn (Sliding) Door System.

B. Frame Profile: Wall-mounted extruded aluminum frame “wrap” frame with integral vertical jamb (stile pocket).

1. Frames wraps leading jamb for complete seal around door leaf.
2. Gasketing required at frame to door interfacings. Exposed gaskets at jamb to be silicone.
3. Coordinate frame depth with scheduled interior wall assembly to receive doors.

C. Frame Finish: Fluoropolymer factory coating.

1. Color and Sheen: As selected by Architect from manufacturer's full range.

D. Doors: Flush wood doors with transparent finish, matching those specified in Section 08 14 16 "Flush Wood Doors."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet, and are ready to receive Work.

B. Prepare substrate in accordance with ASTM F710 and flooring manufacturer's recommendations.

C. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

1. Apply, trowel, and float filler to leave a smooth, flat, hard surface. Repair all floor irregularities.
2. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

3.2 PREPARATION

A. Advise installers of other work about specific requirements relating to door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for installing doors and tracks.

3.4 ADJUSTING AND CLEANING

A. Adjust for proper operation.

B. Remove and replace warped, bowed, or otherwise damaged.

END OF SECTION 08 32 23

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames for walls and ceilings.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 09 29 00 "Gypsum Board" for lay-in non-fire-rated access panels at ceilings.
3. Section 14 24 00 "Hydraulic Elevators" for signal equipment requiring access panels into elevator shafts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Low-Emitting Materials: Product data or manufacturer declaration, indicating compliance with requirements for field-applied coatings, adhesives, and sealants.

a. Retain packaging for fluid-applied products according to Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

D. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 WARRANTY

A. Warrant products against failures in material and workmanship for two years following date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 METALLIC-COATED STEEL SHEET ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acudor Products, Inc.
2. Babcock-Davis.
3. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
4. Karp Associates, Inc.
5. Larsen's Manufacturing Company.
6. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source, from single manufacturer.

C. Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Non-rated walls with ceramic tiles, FRP, or any finish thicker than 1/16 inch.
3. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage.
    a. Finish: Factory prime.
4. Frame Material: Same material, thickness, and finish as door.
5. Hinges: Manufacturer's standard.
6. Hardware: Cylinder lock.

D. Flush Access Doors with Concealed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Non-rated walls other than those finished with ceramic tile, FRP, or other finishes more than 1/16-inch thick; and non-rated ceilings.
3. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage.
    a. Finish: Factory prime.
4. Frame Material: Same material and thickness as door.
5. Hinges: Manufacturer's standard.
6. Hardware: Cylinder lock, where access door is mounted less than 9 feet above finish floor, and at locations designated by Architect. Flush cam latch at other locations.

E. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame, uninsulated. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
2. Locations: Rated walls with ceramic tiles, FRP, or any finish thicker than 1/16 inch.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage.
    a. Finish: Factory prime.

5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Cylinder lock.

F. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Assembly Description: Fabricate door to fit flush to frame, uninsulated. Provide self-latching door with automatic closer and interior latch release. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Rated walls other than those finished with ceramic tile, FRP, or other finishes more than 1/16-inch thick; and rated ceilings.
3. Fire-Resistance Rating: Not less than that of adjacent construction.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch (1.02 mm), 20 gage.
    a. Finish: Factory prime.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Cylinder lock, where access door is mounted less than 9 feet above finish floor, and at locations designated by Architect. Flush cam latch at other locations.

G. Exterior Fire-Rated, Flush Access Doors with Concealed Flanges, with Smoke Detector Cage:

1. Assembly Description: Fabricate door to fit flush to frame, insulated and gasketed. Provide self-latching door with automatic closer. Provide plaster bead and expanded metal recessed frame for installation at plaster.
2. Location: Rated elevator shaft wall, opening to exterior at elevator override.
3. Fire-Resistance Rating: 60 minutes (1 hour).
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage.
    a. Finish: Factory prime.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Self-closing, manufacturer standard.
7. Hardware: Cylinder lock, perimeter gasketing.
    a. Metal: 18 gage metallic-coated sheet steel, expanded metal, not less than 50% open.
    b. Finish: Factory primed or powder-coated.
    c. Assembly: Welded.
    d. Size: Match size of door, and deep enough to accommodate smoke detector specified in Division 28.

2.3 ALUMINUM RECESSED ACCESS PANELS

A. Non-rated aluminum recessed access panels with gypsum board face: Provide at ceiling surfaces where fire rating is not required.

1. Tape-in frames with consistent face joint at door of 1/8 inch or less.
2. Factory-installed gypsum board face of door.
3. Detachable door and concealed pressure-release latch.
4. Product:
    a. Best Access Doors; BA-F2A Drywall Inlay Access Panel with Fully Detachable Hatch.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.
3. Provide mounting holes in frame for attachment of masonry anchors.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

C. Coordinate installation of caged exterior access door with elevator and fire detection equipment.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

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SECTION 08 33 13 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motorized coiling counter door at service counter of commercial kitchen.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements" for sustainable design criteria.
2. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic closing device and testing and resetting instructions.

B. Sustainable Design Submittals: As required to document compliance with requirements in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
5. Include diagrams for power, signal, and control wiring.

D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Locking device(s).

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

1. Obtain operators and controls from coiling counter door manufacturer.

2.2 COUNTER DOOR ASSEMBLY

A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or approved equivalent product:

a. Cookson Company; ESC20 with Cookson EverGard Electric Motor Operator.

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Door Curtain Material: Stainless steel.

D. Door Curtain Slats: Flat profile slats of 1-1/2-inch (38-mm) center-to-center height.

1. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.

F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats.

G. Integral Frame, Hood, and Fascia: Stainless steel.

1. Mounting: Face of wall.

H. Sill Configuration: Integral metal sill.

I. Locking Devices: Equip door with locking device assembly.

1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from inside with thumb turn.

J. Electric Door Operator:

1. Usage Classification: Light duty, up to 10 cycles per hour.
2. Operator Location: Top of hood.
3. Motor Exposure: Interior.
4. Emergency Manual Operation: Chain type.

5. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar ; self-monitoring type.
6. Control Station(s): Interior-side mounted.

K. Door Finish:

1. Stainless-Steel Finish: No. 4 (polished directional satin).

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Stainless-Steel Door Curtain Slats: ASTM A 666, Type 304; sheet thickness of 0.025 inch (0.64 mm); and as required.
2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Stainless Steel: 0.025-inch- (0.64-mm-) thick stainless-steel sheet, Type 304, complying with ASTM A 666.

B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):

1. Stainless Steel: Type 304, complying with ASTM A 666.

2.6 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinders specified in Section 08 71 00 "Door Hardware."
2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 COUNTER DOOR ACCESSORIES

A. Integral Metal Sill: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with No. 4 finish.

2.8 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA 1B, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

1. Electrical Characteristics:

a. Phase: Single phase.
b. Volts: 120 V.

2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 6 in./sec. (150 mm/s) and not more than 9 in./sec. (230 mm/s), without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.12 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION

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SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing, thermally broken.
2. Exterior manual-swing entrance and exit doors.

B. Related Sections:

1. Section 08 12 16 "Aluminum Frames" for framing of openings in interior partition walls to receive doors and glazing (interior storefront).
2. Section 08 14 16 "Flush Wood Doors" for solid-core wood door installed in aluminum storefront framing.
3. Section 08 80 00 "Glazing" for glazing installed in aluminum-framed entrances and storefront.

1.2 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Sustainable Design Submittals: Product data or manufacturer declaration, indicating compliance with low-emitting materials requirements for field-applied coatings, adhesives, and sealants indicated in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
3. For sliding/swinging storefront serving as exit, include hardware schedule and indicate operating hardware types, functions, quantities, and locations. Include details of low-profile multi-track. Coordinate requirements for recessed installation.
4. Include details of system snap-on extenders and indicate provisions for framing decorative metal panels in front of glazed storefront.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. NFRC certificates.

G. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

H. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of aluminum-framed systems.
2. Include design calculations.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Seismic Qualification Certificates: For aluminum-framed systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

C. Welding certificates.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

E. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CBC.

F. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Water leakage through fixed glazing and framing areas.
d. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Marine Environment Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes formulated to resist marine environments do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering for the marine environment finish.

1. Warranty Period: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

2. Initial Maintenance Service: Beginning at Substantial Completion, provide sixmonths' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Seismic Loads: As indicated on Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than 1/8 inch (3.2 mm) and clearance between members and operable units directly below them to less than 1/16 inch (1.5 mm).

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Story Drift: Provide aluminum-framed systems that accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Meet criteria for passing, based on building occupancy type, when tested according to AAMA 501.4 at design displacement and 1.5 times design displacement.

G. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

H. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

I. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
2. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
    b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
4. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

J. Energy Requirements, General: Provide aluminum-framed systems rated and certified according to NFRC 100, NFRC 200, and NFRC 400 Rating Procedures. Provide units with permanent labels.

1. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.48 Btu/sq. ft. x h x deg F when tested according to AAMA 1503 and NFRC 100.
2. Solar Heat Gain Coefficient: Provide aluminum-framed systems having an overall average solar heat gain coefficient (SHGC) of not more than 0.30 when tested according to NFRC 200.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Basis of Design Framing System:

1. Kawneer North America; and Alcoa Company; Trifab VersaGlaze 451T (thermally broken).

B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Depth: 4 inches (100 mm) minimum.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: As indicated in Drawings and schedules.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Sealants applied in field shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Basis-of-Design: Kawneer North America; 350T Insulpour Thermal Entrance.

a. Depth: 2-1/4 inches.
b. Sightline: 3-1/2 inches (medium stile), unless otherwise indicated.
c. Subject to compliance with requirements, Kawneer Insulclad Thermal Entrance will be considered in lieu of basis-of-design entrance.

2. Door Construction: Minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
3. Door Design: As indicated.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

4. Glazing Stops and Gaskets: Square , snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Section 08 71 00 "Door Hardware."

2.6 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

2.7 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 92 00 "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish at Storefront Framing: AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

1. Color: Dark bronze.

B. High-Performance Organic Finish, Two-Coat PVDF, at Entrances: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected from manufacturer's Permafluor range of standard colors.

a. Basis of Design Color: Redwood.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Section 08 80 00 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:
    a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
    b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner shall engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.03 L/s per sq. m), of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).
2. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed by the same Testing Agency to determine compliance of replaced work with specified requirements.

1. If failure occurs, test an additional five linear feet of storefront. Testing shall be performed by the original test agency and shall be paid for by Contractor.

E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

END OF SECTION

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum windows for exterior locations.

1.2 COORDINATION

A. Coordinate requirements for brake-formed metal panel infill between aluminum windows and at corners adjacent to windows. See Section 05 75 00 "Decorative Formed Metal."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation. Include laboratory test results for STC ratings of assemblies submitted.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:

1. Exposed Finishes: 2 by 4 inches (50 by 100 mm).
2. Exposed Hardware: Full-size units.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency. Include sound transmission test report.

C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical window installation as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
4. See Section 01 40 00 "Quality Requirements" for Alternate envelope mockup.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 10 years from date of Substantial Completion.
c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer:

1. All Weather Architectural Aluminum.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AMMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class and Grade:

a. Fixed Windows: FW-AW80.
b. Operable Windows: C-AW80.

C. Thermal Transmittance (U-factor): NFRC 100 maximum whole-window U-factor as required per envelope energy requirements:

1. Fixed: Maximum U-factor of 0.36.
2. Operable: Maximum U-factor of 0.47.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC as required per envelope energy requirements in Drawings.

1. Fixed: Maximum SHGC of 0.25.
2. Operable: Maximum SHGC of 0.25

E. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

F. Sound Transmission Class (STC) and Outside-Inside Transmission Class (OITC): Rated for not less than scheduled STC, when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413. Rated for not less than scheduled OITC when tested according to ASTM E1332.

1. STC 28: All windows.

2.3 ALUMINUM WINDOWS

A. Basis-of-Design Products: Subject to compliance with requirements, provide the following:

1. All Weather Architectural Aluminum; Series 6000 with 675 Panning Frame.

B. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Casement.
2. Awning.
3. Fixed.

C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

D. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.

1. Kind: Fully tempered where indicated on Drawings and as required by applicable codes.

E. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.

1. Basis-of-Design Low-e IGU:

a. Vitro Architectural Glass; Solarban 70.

2. Glass: ASTM C 1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered where indicated on Drawings.

3. Lites: Two.
4. Filling: Fill space between glass lites with air or argon, as required to meet performance.
5. Low-E Coating: Sputtered on second surface.

F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
2. Accessibility: Meet ADA requirements for height, force, and ease of grasping and twisting.

H. Casement and Awning Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.

2. Hinges: Non-friction type, not less than two per sash.
3. Lock: Concealed multipoint lock operated by single lever handle or lift-type throw.
4. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches (1500 mm) above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches (1800 mm) above floor.

I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Panning Trim: Extruded-aluminum profiles in sizes and custom and standard profiles indicated on Drawings.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, inside for project-out sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable aluminum spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
2. Wickets: Full length or width of sash by 6 inches wide, formed from aluminum sheet matching frame, with mesh fabric infill.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.

1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.

G. Window Assemblies: Provide operating units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:

1. Exterior head and sill casings and trim.

H. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502 and ASTM E1105.
2. Air-Infiltration Testing:

a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

a. Test Pressure: Two-thirds of laboratory test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.

4. Testing Extent: Test window mock-up. In addition, test three windows in the completed Work of each type, as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
5. Test Reports: Prepared according to AAMA 502.

C. Remove and replace noncomplying windows and retest until windows pass as specified above, at Contractor's expense.

D. If window test failure occurs, test as follows, at Contractor's expense:

1. If one window fails, test an additional three windows.
2. If two windows fail, test an additional six windows.
3. If three windows fail, test an additional nine windows.
4. If four or more windows fail, test all remaining untested windows.

E. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION

SECTION 08 56 19 - SERVICE WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed transaction (service) windows.

1.2 COORDINATION

A. Coordinate framing requirements for transaction windows.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes for window units.

B. Shop Drawings: For transaction windows.

1. Include plans, elevations, sections, and attachment details.
2. Full-size section details of framing members, including internal armoring, reinforcement, and stiffeners.
3. Glazing details.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Framing: 12-inch- (305-mm-) long sections of frame members.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack transaction windows in wood crates for shipment.

B. Store crated transaction windows on raised blocks to prevent moisture damage.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 FIXED TRANSACTION WINDOWS

A. Provide fixed, transaction security windows with operable sash or ventilator capable of allowing transfer of documents and/or medications.

B. Configuration: One fixed-glazed panel.

C. Framing: Fabricate perimeter framing, mullions, and glazing stops from aluminum as follows:

1. Profile: Manufacturer's standard, with minimum face dimension indicated.
2. Minimum Face Dimension: 2 inches (50 mm)~~]~~.
3. Depth: Manufacturer's standard.

D. Head and Jamb Framing: Designed for gasket glazing.

E. Channel-Frame Sill: Formed from stainless steel and designed for sealant glazing.

F. Glazing and Glazing Materials: Comply with requirements in Section 08 88 00 "Glazing."

G. Materials:

1. Aluminum Extrusions: ASTM B221 (ASTM B221M). Provide alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength.
2. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M).

2.3 FABRICATION

A. General: Fabricate transaction windows to provide a complete system for assembly of components and anchorage of window units.

B. Framing: Miter or cope corners the full depth of framing; weld and dress smooth.

1. Fabricate framing with manufacturer's standard, internal opaque armoring in thicknesses required for security windows to comply with security performance indicated.

C. Glazing Stops: Finish glazing stops to match security window framing.

1. Attack-Side (Exterior) Glazing Stops: Welded or integral to framing.
2. Secure-Side (Interior) Glazing Stops: Removable, coordinated with glazing indicated

D. Welding: Weld components to comply with referenced AWS standard. To greatest extent possible, weld before finishing and in concealed locations to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

E. Metal Protection: Separate dissimilar metals to protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.

F. Factory-cut openings in glazing for speaking apertures

G. Optional Preglazed Fabrication: Preglaze window units at factory, where required for applications indicated. Installation orientation of glazing to meet performance requirements.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.6 ACCESSORIES

A. Miscellaneous Glazing Materials: Provide material, size, and shape complying with requirements of glass manufacturers and with a proven record of compatibility with surfaces contacted in installation.

1. Cleaners, Primers, and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.
3. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
4. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

B. Anchors, Clips, and Window Accessories: Stainless steel; hot-dip, zinc-coated steel or iron, complying with ASTM B633; provide sufficient strength to withstand design pressures indicated.

C. Sealants: For sealants required within fabricated transaction windows, provide type recommended by manufacturer for joint size and movement. Sealant remains permanently elastic, nonshrinking, and nonmigrating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of transaction windows.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of transaction window connections before transaction window installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of transaction windows.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other transaction window anchors whose installation is specified in other Sections.

3.3 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing transaction windows to in-place construction. Include threaded fasteners for inserts, security fasteners, and other connectors.

B. Removable Glazing Stops and Trim: Fasten components with security fasteners.

C. Fasteners: Install transaction windows using fasteners recommended by manufacturer with head style appropriate for installation requirements, strength, and finish of adjacent materials.

D. Sealants: Comply with requirements in Section 07 92 19 "Architectural Joint Sealants" for installing sealants, fillers, and gaskets.

E. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended in writing by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 ADJUSTING

A. Adjust transaction drawers to provide a tight fit at contact points for smooth operation and secure enclosure.

B. Remove and replace defective work, including transaction windows that are warped, bowed, or otherwise unacceptable.

3.5 CLEANING AND PROTECTION

A. Clean surfaces promptly after installation of transaction windows. Take care to avoid damaging the finish. Remove excess glazing and sealant compounds, dirt, and other substances.

1. Lubricate transaction drawer hardware.

B. Clean glass of preglazed transaction windows promptly after installation. Comply with requirements in Section 08 88 00 "Glazing" for cleaning and maintenance.

C. Provide temporary protection to ensure that transaction windows are without damage at time of Substantial Completion.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain operable transaction windows.

END OF SECTION 08 56 53

SECTION 08 62 00 - UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Unit skylights.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include product dimensions, construction details, material descriptions, dimensions and profiles of components, and finishes.
2. Include power requirements, ratings, characteristics, and mounting requirements for electrical components.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting, and attachment details and methods of structural support.
2. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each product, as follows:

1. Glazing: 12 inches (305 mm) square and of same thickness indicated for the final Work.
2. Finishes: For each type and color of factory-applied exposed finish required, in manufacturer's standard size.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type and size of product, for tests performed by a qualified testing agency on specimens equal to or greater than sizes required for Project.

B. Evaluation Reports: Indicating product compliance with code requirements of authorities having jurisdiction.

C. Field quality-control reports.

D. Sample Warranty: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For products and accessories to include in maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Water leakage not controlled by drainage features.
c. Deterioration of materials and finishes beyond normal weathering.
d. Deterioration of insulating-glass units including failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating-glass units contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

2. Warranty Period:

a. Products and Accessories: Five years from date of Substantial Completion.
b. Insulating-Glass Units: 10 years from date of Substantial Completion.

B. Special Aluminum Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of finish deterioration within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, peeling, checking, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Standard: Comply with AAMA/WDMA/CSA 101/1.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Minimum Performance Grade: PG 80.
2. Label Requirements: Label each product with names of manufacturer and labeling agency and AAMA/WDMA/CSA 101/1.S.2/A440 product designation, performance grade, and test specimen size equal to or greater than the size of the product.
3. Certification Requirements: Provide AAMA or WDMA certified products, with label attached to each.

B. Thermal Transmittance: NFRC 100 maximum U-factor of 0.42 Btu/sq. ft. x h x deg F (2.38 W/sq. m x K).

C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum SHGC of 0.40.

D. Exterior Fire-Test Exposure: Provide products identical to those of assemblies tested for Class B fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Fall-Protection Performance: Installed assemblies are capable of safely supporting the greater of 400 lbs (181.4 kg) or twice the weight of employees, equipment, and materials that may be imposed on any 1 sq. foot (0.09 sq. m) of the assembly at any time.

2.2 UNIT SKYLIGHTS

A. Factory-Assembled Skylight: Unit that includes glazing, extruded-aluminum glazing retainers, gaskets, and inner frame.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Skylights, Inc.
b. Lane-Aire Manufacturing Corp.
c. Major Industries, Inc.
d. Sunoptics Skylights and Daylighting Systems; Acuity Brands International, Inc.
e. Velux America, LLC.
f. Wasco - Part of VELUX Commercial.

B. Product Type: AAMA/WDMA/CSA 101/1.S.2/A440 SKG, unit skylight - glass glazed.

1. Provide fixed (nonoperable) units.

C. Unit Shape and Size: As indicated.

D. Insulating Glass: Sealed units that comply with Section 08 80 00 "Glazing," in manufacturer's standard overall thickness.

1. Exterior Lite: 6-mm, clear, heat-strengthened glass.
2. Interior Lite: Laminated glass; two plies of 3-mm clear heat-strengthened glass with 0.030-inch (0.76-mm) clear polyvinyl butyral interlayer.
3. Interspace Content: Argon.
4. Low-Emissivity Coating: Manufacturer's standard.

E. Glazing Gaskets: Manufacturer's standard.

F. Integral Curb: Extruded-aluminum, ASTM B221 (ASTM B221M), alloy and temper to suit structural and finish requirements but with not less than the strength and durability of Alloy 6063-T52, self-flashing type.

1. Height: As indicated on Drawings, or 12 inches (305 mm) if not indicated.
2. Construction: Double wall.
3. Insulation: Manufacturer's standard rigid or semirigid type.

G. Condensation Control: Fabricate unit skylights with integral internal gutters and nonclogging weeps to collect and drain condensation to the exterior.

H. Thermal Break: Fabricate unit skylights with thermal break separating exterior and interior metal framing.

I. Aluminum Finishes:

1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

a. Color: Light bronze.
b. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.3 ACCESSORY MATERIALS

A. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal that is compatible with the materials being fastened and as recommended in writing by manufacturer. Finish exposed fasteners to match material being fastened.

1. Where removal of exterior exposed fasteners might allow access to building, provide nonremovable fastener heads.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Coordinate installation of products and accessories with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

B. Install products and accessories to comply with recommendations in AAMA 1607 and with manufacturer's written installation instructions.

C. Install products true to line and without distortion.

D. Anchor products securely to supporting substrates.

E. Where metal surfaces of products will contact other metal or corrosive substrates, such as preservative-treated wood, apply bituminous coating on concealed metal surfaces or provide other approved permanent separation recommended in writing by manufacturer.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. After completion of installation and nominal curing of sealant and glazing compounds, but before installation of interior finishes, test for water leaks in accordance with AAMA 501.2.

C. Perform test for total area of each installed product.

D. Work will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.4 CLEANING AND ADJUSTING

A. Clean exposed product surfaces in accordance with manufacturer's written instructions. Touch up damaged metal coatings and finishes.

B. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect product surfaces from contact with contaminating substances resulting from construction operations.

E. Unit-Skylight Operating System: Clean and lubricate joints and hardware. Adjust for proper operation.

END OF SECTION 08 62 00

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SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions of Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

B. This Section includes the following, but is not necessarily limited to:
   1. Door Hardware, including electric hardware.
   2. Entrance door hardware.
   3. Gate Hardware.
   4. Thresholds, gasketing and weather-stripping.
   5. Door silencers or mutes.

C. Related Sections: The following sections are noted as containing requirements that relate to this Section, but may not be limited to this listing.
   1. Division 8: Section - Steel Doors and Frames.
   2. Division 8: Section - Aluminum Storefront
   3. Division 8: Section - Wood Doors.

1.3 REFERENCES (Use date of standard in effect as of Bid date.)

A. 2022 California Building Code, CCR, Title 24.
B. BHMA – Builders' Hardware Manufacturers Association
C. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
D. DHI – Door and Hardware Institute
E. NFPA - National Fire Protection Association.
   1. NFPA 80 - Fire Doors and Other Opening Protectives
   2. NFPA 105 - Smoke and Draft Control Door Assemblies
F. UL - Underwriters Laboratories.
   1. UL 10C - Fire Tests of Door Assemblies
   2. UL 305 - Panic Hardware
G. WHI - Warnock Hersey Incorporated
H. SDI - Steel Door Institute

1.4 SUBMITTALS & SUBSTITUTIONS

A. General: Submit in accordance with Conditions of the Contract and Division 1 Specification sections.

B. Submit product data (catalog cuts) including manufacturers' technical product information for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Submit digital copy of schedule organized vertically into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
   1. Include a Cover Sheet with;
      a. Job Name, location, telephone number.
      b. Architects name, location and telephone number.
      c. Contractors name, location, telephone number and job number.
      d. Suppliers name, location, telephone number and job number.
      e. Hardware consultant's name, location and telephone number.
   2. Job Index information included;
      a. Numerical door number index including; door number, hardware heading number and page number.
      b. Complete keying information (referred to DHI hand-book "Keying Systems and Nomenclature"). Provision should be made in the schedule to provide keying information when available; if it is not available at the time the preliminary schedule is submitted.
      c. Manufacturers' names and abbreviations for all materials.
      d. Explanation of abbreviations, symbols, and codes used in the schedule.
      e. Mounting locations for hardware.
      f. Clarification statements or questions.
      g. Catalog cuts and manufacturer’s technical data and instructions.
   3. Vertical schedule format sample:

Heading Number 1 (Hardware group or set number – HW -1)					
			(a) 1 Single Door #1 - Exterior from Corridor 101	(b) 90°	(c) RH
			(d) 3' 0"x7' 0" x 1-3/4" x (e) 20 Minute (f) WD x HM		
(g) 1	(h)	(i) ea	(j) Hinges - (k) 5BB1HW 4.5 x 4.5 NRP (l) ½ TMS	(m) 626	(n) IVE
2	6AA	1 ea	Lockset - ND50PD x RHO x RH x 10-025 x JTMS	626	SCH

(a) - Single or pair with opening number and location. (b) - Degree of opening (c) - Hand of door(s) (d) - Door and frame dimensions and door thickness. (e) - Label requirements if any. (f) - Door by frame material. (g) - (Optional) Hardware item line #. (h) - Keyset Symbol. (i) - Quantity. (j) - Product description. (k) - Product Number. (l) - Fastenings and other pertinent information. (m) - Hardware finish codes per ANSI A156.18. (n) - Manufacture abbreviation.

D. Make substitution requests in accordance with Division 1. Substitution requests must be made prior to bid date. Include product data and indicate benefit to the project. Furnish samples of any proposed substitution.

E. Wiring Diagrams: Provide product data and wiring and riser diagrams for all electrical products listed in the Hardware Schedule portion of this section.

F. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

G. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

H. Furnish as-built/as-installed schedule with close-out documents, including keying schedule and transcript, wiring/riser diagrams, manufacturers' installation and adjustment and maintenance information.

I. Fire Door Assembly Testing: Submit a written record of each fire door assembly to the Owner to be made available to the Authority Having Jurisdiction (AHJ) for future building inspections.

1.5 QUALITY ASSURANCE

A. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Responsible for detailing, scheduling and ordering of finish hardware.
2. Meet with Owner to finalize keying requirements and to obtain final instructions in writing. Stock parts for products supplied and are capable of repairing and replacing hardware items found defective within warranty periods.

C. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.

1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

E. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

1.6 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of packaged hardware items to the appropriate locations (shop or field) for installation.

B. Hardware items shall be individually packaged in manufacturers' original containers, complete with proper fasteners. Clearly mark packages on outside to indicate contents and locations in hardware schedule and in work.

C. Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

1.7 WARRANTY

A. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:

1. Locksets: Ten (10) years.
2. Electro-mechanical locksets: Three (3) years
3. Closers: Thirty (30)
4. Mechanical exit devices: Ten (10) years
5. Electro-mechanical exit devices: Five (5) years
6. All other hardware: Three (3) years.

1.8 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.9 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference at least one week prior to beginning work of this section.

B. Attendance: Architect, Construction Manager, Contractor, Security Contractor, Hardware Supplier, Installer, Key District Personnel, and Project Inspector.

C. Agenda: Review hardware schedule, products, installation procedures and coordination required with related work. Review District's keying standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Item	Manufacturer	Acceptable Substitutes
Hinges	Ives	Hager, Stanley, McKinney
Locks, Latches & Cylinders	Schlage	Or Approved Equal
Exit Devices	Von Duprin	Or Approved Equal
Closers	LCN	Or Approved Equal
Push, Pulls & Protection Plates	Ives	Trimco, BBW, DCI
Flush Bolts	Ives	Trimco, BBW, DCI
Dust Proof Strikes	Ives	Trimco, BBW, DCI
Coordinators	Ives	Trimco, BBW, DCI
Stops	Ives	Trimco, BBW, DCI
Overhead Stops	Glynn-Johnson	Or Approved Equal
Thresholds	National Guard	Pemko, Zero

Seals & Bottoms	National Guard	Pemko, Zero

2.2 MATERIALS

A. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
   1. Hinges shall be sized in accordance with the following:
      a. Height:
         1) Doors up to 42" wide: 4-1/2" inches.
         2) Doors 43" to 48" wide: 5 inches.
      b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
      c. Number of Hinges: Furnish 3 hinges per leaf to 7'-5" in height. Add one for each additional 2 feet in height.
   2. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.

B. Continuous Hinges: As manufactured by Ives, an Allegion Company. UL rated as required.

C. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled, fastened with through-bolts and threaded chassis hubs.
   1. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below:
      a. Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access
      b. Offset lever pull – minimum 1,600 foot pounds without gaining access
      c. Vertical lever impact – minimum 100 impacts without gaining access
   2. Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers
   3. UL 10C for 4’-0” x 10’-0” 3-hour fire door.
   4. Cylinders: Refer to “KEYING” article, herein.
   5. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
   6. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
   7. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw capable of UL listing of 3 hours on a 4’ x 10’ opening. Provide proper latch throw for UL listing at pairs.
   8. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
   9. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
   10. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   11. Provide wired electrified options as scheduled in the hardware sets.
      a. 12 through 24 volt DC operating capability, auto-detecting
      b. Selectable EL (fail safe)/EU (fail secure) operating mode via switch on chassis
      c. 0.230A (230mA) maximum current draw
      d. 0.010A (10mA) holding current
      e. Modular / “plug in” request to exit switch
   12. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

D. Schlage “ALX” cylindrical lock
   1. Locksets shall meet or exceed ANSI A156.2 Series 4000, Grade 2 strength and operational requirements.

2. Meets A117.1 Accessibility Code.
3. Latch bolt shall have ¼" throw, deadlocking on keyed and exterior functions.
4. Furnish at interior guest room doors.

E. Dorm Entry Lock: Schlage CS210
1. Locksets to comply with UL listing for 3-hour fire door
2. Deadbolts must have 1" x 2-1/4" dual option faceplate and 1" housing diameter with 1" throw.
3. Furnish at dorm doors

F. Exit devices: Von Duprin as scheduled.
1. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
2. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
3. Mechanism case shall have an average thickness of .140".
4. Compression spring engineering.
5. Non-handed basic device design with center case interchangeable with all functions.
6. All devices shall have quiet return fluid dampeners.
7. All latchbolts shall be deadlocking with ¾" throw and have a self-lubricating coating to reduce friction and wear.
8. Device shall bear UL label for fire and or panic as may be required.
9. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
10. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.
11. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
12. Furnish glass bead kits for vision lites where required.
13. All Exit Devices to be sex-bolted to the doors.
14. Panic Hardware shall comply with CBC Section 11B.404.2.7 and shall be mounted between 34" and 44" above the finished floor surface.
    a. Provide exit devices UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4, and UL listed for Panic Exterior Fire Exit Hardware.

G. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
1. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
3. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16" steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
4. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to

begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.

5. Closers shall be installed to permit doors to swing 180 degrees.
6. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
7. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed.
8. Maximum effort to operate closers shall not exceed 5 lbs., such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Per 11B-404.2.8.1, door shall take at least 5 seconds to move from an open position of 90 degrees to a position of 12 degrees from the latch jamb.

H. Flush Bolts & Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
   1. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
   2. Provide dust proof strikes at openings using bottom bolts.

I. Door Stops:
   1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
   2. Do not install floor stops more than four (4) inches from the face of the wall or partition (CBC Section 11B-307).
   3. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

J. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10" high and 2" LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

K. Thresholds: As Scheduled and per details.
   1. Thresholds shall not exceed 1/2" in height, with a beveled surface of 1:2 maximum slope.
   2. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 “Thermal and Moisture Protection”.
   3. Use ¼” fasteners, red-head flat-head sleeve anchors (SS/FHSL).
   4. Thresholds shall comply with CBC Section 11B-404.2.5.

L. Seals: Provide silicone gasket at all rated and exterior doors.
   1. Fire-rated Doors, Resilient Seals: UL10C Classified complies with NFPA 80 & NFPA 252. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
   2. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL10C Classified

complies with NFPA 80 & NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.

3. Smoke & Draft Control Doors, Provide UL10C Classified complies with NFPA 80 & NFPA 252 for use on "S" labeled Positive Pressure door assemblies.

M. Door Shoes & Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors.

N. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occurs, or for fire-resistive-rated door assemblies.

O. KEYING

1. A detailed keying schedule is to be prepared by the owner and/or architect in consultation with a representative of Allegion or an Authorized Key Center or Authorized Security Center. Each keyed cylinder on every keyed lock is to be listed separately showing the door #, key group (in BHMA terminology), cylinder type, finish and location on the door.
2. Establish a new masterkey system for this project as directed by the keying schedule.
3. Furnish all cylinders in Schlage Full Size Interchangeable Core (FSIC). Pack change keys independently (PKI).
4. Furnish construction keying for doors requiring locking during construction.
5. Furnish all keys with visual key control.
   a. Stamp key "Do Not Duplicate".
   b. Stamp (BHMA) key symbol on key.
   c. Stamp unique owner identifier from the key bow.
6. Furnish all cylinders with visual key control.
   a. Stamp (BHMA) key symbol on side of cylinder (CKC).
7. Furnish mechanical keys as follows:
   a. Furnish 6 cut masterkeys for each different masterkey set.
   b. Furnish 2 cut control keys cut to the top masterkey for permanent I/C cylinders.
   c. Furnish 1 cut control key cut to each SKD combination.
   d. Furnish 4 cut keys per unit entry lock
   e. Furnish 3 cut keys per each cylinder at balance of doors.
   f. Furnish 100 key blanks.
8. Furnish Schlage Padlocks and the cylinders to tie them into the masterkey system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
   a. Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47-413 (conventional) or 47-743-XP (PrimusXP) with above.
   b. Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
   c. Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.
9. Furnish one Schlage cabinet lock for each cabinet door or drawer so designated on the drawings or keying schedule to match the masterkey system.
   a. Furnish CL100PB for use with non-I/C Schlage cylinders.
   b. Furnish CL77R for use with FSIC Schlage cylinders.
   c. Furnish CL721G for use with SFIC Schlage cylinders.

2.3 FINISHES

A. Generally to be oil rubbed bronze US10B (613 on bronze and 640 on steel) unless otherwise noted.

B. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
C. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

2.4 FASTENERS

A. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
B. Screws for butt hinges shall be flathead, countersunk, full-thread type.
C. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
D. Provide expansion anchors for attaching hardware items to concrete or masonry.
E. All exposed fasteners shall have a phillips head.
F. Finish of exposed screws to match surface finish of hardware or other adjacent work.
G. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that doors and frames are square and plumb and ready to receive work and dimensions are as instructed by the manufacturer.
B. Beginning of installation means acceptance of existing conditions.
C. Fire-Rated Door Assembly Inspection: Upon completion of the installation, all fire door assemblies shall be inspected to confirm proper operation of the closing device and latching device and that only the manufacturer's furnished fasteners are used for installation and that it meets all criteria of a fire door assembly per NFPA 80 (Standard for Fire Doors and Other Opening Protectives) 2013 Edition. A written record shall be maintained and transmitted to the Owner to be made available to the Authority Having Jurisdiction (AHJ). The inspection of the swinging fire doors shall be performed by a certified FDAI (Fire Door Assembly Inspector) with knowledge and understanding of the operating components of the type of door being subjected to the inspection. The record shall list each fire door assembly throughout the project and include each door number, an itemized list of hardware set components at each door opening, and each door location in the facility.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of DHI.
B. Use the templates provided by hardware item manufacturer.
C. Mounting heights for hardware shall be as recommended by the Door and Hardware Institute. Operating hardware will to be located between 34" and 44" AFF.
D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
F. Set thresholds for exterior doors in full bed of butyl-rubber sealant.
G. If hand of door is changed during construction, make necessary changes in hardware at no additional cost.

H. Hardware Installer shall coordinate with security contractor to route cable to connect electrified locks, panic hardware and fire exit hardware to power transfers or electric hinges at the time these items are installed so as to avoid disassembly and reinstallation of hardware.

I. Hardware Installer shall also be present with the security contractor when the power is turned on for the testing of the electronic hardware applications. Installer shall make adjustments to solenoids, latches, vertical rods and closers to insure proper and secure operation.

J. All wiring for electro-mechanical hardware mounted on the door shall be connected through the power transfer and terminated in the interface junction box specified for in the Electrical Section.

K. Conductors shall be minimum 18 gage stranded, multicolored. A minimum 12 in. loop of conductors shall be coiled in the interface junction box. Each conductor shall be permanently marked with its function.

L. If a power supply is specified in the hardware sets, all conductors shall be terminated in the power supply. Make all connections required for proper operation between the power supply and the electro-mechanical hardware. Provide the proper size conductors as specified in the manufacturer's technical documentation.

3.3 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy, return to that work area and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

D. Instruct Owner's Personnel in proper adjustment and maintenance of hardware finishes, during the final adjustment of hardware.

E. Continued Maintenance Service: Approximately six months after the completion of the project, the Contractor accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.4 HARDWARE LOCATIONS

A. Conform to CCR, Title 24, Part 2; and ADAAG; and the drawings for access-compliant positioning requirements for the disabled.

3.5 Field quality control

A. Hardware supplier is responsible for providing the services of an Architectural Hardware Consultant (AHC) or a proprietary product technician to inspect installation and certify that hardware and its installation have been furnished and installed in accordance with manufacturers' instructions and as specified herein.

3.6 SCHEDULE

A. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.

B. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Abbreviation	Name
ADS	AD Systems
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	LCN Commercial Division
SCE	Schlage Electronic Security
SCH	Schlage Lock Company
VON	Von Duprin
WIK	Wikk Industries, Inc.
ZER	Zero International Inc

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GROUP NO. 01

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	QELX-PA-AX-98-L-06	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURFACE CLOSER	4040XP EDA	695	LCN
1	EA	FLOOR STOP	FS444	613	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 02

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	QELX-PA-AX-98-L-06	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 03

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	613	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	RX-PA-AX-98-L-M996-06-FSE	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURFACE CLOSER	4040XP EDA	695	LCN
1	EA	FLOOR STOP	FS444	613	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 04

1	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	PANIC HARDWARE	PA-AX-98-EO	313	VON
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER

GROUP NO. 05

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	OH STOP	100S	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	153D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 06

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP EDA	695	LCN
1	EA	FLOOR STOP	FS444	613	IVE
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 07

2	EA	HINGE	5BB1 4.5 X 4.5	613	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	613	IVE
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	OH STOP & HOLDER	100H	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	MOUNTING PLATE	4040XP-18	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	EA	DOOR SWEEP	153D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 08

3	EA	HINGE	5BB1 4.5 X 4.5 NRP	613	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER

GROUP NO. 09

2	EA	CONT. HINGE	112XY EPT	313AN	IVE
2	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-PA-AX-9849-EO-LBL	313	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-PA-AX-9849-NL-OP-110MD-LBL	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
2	EA	LONG DOOR PULL	9264F 36" 20" O	613	IVE
1	EA	POWER ASSIST OPERATOR	9553IQ TLS2 LESS TRACK COV2 RSA 72 (POWER ASSIST MODE ONLY)	ANDKB	LCN
4	EA	ACTUATOR, TOUCH	8310-853T		LCN
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 10

2	EA	CONT. HINGE	112XY EPT	313AN	IVE
2	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-PA-AX-9849-EO-LBL	313	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-PA-AX-9849-NL-OP-110MD-LBL	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
2	EA	LONG DOOR PULL	9264F 36" 20" O	613	IVE
1	EA	POWER ASSIST OPERATOR	9553IQ TLS2 LESS TRACK COV2 RSA 72 (POWER ASSIST MODE ONLY)	ANDKB	LCN
1	EA	BACK UP POWER FOR AUTO OPERATOR	SOLAK		LCN
4	EA	ACTUATOR, TOUCH	8310-853T		LCN
2	EA	BOLLARD	SQ2	DKB	WIK
1	SET	SEAL SET	WEATHERSTRIP BY DOOR/FRAME MANUFACTURER		
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS904 900-2RS 900-BBK 120/240 VAC		VON

GROUP NO. 11

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	640	IVE
1	EA	FIRE EXIT HARDWARE	PA-AX-9849-EO-F-LBL	313	VON
1	EA	FIRE EXIT HARDWARE	PA-AX-9849-L-NL-F-06-LBL	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
2	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	SET	MEETING STILE	328D-S	D	ZER
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER

GROUP NO. 12

6	EA	HINGE	5BB1 4.5 X 4.5	613	IVE
1	EA	AUTO FLUSH BOLT	FB31P	613	IVE
1	EA	DUST PROOF STRIKE	DP1	613	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	COORDINATOR	COR X FL	711	IVE
2	EA	OH STOP	100S	695	GLY
2	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
2	EA	DOOR SWEEP	39D	D	ZER
1	EA	ASTRAGAL	44STST OR BY HM DOOR MFR	STST	ZER
1	EA	THRESHOLD	PER DETAIL	D	ZER

GROUP NO. 13

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	QELX-PA-AX-98-L-06	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURF. AUTO OPERATOR	9542IQ TLS NO TRACK COV2 RSA	ANDKB	LCN
2	EA	ACTUATOR, TOUCH	8310-853T		LCN
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

ENTRY BY REMOTE RELEASE AT RECEPTION

GROUP NO. 14

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	QELX-PA-AX-98-L-06	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 15

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 16

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP/HOLDER	FS40	613	IVE
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 17

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	OH STOP & HOLDER	100H	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 18

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 19

2	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	640	IVE
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 20

2	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	640	IVE
1	EA	EL STOREROOM LOCK	ND80RDEL RHO RX CON 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 21

2	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	640	IVE
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 22

2	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	640	IVE
1	EA	EU STOREROOM LOCK	ND80RDEU RHO RX 12V/24V DC	613	SCH
1	EA	OH STOP	100S	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	MOUNTING PLATE	4040XP-18	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 23

1	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	INSTITUTION LOCK	ND82RD RHO	613	SCH
1	EA	ELECTRIC STRIKE	6211AL FSE 12/16/24/28 VAC/VDC	613	VON
1	EA	SURF. AUTO OPERATOR	9531IQ COV RSA	ANDKB	LCN
2	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

ENTRY BY REMOTE RELEASE AT RECEPTION OR FOB.

GROUP NO. 24

1	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	ELECTRIC STRIKE	6211AL FSE 12/16/24/28 VAC/VDC	613	VON
1	EA	SURF. AUTO OPERATOR	9531IQ COV RSA	ANDKB	LCN
2	EA	ACTUATOR, TOUCH	8310-853T		LCN
2	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

GROUP NO. 25

2	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	640	IVE
1	EA	EU MORTISE LOCK W/ INDICATOR XL13-346	L9492REU 06A L583-363 XL13-346 DM CON 12/24 VDC	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	WALL STOP	WS406/407CCV	613	IVE
1	EA	GASKETING	188SBK	BK	ZER
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

TURNING INSIDE THUMBTURN SHUNTS CARD READER

GROUP NO. 26

1	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP SHCUSH	695	LCN

GROUP NO. 27

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 28

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 29

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	ND80RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 30

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	CLASSROOM LOCK	ND70RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 31

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 32

1	EA	CONT. HINGE	112XY	313AN	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50RD RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE

GROUP NO. 33

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50RD RHO	613	SCH
1	EA	OH STOP	100S	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	MOUNTING PLATE	4040XP-18	695	LCN
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 34

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50RD RHO	613	SCH
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 35

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	613	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	695	LCN
1	EA	WALL STOP	WS406/407CCV	613	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 36

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 37

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PRIVACY LOCK	ND40S RHO	613	SCH
1	EA	OH STOP	450S	695	GLY
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 38

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PASSAGE SET	ND10S RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP EDA	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 39

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PASSAGE SET	ND10S RHO	613	SCH
1	EA	OH STOP	100S	695	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	MOUNTING PLATE	4040XP-18	695	LCN
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 40

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	PASSAGE SET	ND10S RHO	613	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	695	LCN
1	EA	GASKETING	188SBK	BK	ZER

GROUP NO. 41

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ENTRANCE LOCK	CS210-B500RD SAT PLY	643E	SCH
1	EA	OH STOP	410S	613	GLY
1	EA	SURFACE CLOSER	4040XP ST-1630	695	LCN
1	EA	MOUNTING PLATE	4040XP-18	695	LCN
1	EA	GASKETING	188SBK	BK	ZER
1	EA	VIEWER	U698	B643E/ 716	IVE

GROUP NO. 42

HARDWARE BY ELEVATOR DOOR MFR

GROUP NO. 43

3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	ENTRANCE LOCK	CS210-B500RD SAT PLY	643E	SCH
1	EA	SURFACE CLOSER	4040XP	695	LCN
1	EA	FLOOR STOP	FS439	US10B	IVE
1	EA	GASKETING	188SBK	BK	ZER
1	EA	VIEWER	U698	B643E/ 716	IVE

GROUP NO. 44

1	EA	EXAMSLIDE SYSTEM	EXAM SLIDE SYSTEM		ADS
1	EA	DOOR PULL, 1" ROUND	PR 8103EZHD 8" N	613	IVE

GROUP NO. 45

1	EA	EXAMSLIDE SYSTEM	EXAM SLIDE SYSTEM		ADS
1	EA	ELECTRIC STRIKE	AD-11-ELEC5 LESS OUTSIDE PULL	630	ADS
1	EA	DOOR PULL, 1" ROUND	8103EZHD 8" O	613	IVE

GROUP NO. 46

1	EA	CONT. HINGE	112XY EPT	313AN	IVE
1	EA	POWER TRANSFER	EPT10	695	VON
1	EA	ELEC PANIC HARDWARE	QELX-PA-AX-98-L-06	313	VON
1	EA	RIM CYLINDER	20-057	613	SCH
1	EA	SURF. AUTO OPERATOR	9542IQ TLS NO TRACK COV2 RSA	ANDKB	LCN
2	EA	ACTUATOR, TOUCH	8310-853T		LCN
1	EA	CARD READER	MT SERIES	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

END OF SECTION

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SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Insulating glazing units for storefront framing and exterior doors.
2. Laminated glass for exterior trellis covers.
3. Monolithic glazing for interior applications.
4. Glazing sealants and accessories.
5. Glazing film.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 08 12 16 "Aluminum Frames" for aluminum framing at interior partition walls to receive glazing specified in this Section.
3. Section 08 41 13 "Aluminum-Framed Entrances and Storefront" for framing and doors to receive glazing specified in this Section.
4. Section 08 51 13 "Aluminum Windows" for windows with factory-installed glazing.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate requirements at trellises to receive laminated glass covers mounted on stand-offs at wood beams.

B. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. NFRC certificates.
2. For field-applied glazing sealants, documentation including printed statement of VOC content.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Samples:

1. For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

a. Coated glass.
b. Insulating glass.
c. Laminated glass.

2. Glazing Film: For each type of glazing film applied to glazing used in Project, 12 inches (300 mm) square.

D. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch (300-mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Product Test Reports: For coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.

D. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Install glazing in mockups specified in Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" to match glazing systems required for Project, including glazing methods.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

3. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide glass products by one of the following:

1. Cardinal Glass.
2. PPG Industries, Inc.
3. Viracon, Inc.

B. Source Limitations for Glass: Obtain from single source, from single manufacturer for each glass type.

C. Source Limitations for Glazing Accessories: Obtain from single source, from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual" and "Laminated Glazing Manual."
2. GMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

2.4 GLASS TYPES

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. Provide fully tempered at exterior lights of all insulating glazing units.

2.5 FABRICATION OF GLAZING, GENERAL

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lights to produce square edges with slight chamfers at junctions of edges and faces.

2.6 LAMINATED GLAZING FOR TRELLIS COVERS

A. Laminated Glass: Complying with ASTM C 1172. Use materials that have a proven record of not bubbling, discoloring, or losing physical and mechanical properties after fabrication and installation.

1. Products: Subject to compliance with requirements, provide the following:

a. Kuraray America; SentryGlas series.

2. Construction: Two plies of ultraclear heat-strengthened float glass with ionomeric polymer interlayer.

a. Overall Thickness: Nominal 1/2 inch (12.7 mm).

b. Thickness of Each Glass Ply: Not less than 6 mm.

3. Construction: Laminate glass with ionomeric polymer interlayer to comply with interlayer manufacturer's written recommendations.

   a. Interlayer Stability: Where laminated glass is unframed, provide interlayer unaffected by exposure to weather at laminated glass edge and penetrating fittings.
   b. Comply with requirements for safety glazing for overhead installation.
   c. Interlayer Material Color: Clear.

4. Stand-Offs: Diameter and height as indicated on Drawings, capable of securing glass of thickness indicated. Metal and finish as indicated.
5. Manufacturers: Subject to compliance with requirements, provide stand-offs by one of the following, or approved equivalent:

   a. C. R. Laurence Co., Inc.
   b. Wagner Architectural Systems.

2.7 INSULATING GLASS UNITS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Aluminum with powdered metal paint finish in color selected by Architect or Polypropylene-covered stainless steel in color selected by Architect.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.
4. Low-E Coated Glass: Provide IGUs fabricated with the following low-E coating, or approved comparable product providing same or better performance:

   a. Vitro Architectural Glass; Solarban 70XL.

2.8 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Corning Corporation; Dow Corning 790 Silicone Building Sealant.
   b. May National Associates, Inc.; a subsidiary of Sika Corporation; Bondaflex Sil 290.
   c. Sika Corporation; SikaSil WS-290.
   d. Tremco Incorporated; Spectrem 1.

2.9 GLAZING FILM

A. Glazing Film: Translucent decorative film, polyester or vinyl, with acrylic pressure-sensitive adhesive backing.

1. Product: Subject to compliance with requirements, provide glazing films providing effects indicated on Drawings, subject to acceptance by Architect, by one of the following:

a. 3M.
b. Avery-Denison.
c. SuperGraphics.

2. Color, Opacity, and Pattern: As selected by Architect from manufacturer's full range.

2.10 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Glazing Gaskets: As provided with doors, windows, and storefront framing.

C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

D. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

G. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.11 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 INSTALLATION OF GLAZING FILM

A. Install glazing film at locations indicated on Drawings, complying with manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Tempered Glass: Clear annealed fully tempered float glass for interior applications.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Glass Type at Exterior Storefront and Entrances: Low-E-coated, clear insulating glass.

1. GL-1 in Finish Schedule on Drawings.
2. Overall Unit Thickness: 1 inch (25 mm).
3. Minimum Thickness of Each Glass Lite: 6 mm.
    a. Prefer dissimilar thicknesses of lites for improved acoustical performance.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Heat-strengthened float glass.
7. Low-E Coating: Pyrolytic on second surface.
8. U-Factor: 0.40 maximum.
9. Solar Heat Gain Coefficient: 0.35 maximum.
10. Safety glazing required.

END OF SECTION 08 80 00

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Annealed monolithic glass mirrors at common restrooms.

B. Related Work:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
2. For mastic, documentation including printed statement of asbestos and VOC content.

a. Provide mastic that contains no asbestos.

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.

D. Samples: For each type of the following:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Trim: 12 inches (300 mm) long.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of mirror and mirror mastic.

C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and safety film.

1. Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Mirror Accessories: Obtain mirror accessories from single source, from single manufacturer.

2.2 SILVERED FLAT GLASS MIRRORS

A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Annealed Monolithic Glass Mirrors: Mirror Select Quality, clear.

1. Nominal Thickness: 6.0 mm unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Franklin International.
b. Royal Adhesives & Sealants, LLC.

2. Adhesive shall have a VOC content complying with requirements in Section 01 81 13 "Sustainable Design Requirements."

2.4 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.04 inch (1.0 mm).
3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.5 FABRICATION

A. Fabricate mirrors in the shop to greatest extent possible.

B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Flat polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Provide a minimum airspace of 3/4 inch (19 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

1. At Unit vanities, provide standoff installation of mirrors using plywood backing panel with black-painted edges, as detailed on Drawings.

C. Install mirrors with mastic and mirror hardware, except where otherwise detailed.

1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
2. Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
3. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Clean safety film as directed by mastic manufacturer. Do not strip film to apply mastic.
c. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
d. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 3/4 inch (19 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

END OF SECTION

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SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1. Use of manufacturer standard data is acceptable in lieu of signed and sealed project-specific engineering data to substantiate compliance with performance requirements. Shop Drawings or Product Test Reports shall clearly demonstrate compliance with design values in manufacturer's load charts.

C. Shop Drawings:

1. Indicate equipment, ducts, and plenums served by louvers.

a. Where applicable, indicate air flow and direction.

2. Indicate louver locations and sizes in elevation, including relationship to adjacent surfaces.
3. Provide installation details.

a. Manufacturer's details are acceptable if they are selected for project-specific conditions.
b. Provide additional details for special conditions.
c. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
d. Show mullion profiles and locations.

D. Samples: For each type of metal finish required.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Ruskin Company; Louver Models as specified in Articles below or comparable products by one of the following:

1. American Warming and Ventilating; a Mestek Architectural Group company.
2. Construction Specialties, Inc.
3. Greenheck Fan Corporation.
4. Pottorff.

B. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Provide louvers engineered by manufacturer to comply with Project performance requirements, selected using structural and seismic performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

C. Seismic Performance: Louvers, including attachments to other construction, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Drainable-Blade Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved comparable product:
    a. Ruskin Company; Model ELF6425DD Horizontal Drainable-Blade Louver.
2. Louver Depth: 6 inches (150 mm).
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
4. Louver Performance Ratings:
    a. Free Area: Not less than 50 percent for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
    b. Point of Beginning Water Penetration: Not less than 850 fpm (4.3 m/s).
    c. Air Performance: Not more than 0.10-inch wg (24.90-Pa) static pressure drop at Point of Beginning Water Penetration free-area intake velocity.
5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Mill finish unless otherwise indicated.
3. Type: Non-rewirable, U-shaped frames.

D. Bird Screening: Aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type:

a. At wood-framed walls, provide flanged frames with returns sized to receive adjacent cladding.
b. At concrete walls, provide box frames with returns to receive sealant joint.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

F. Provide subsills made of same material as louvers for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view , threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

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SECTION 09 05 61.13 - MOISTURE VAPOR EMISSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fluid-applied, elastomeric membrane that controls the moisture-vapor-emission rate of high-moisture, interior concrete to prepare it for floor covering installation (resilient flooring or carpet).
2. Testing of concrete slab on grade to determine whether membrane application is required.
3. MVE-control system shall be installed if required by testing specified in resilient flooring Sections or testing specified in "Preinstallation Testing" article in this Section, whichever is more restrictive.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. ~~Section 01 21 00 "Allowances" for allowance affecting Work of this Section.~~
3. ~~Section 01 22 00 "Unit Prices" for unit pricing of Work of this Section.~~
2. Division 09 for resilient flooring to be installed over MVE-control membrane where moisture exceeds flooring manufacturer's recommended limits.

1.2 DEFINITIONS

A. MVE: Moisture vapor emission.

1. For purposes of this Section, product specified, although branded as a waterproofing membrane, shall be referred to as MVE-control membrane, consistent with manufacturer's guidelines for appropriate uses.

1.3 COORDINATION

A. Coordinate installation of MVE-control membrane with flooring finishes to ensure that membrane is not applied to adjacent concrete indicated to receive sealed concrete finish. Extent of MVE-control membrane under flooring finishes shall be within 2 inches of perimeter edge but not beyond.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Including VOC content.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Preinstallation testing reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 PREINSTALLATION TESTING

A. Preinstallation Testing:

1. Testing Agency: Engage a qualified testing agency to perform tests.
2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Install MVE-control system in areas where pH readings are less than 7.0 and in areas where pH readings are greater than 8.5.
3. Moisture Testing: Perform one or both of the following tests, as recommended by membrane manufacturer. Select test locations so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Install MVE-control system in locations where concrete substrate MVER exceeds 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.

4. Tensile-Bond-Strength Testing: For typical locations indicated to receive installation of MVE-control system, install minimum 100-sq. ft. (9.29-sq. m) area of MVE-control system to prepared concrete substrate and test according to ASTM D 7234.

    a. Proceed with installation only where tensile bond strength is greater than 200 psi (1.38 MPa) with failure in the concrete.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with MVE-control membrane manufacturer's written instructions for substrate and ambient temperatures, humidity, ventilation, and other conditions affecting system installation.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. All materials within this division to comply with requirements Section 01 81 13 "Sustainable Design Requirements."

2.2 PERFORMANCE REQUIREMENTS

A. MVE-Control System Capabilities: Capable of suppressing MVE without failure where installed on concrete cured at least 7 days:

1. Relative Humidity: Maximum 85 percent when tested according to ASTM F 1869.

B. Water-Vapor Transmission: Through MVE-control membrane, maximum 0.06 perm (3.45 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M.

2.3 MVE-CONTROL MEMBRANE

A. Product: Subject to compliance with requirements, provide the following:

1. Custom Building Products, Inc.; RedGard Waterproofing and Crack Prevention Membrane, approved by manufacturer for use as MVE-control membrane.

B. MVE-Control System: Fluid-applied, elastomeric membrane-forming system; formulated for application on concrete substrates to reduce MVER to level required for installation of floor coverings indicated, and acceptable to manufacturers of floor covering products indicated, including adhesives.

2.4 ACCESSORIES

A. Patching and Leveling Material: Moisture-, mildew-, and alkali-resistant product, recommended in writing by MVE-control membrane manufacturer and with minimum of 3000-psi (20.68-MPa) compressive strength after 28 days when tested according to ASTM C 109/C 109M.

1. Product, and associated primer, if required, shall be compliant with requirements in Section 01 81 13 "Sustainable Design Requirements."

B. Crack-Filling Material: Liquid MVE-control membrane product can be used to prefill cracks up to 1/8-inch prior to installation as MVE-control. Allow fluid in cracks to cure prior to installation as MVE control.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for minimum cure time for concrete, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of system indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Concrete Substrates: Prepare and clean substrates according to MVE-control membrane manufacturer's written instructions to ensure adhesion of system to concrete.

1. Remove coatings and other substances that are incompatible with MVE-control membrane and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by MVE-control membrane manufacturer. Do not use solvents.
2. Fill surface depressions and irregularities with patching and leveling material complying with MVE-control membrane manufacturer's recommendations.
3. Fill surface cracks, grooves, and other nonmoving joints up to 1/8-inch with liquid MVE-membrane material, and allow to cure.
4. Allow concrete to dry, undisturbed, for period recommended in writing by MVE-control membrane manufacturer after surface preparation.
5. Before installing MVE-control membrane, broom sweep and vacuum prepared concrete.

B. Protect walls, floor openings, electrical openings, door frames, and other obstructions during installation.

3.3 INSTALLATION

A. Locations: Resilient fooring specified in Division 09.

B. Install elastomeric MVE-control membrane according to manufacturer's written instructions for use of membrane for moisture vapor mitigation. Apply liquid at rate recommended by manufacturer, based on testing of moisture vapor emissions, to produce a uniform, monlithic surface free of surface deficiencies.

C. Do not apply MVE-control membrane across substrate expansion, isolation, and other moving joints.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform installation inspections.

B. Installation Inspections: Inspect substrate preparation and installation of membrane to ensure compliance with manufacturer's written instructions and to ensure that a complete MVE-control membrane is installed without deficiencies.

1. Verify that surface preparation meets requirements.
2. Verify that MVE-control membrane film coat thicknesses comply with manufacturer's written instructions.
3. Verify that MVE-control membrane installation areas that evidence deficiencies are repaired according to manufacturer's written instructions.

C. MVE-control membrane will be considered defective if it does not pass inspections.

3.5 PROTECTION

A. Protect MVE-control membrane from damage, wear, dirt, dust, and other contaminants before floor covering installation. Use protective methods and materials, including temporary coverings, recommended in writing by MVE-control membrane manufacturer.

B. Do not allow subsequent preinstallation examination and testing for floor covering installation to damage, puncture, or otherwise compromise the MVE-control membrane.

END OF SECTION

SECTION 09 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Gypsum board shaft wall assemblies at one-hour rated shafts where indicated on Drawings .

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 16 43 "Gypsum Sheathing" for gypsum board sheathing at exterior walls.
3. Section 09 29 00 "Gypsum Board" for gypsum board at interior walls and ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

B. Evaluation Reports: For shaft wall assemblies and firestop tracks, from ICC-ES.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: 51, minimum.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: 4 inches (102 mm) unless otherwise indicated.
2. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm) unless otherwise indicated.

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 3 inches (75 mm) long and matching studs in depth.

1. Minimum Base-Metal Thickness: Matching steel studs.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Room-Side Finish: As indicated.

G. Shaft-Side Finish: Gypsum shaftliner board, moisture- and mold-resistant Type X.

1. If shaft is installed after building enclosure is complete and connects conditioned spaces only, gypsum shaftliner board, Type X, is permitted in lieu of moisture- and mold-resistant type.

H. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Georgia-Pacific Building Products; ToughRock Fireguard Shaftliner.
b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
c. USG Corporation; Sheetrock Brand Gypsum Liner Panel.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

C. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Georgia-Pacific Building Products; Dens-Glass Ultra Shaftliner.
b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Gypsum Board: As specified in Section 09 29 00 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized unless otherwise indicated.

a. Under conditions permitting gypsum shaft liner, Type X, above, G40 (Z120) is permitted.

B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

E. Sound Attenuation Blankets: As specified in Section 09 29 00 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 07 81 00 "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient channels used with wood stud framing.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.
4. GSM backing for wall-mounted equipment.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood stud framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING AND SUSPENSION SYSTEMS

A. Framing and Suspension Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: C-H studs and deep-leg channel runners as indicated for fire-rated shaft walls and horizontal shaft construction.

C. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members with asymmetrical legs, designed to reduce sound transmission.

1. Product: ClarkDietrich Metal Framing; RC Deluxe.

D. Galvanized Steel Hat Channels: 3/4-inch (19-mm) deep, 20 ga, vented, for attaching siding in rainscreen configuration.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter (8 gauge).

C. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.367 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.

D. Furring Channels (Furring Members):

1. Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Metal Thickness: As indicated on Drawings.
b. Depth: As indicated on Drawings.

2. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission, as specified for partition framing systems.

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Basis-of-Design: Armstrong World Industries, Inc; Drywall Grid Systems.
b. Chicago Metallic Corporation; 640/660 Drywall Ceiling Suspension SpanFast Drywall Ceiling Suspension for Corridors.
c. United States Gypsum Company; Drywall Suspension System Wall-to-Wall Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing, General: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
2. Fasteners for Fire-Rated Assemblies: Type and length per CBC, assemblies on Drawings, and USG recommendations.

a. Minimum at Fire-Rated Wall Assemblies: 1-inch Type S bugle head.
b. Minimum at Fire-Rated Ceiling Assemblies: 1-1/4-inch Type S bugle head.

B. Isolation Strip at Exterior Walls: Except where self-adhered flashing (SAF) strip reinforcements are indicated, provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hold back resilient channels 1/2 inch from intersecting surfaces.
2. Locate channels maximum 3 inches from framing at base and head of wall.
3. To extent feasible, do not change direction of channels within a plane.
4. Do not cantilever channels more than 6 inches; provide supplemental framing as needed.

B. Resilient Channel Installation:

1. Attach resilient channels directly to framing system. Comply with manufacturer's recommendations for attaching channels to wood studs, where indicated.

C. Install resilient channels so flanges within framing system point in same direction.

D. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Furring Channels (Furring Members): 16 inches (406 mm) o.c. unless otherwise indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.
3. Texture finishes.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 16 43 "Gypsum Sheathing" for gypsum sheathing for exterior walls and soffits.
3. Section 07 21 00 "Thermal Insulation"
4. Section 07 92 00 "Joint Sealants" for acoustical joint sealants.
5. Section 09 22 16 "Non-Structural Metal Framing" for resilient channels and for suspension systems for gypsum board ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Data for Low-Emitting Materials: For adhesives used to laminate gypsum board panels to substrates, documentation including printed statement of VOC content.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Samples: For the following products:

1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution. Install mockups as follows:

1. Apply or install final decoration indicated, including painting and basket-pattern wallcoverings, on portion of exposed surface, for review of mockups.
2. Simulate finished lighting conditions for review of mockups.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1. Label fire-resistance rated assemblies in compliance with CBC 703.6:

a. Locate labels in accessible concealed floor, floor-ceiling, and attic spaces. Where ceilings are not removable for access, labels are not required.
b. Repeat labels at intervals not exceeding 30 feet measured horizontally along wall or partition.
c. Label shall consist of lettering not less than 1/2 inch tall, stating "FIRE RATED ASSEMBLY - PROTECT ALL OPENINGS."

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Recycled Content: All gypsum board to contain minimum 35 percent recycled content.

2.3 INTERIOR GYPSUM BOARD

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products by the following, or named manufacturer of equivalent products:

1. Georgia-Pacific Gypsum, LLC.

B. Manufacturers of Equivalent Products:

1. CertainTeed, part of Saint Gobain Group.
2. National Gypsum Company.
3. PABCO Gypsum.
4. USG Corporation.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Gypsum Sheathing: See Section 06 16 43 "Gypsum Sheathing."

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistive capability.

1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
2. Long Edges: Tapered.

B. Mold and Moisture-Resistant Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. Paperless, with fiberglass mat laminated to both sides. Specifically designed for interior use.

1. Products: Subject to compliance with requirements, provide the following:

a. Georgia-Pacific Gypsum LLC; DensArmour Plus Fireguard.

1) At non-tile locations in laundry closets and bathroom walls.
2) At unconditioned interiors use DensArmour Plus or gypsum sheathing.

2. Thickness: 5/8 inch.
3. Core: As indicated.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide the following:

a. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.

2. Core: 5/8 inch (15.9 mm), Type X.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. Expansion (control) joint.
e. Tear-Away L-Bead: Provide at joints indicated to receive sealant at acoustical assemblies.

1) Description: Plastic L-bead with foam gasket and temporary protective strip.
2) Available Manufacturers:

a) Amico.
b) ClarkDietrich.
c) Trim-Tex.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool, as specified for thermal insulation. See Section 07 21 00 "Thermal Insulation."

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Putty Pads: Permanently resilient, UL listed for both metallic and non-metallic outlet boxes, designed to maintain high acoustical ratings in sound and fire rated wall assemblies.

F. Acoustical Joint Sealant: See Section 07 92 00 "Joint Sealants" at non-rated partitions and Section 07 84 13 "Penetration Firestopping" at fire-rated partitions.

G. Fire Foam Sealant: See Section 07 84 13 "Penetration Firestopping."

1. Not for use at sound-rated assemblies.

2.9 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.
b. National Gypsum Company; Perfect Spray EM Texture.
c. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.

2. Texture: Light orange peel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. Sound-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

1. Install tear-away L-bead as indicated in Article "Installing Trim Accessories."
2. Make penetrations regular, without fracturing gypsum board core or tearing face.
3. Do not make unnecessary penetrations. Seal penetrations airtight according to Section 07 84 13 "Penetration Firestopping" at rated construction and with acoustical sealant at non-rated construction.

    a. Annular Space: Provide 1 inch annular space, plus or minus 1/4 inch, for penetrating items 3 inches or less in diameter, except as limited by requirements of 07 84 13 "Penetration Firestopping."
    b. After installing penetrating items, use sheet metal sleeves and safing insulation to reduce clear joint widths exceeding 3/4 inch.
    c. Seal joints; use flexible backing rod at joints exceeding 3/8 inch in unrated construction.
    d. Seal multiple-item penetrations with fire foam sealant, including at unrated construction.

I. Install acoustical putty pads according to manufacturer's instructions before installing gypsum panels.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical and ceiling surfaces unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Glass-Mat Interior Type: At unconditioned spaces, trash rooms, and laundry rooms.

B. Single-Layer Application, Except on Acoustical Resilient Channel Members:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application, Except on Acoustical Resilient Channel Members:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

D. Single Layer Application on Acoustical Resilient Channels

1. Apply gypsum board of maximum practical length with the long edge parallel with the centered on channels. Orienting the long edge vertically is acceptable on walls where a single sheet of gypsum board extends from floor to ceiling.
2. Fasten gypsum board using Type S Bugle Head gypsum board screws of appropriate length to prevent penetration into framing, but not less than 1 inch.
3. Space screws 12 inches center-to-center in the field of gypsum board and along all edges.
4. Hold back gypsum board 1/4 inch from ceiling and floor at wall applications and not less than 1/4 inch from perimeter at ceilings.
5. Caulk the ceiling and floor and perimeter voids full and airtight with an acoustical sealant.
6. Recessed light fixtures, junction boxes, fire sprinkler pipes, and other penetrations must be sealed airtight with acoustical sealant.

E. Two Layer Application on Acoustical Resilient Channels

1. When a construction with two layers of gypsum board on resilient channels is recommended, apply the face gypsum board layer in the same manner as the base layer, except offset the long edge joints by 24 inches and the short edge joints by 48 inches.
2. Fasten the face layer panel to channels using Type S Bugle Head drywall screws spaced 12 inches on center in field of panels and along butting edges. Use screws of appropriate length to prevent rigid contact with framing, but not less than 1 inch.
3. Offset face layer screw pattern six inches from the base layer screws along all channels. Face layer screws must no penetrate into framing.
4. Hold back edges of resiliently hung gypsum board 1/4 inch at all intersecting surfaces; ceiling and floor for wall installations, full perimeter at ceiling installations.
5. Caulk the ceiling and floor and perimeter voids full and airtight with an acoustical sealant.
6. Recessed light fixtures, junction boxes, fire sprinkler pipes, and other penetrations must be sealed airtight with acoustical sealant.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. Tear-Away L-Bead: Use at joints where gypsum board is held back and sealant is applied.

D. Aluminum Trim: Install in locations indicated on Drawings.

E. Do not rigidly attach finishing trim to framing through resiliently suspended gypsum board. Screw-attach finishing trim to resilient channels, or adhere trim to gypsum board. Do not allow fasteners at gypsum board side of resilient channel to contact supporting construction.

F. Except as otherwise detailed, surface-mounted fixtures shall be attached using molly bolts through gypsum board without contacting resilient channels or supporting framing.

G. Line openings for recessed panel boards, equipment, boxes, and similar items with penetration area exceeding 24 square inches with 5/8-inch thick gypsum board.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Remove protective strip from tear-away L-beads according to manufacturer's instructions. Apply paintable latex sealant at joints exposed to view in finished Work.

E. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated.
4. Level 4: At areas exposed surfaces that will be exposed to view, unless otherwise indicated.
    a. Smooth finish at common use areas and as indicated on the Finish Schedule.
    b. Light orange peel finish at dormitory rooms and where indicated on finish schedule.
    c. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions, to comply with ASTM C 840 levels specified herein.

3.7 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.8 PROTECTION

A. Apply labels to fire walls, fire partitions, and fire barriers in concealed above-ceiling locations with accessible ceilings.

B. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

C. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

D. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain floor tile at bathrooms, shower rooms and where indicated on drawings.
2. Porcelain wall tile.
3. Waterproof membrane for thinset and mortar bed applications.
4. Shower waterproofing assemblies, with integrated tapered boards and drain assemblies.
5. Metal edge strips.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 07 92 23 "Architectural Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Section 10 21 13.19 "Plastic Dressing Compartments and Toilet Compartments" for HDPE dressing compartments contiguous with tiled shower surrounds.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples: Provide a sample board for each type and composition of tile. Sample board shall contain a minimum of four tiles adhered to panel with specified grout or shall be 8 inches by 8 inches, adhered to panel with specified grout. Other samples shall include:

1. Full-size units of each type of trim and accessory for each color and finish required.
2. Metal edge strips in 6-inch (150-mm) lengths.

D. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Experienced installer who has completed similar installations with a record of successful performance.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Provide products indicated by the following:

1. Daltile.

B. Source Limitations:

1. Tile: Obtain tile of each type and color or finish from single source or producer, from same production run and of consistent quality in appearance and physical properties for each contiguous area.
2. Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer.
3. Aggregate: Obtain each aggregate except for unmodified Portland cement and aggregate, from single source or producer.
4. Other Products: Obtain waterproof membrane and metal edge strips from single manufacturer.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Products: As indicated in Finish Schedule on Drawings (T- prefix).

1. Colors: For floor tiles and wainscot tiles, up to four colors selected from manufacturer's standard colors.

B. Tile colors and glazes as indicated by manufacturer's designations for products scheduled.

1. Floor Tile: Unglazed porcelain tile, 24 by 12 inch nominal face dimension.
2. Shower Floor Tile: Unglazed porcelain mosaic tile, 2 by 2 inch nominal face dimension.
3. Wainscot Tile: Unglazed porcelain mosaic tile, 2 by 2 inch nominal face dimension.

C. Trim: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Cove Base: As indicated in Finish Schedule on Drawings (TB).
2. Wainscot Cap: As indicated on Drawings.
3. External Corners: As indicated on Drawings.
4. Internal Corners: Field-butted square corners.

2.4 TILE BACKING PANELS

A. See Section 09 29 00 "Gypsum Board" for coated glass-mat-faced gypsum board tile-backing panels.

B. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, Type A, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. C-Cure; C-Cure Board 990.
b. Custom Building Products; Wonderboard.
c. USG Corporation; DUROCK Cement Board.

2. Thickness: 7/16 inch to 1/2 inch.

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
b. Laticrete International, Inc.; Laticrete Hydro Ban.
c. MAPEI Corporation; Mapelastic HPG.

2. Locations: Other than shower pans.

C. Shower Pan System Waterproofing Membrane: Corrugated polyethylene, with anchoring webbing on underside; 1/8-inch (3 mm) nominal thickness, for installation at shower floors.

1. Product: Subject to compliance with requirements, provide the following:

a. Schluter Systems; DITRA tiling underlayment, with KERDI-BAND polyethylene seaming tape.

2. Provide membrane manufacturer's detail strip membranes and accessories for complete shower membrane system.

~~D. Bonded Sheet Membrane: Provide complete system of membrane and accessories, IAPMO listed, and acceptable to authorities having jurisdiction for use as shower pan, one of the following types.~~

~~1. Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness.~~

~~a. System: Schluter Systems L.P.; KERDI Shower series~~
~~b. Components:~~

~~1) Prefabricated Panels: Kerdi-Board and Kerdi-Shower series, including sloped shower trays.~~
~~2) Drain Assembly with Bonding Flange: Kerdi-Drain series.~~
~~3) Prefabricated Ramp: Kerdi-Shower-R.~~

~~2. Comparable Nonwoven Polyethylene Sheet System:~~

~~a. Mapei Corporation; Mapeilastic WSM, with ShowerPerfect accessories.~~

2.6 SETTING MATERIALS

A. Portland Cement Mortar Bed (Thick-Bed): ANSI A108.1A or ANSI A108.1B.

1. For mortar bed applications.

B. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062-inch (1.57-mm) diameter; comply with ASTM A185/A185M and ASTM A82/A82M, except for minimum wire size.

C. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.

c. MAPEI Corporation.

2. For wall applications provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. High-Performance Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. MAPEI Corporation.

2. Grout Colors: As selected by Architect from manufacturer's full range.

2.8 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver or stainless-steel, ASTM A 666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis-of-Design: Schluter Systems L.P.
b. Blanke Corporation.
c. Ceramic Tool Company, Inc.

2. Basis of Design Profiles:

a. Base: Schluter DILEX-AHK, stainless steel.
b. Inside Corner: Schluter; DILEX-AHK, stainless steel
c. Outside Corner: Schluter; RONDEC series, sized for tile assembly thickness.
d. Top edge: Schluter; RONDEC.series, sized for tile assembly thickness.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bonsal American, an Oldcastle company; Grout Sealer.
b. Custom Building Products; Grout Sealer.
c. Miracle Sealants; 511 H2O Plus Sealer.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the Work of this Section, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Wall Tile: 1/16 inch (1.6 mm).
2. Large-Format Tile: 1/8 inch (3.2 mm), or according to manufacturer recommendations.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile. Also install where exposed edge of tile flooring meets concrete that does not finish flush with the top of tile.

J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

~~B. Install bonded membrane shower system according to manufacturer's instructions and IAPMO approved details.~~

B. Install corrugated polyethylene waterproofing underlayment at shower receptors according to manufacturer's written instructions. Comply with manufacturer's requirements for sealing seams and floor/wall transitions.

C. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Ceramic Tile Installation for Interior Floors with Concrete Subfloors (Other than Shower Floors): TCNA F112; Thinset mortar on waterproof membrane over cured Portland cement mortar bed (thick-set), per ANSI A108.1B.

1. Ceramic Tile Type: Floor tile as scheduled.
2. Mortar Bed: Bonded, portland cement.
3. Thinset Mortar: Latex-portland cement mortar.
4. Membrane: Fluid-applied waterproof membrane.
5. Grout: High-performance unsanded grout.

B. Ceramic Tile Installation at Interior Walls and Wainscots (Other than Shower Walls): TCNA W244C or W245; Thinset mortar on cementitious backer units (W244C) or thinset mortar on coated glass-mat gypsum board tile backer units (W245).

1. Ceramic Tile Type: Wall tile.
2. Thinset Mortar: Latex-portland cement mortar.
3. Grout: High-performance unsanded grout.
4. Membrane: Fluid-applied waterproofing membrane.

C. Ceramic Tile Installation at Shower Walls: TCNA B415; Thinset mortar on waterproof membrane over cementitious backer units.

1. Membrane: ~~Bonded sheet~~Fluid-applied membrane and accessories.
2. Ceramic Tile Type: Wall tile.
3. Thinset Mortar: Latex-portland cement mortar.
4. Grout: High-performance unsanded grout.

D. Ceramic Tile Installation at Shower Floor and Base: TCNA B415; Reinforced portland cement mortar bed (thick-set) on waterproof membrane, per ANSI A108.1C.

1. Membrane: ~~Bonded~~Corrugated polyethylene sheet membrane and accessories.
2. Ceramic Tile Type: Floor tile
3. Thinset Mortar: Latex-portland cement mortar.
4. Grout: High-performance unsanded grout.

END OF SECTION

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mineral fiber acoustical panels in exposed metal suspension grids.
2. Direct-attached panels.
3. Aluminum perimeter trim.

B. Related Sections:

1. Section 01 81 13 "Sustainability Requirements."
2. Section 09 54 ~~2600~~ "~~Suspended~~ Wood Ceilings" for wood ceiling panels installed on suspension system specified in this Section.

1.2 DEFINITIONS

A. Sabin: Square foot Sabin or Imperial Sabin. Unit of sound absorption equivalent to absorption performed by one square foot of a surface with 100 percent absorption of sound.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. For sealants, documentation including printed statement of VOC content
2. Maintenance data to include in maintenance manuals.
3. Product test reports and evaluation reports.

B. Certifications and laboratory test reports with acoustical and fire rating data to show compliance with Performance Specification.

C. Samples: For each exposed product and for each color and texture specified, 6 inches (150 mm) square or six inches long. Provide full-size samples of anchor and cable-gripper hardware.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access requirements for equipment above ceilings.
f. Power and signal devices.

4. Perimeter moldings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Seismic Perimeter Clips: Equal to 2 percent of quantity installed.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling areas for each type of acoustical panel ceiling, not less than 50 sq ft.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84, Class A performance; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products by the following, or equivalent products by named manufacturer of equivalent products:

1. Armstrong World Industries, Inc.

B. Products: As indicated in Finish Schedule on Drawings:

1. ACT: Armstrong; CIRRUS, Second Look III.

a. Panel Type: Wet-formed mineral fiber, ASTM E 1264, Type A.
b. Panel Dimensions: 24-by-48 inches, 3/4-inch thick.
c. Profile: Tegular, for 9/16-inch reveal.
d. Decorative Scoring: Parallel to long side of panel, 6 inches apart, creating appearance of 6-by-48-inch planks.
e. Factory Finish: Latex paint.
f. Noise Reduction Coefficient: 0.65 NRC.
g. Installation: Lay-in on suspension grid.

2. W~~AP~~-ACT: Armstrong; ULTIMA Health Zone.

a. Panel Type: Wet-formed mineral fiber with scrubbable acoustically transparent, water-repellent membrane, ASTM E 1264, Type A.
b. Panel Dimensions: 24-by-48 inches, 1-inch thick.
c. Profile: Tegular, for 15/16-inch reveal.
d. Factory Finish: Latex paint over DuraBrite membrane.
e. Noise Reduction Coefficient: 0.80 NRC.
f. Installation: Lay-in on suspension grid.

3. Armstrong; Lyra PB Direct Apply.

a. Panel Type: Fiberglass with plant-based binder, faced with acoustically transparent membrane, ASTM E 1264, Type B.
b. Panel Dimensions: 24-by-48 inches, 1-inch thick.
c. Profile: Square edge.
d. Factory Finish: Latex paint.
e. Noise Reduction Coefficient: 0.80 NRC.
f. Installation: Direct-adhered to steep-slope gypsum board ceiling substrate, with joints caulked and long side joints covered with wood trim. See Section 09 54 00 "Wood Ceilings" for wood trim overlaying acoustical panels.

~~4. Armstrong; Invisacoustics, smooth texture. Surface applied panels.~~

~~a. Flat panels for direct application to gypsum ceiling.~~

~~5. Armstrong; TBD.~~

~~a. Round panels for direct application to gypsum ceiling.~~

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

D. Seismic Stabilizer Bars or Seismic Perimeter Clips: At contractor's option, use either seismic stabilizer bars or seismic perimeter clips.

1. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
2. Seismic Perimeter Clips: Manufacturer's standard perimeter clips designed to accommodate seismic forces without requiring edge moldings wider than 7/8 inch.

2.5 METAL SUSPENSION GRID SYSTEM

A. Products: Subject to compliance with requirements, provide capped double-web suspension system by manufacturer of acoustical panels.

B. Capped, Double-Web, Suspension Systems:

1. Galvanized Steel, Narrow-Faced, at Locations other than Clinics: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished metal caps on flanges.

a. Basis-of-Design Product: Armstrong; Suprafine XL.

b. Cap Face Width: 9/16 inch (narrow face).
c. Structural Classification: Heavy-duty system.
d. Finish Color: White.
e. For use with CIRRUS Second Look acoustical panels.

2. Galvanized Steel, Wide-Faced: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished metal caps on flanges.

a. Basis-of-Design Product: Armstrong; Prelude.
b. Cap Face Width: 15/16 inches (wide face).
c. Structural Classification: Heavy-duty system.
d. Finish Colors:

1) White, for use with ULTIMA Health Zone panels.
2) Black, for use with wood ceilings. See Section 09 54 ~~1600~~ "~~Suspended~~ Wood Ceilings."

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by same manufacturer as suspension system.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for Alloy and Temper 6063-T5.
2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils (0.04 mm). Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ~~ACOUSTICAL SEALANT~~INSTALLATION ACCESSORIES

A. Acoustical Sealant for Exposed and Concealed Joints: See Section 07 92 00 "Joint Sealants."~~.~~

B. Adhesive for Direct-Adhered Panel Ceiling: As recommended by manufacturer for panels and substrate, complying with VOC limits in Section 01 81 13 "Sustainable Design Requirements."

1. Basis-of-Design Product: Titebond GREENchoice Acoustical Ceiling Tile Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, GENERAL

A. ~~General:~~ Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

3.4 SUSPENDED CEILINGS

A. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

B. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

~~1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.~~

1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.5 INSTALLATION, DIRECT-ADHERED PANELS AT STEEP SLOPE CEILINGS

A. Adhere acoustical panels to gypsum board ceiling substrates according to manufacturer's instructions and accepted Shop Drawings, with layout as shown on Drawings.

1. Align joints with framing at 24 inches o.c.
2. Coordinate fit of panels at penetrations, such as fire sprinkler heads.
3. Provide additional blocking where required.
4. Stagger joints in running bond pattern, as shown.
5. Trim to fit all spaces.
6. Caulk joints to conceal seams.

B. See Section 09 54 00 "Wood Ceilings" for screw-attached decorative wood trim overlaying long joints of acoustical panels.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 54 00 - WOOD CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured wood slat panel ceiling installed on metal suspension grid, with acoustic insulation above.
2. Manufactured wood slat panel ceiling direct-attached to fixed subframing, with acoustic insulation above.
3. Custom-fabricated fixed wood grille ceiling with different depth blades held in position with cross-piece backers, installed on furring channels over fixed framing.
4. ~~[TBD]Wood tongue-and-groove plank ceiling installed on metal suspension grid.~~
5. Wood trim overlaying acoustic panels as vaulted ceiling finish.
6. Wood ceiling trim.

~~B. Section Includes:~~

~~1. |Wood grille panels and acoustical backing installed on metal suspension system at ceilings.~~

~~2. |Wood tongue-and-groove planks installed on metal suspension system.~~

~~3. |Wood trim members.~~

B. Related Sections include the following:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 09 51 13 "Acoustical Panel Ceilings" for fiberglass acoustic panels to receive decorative wood trim overlay at sloped ceilings, and for metal suspension T-grid for use with suspended wood ceilings.

1.2 COORDINATION

A. Coordinate requirements for ~~wall washing light fixtures~~cove lighting, including electrical power and wiring, interfacing with ~~decorative wood trim at Lobby~~custom-fabricated wood grille ceiling ~~walls~~at Wellness Entry Hall.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product or ceiling system specified.

B. Sustainable Design Submittals: Documentation evidencing compliance with requirements set forth in Section 01 81 13 "Sustainable Design Requirements," as pertain to the Work of this Section.

C. Coordination Shop Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Fixed framing and subframing at ceilings installed over gypsum board substrates.
2. Suspended ceiling components.
3. Structural members to which suspension systems will be attached.

4. Size and location of initial access modules for ~~linear wood panels~~manufactured wood ceilings.
5. Provisions for above ceiling access at fixed ceilings.
6. Items penetrating finished ceiling including the following:
    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
7. Include installation details for attaching ~~plank~~plank panels ~~and panels~~ to suspension grids ~~where indicated, and to subframing where indicated,~~ and for installing shield fabric and acoustic insulation above ~~grille~~ panels.
8. Include installation details for attaching custom wood grille ceiling to subframing.
9. ~~Include installation details for attaching tongue-and-groove plank ceilings to grids.~~
10. Include installation details for attaching wood trim over acoustic panel joints at vaulted (sloped) ceiling.
11. Include seismic details.

D. Samples: For verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the range of variations expected.

1. Manufactured Wood ~~Grille~~Slat Panels: 12~~-~~by~~-~~18 inch assembled sample of system indicated, with finish specified.
2. Custom Wood Grille: Provide two 12-by-18 inch Samples; one with 1-by-8 inch blades and one with 1-by-12 inch blades, configured with spans between members as indicated on Drawings.
3. ~~[TBD] Manufactured Wood Plank Ceiling Systems: Two 12 inches-by-full-width samples of plank profile, with clips, with finish specified.~~
3. Wood Trim Members for Installation over Direct-Attached Acoustic Panels: 12-inch lengths of each profile.

E. Delegated Design Submittal: For suspended ceiling systems and accessories installed on light-gage metal framing capable of supporting specified wood members indicated on Drawings, in configuration indicated; including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

~~1.~~ ~~–~~

1.4 INFORMATIONAL SUBMITTALS

A. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

B. Evaluation Reports: For each anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer, approved by wood ceiling manufacturer, who has completed panel ceilings similar in species, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling areas as shown on Drawings or as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

D. Pre-Installation Conference: Conduct meeting at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver custom wood grille, wood slat panels, suspension-system components, wood trim, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing custom wood grille, wood slat panels, and wood trim, permit them to reach room temperature and a stabilized moisture content.

C. Handle custom wood grille, wood slat panels, and wood trim carefully, to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install wood ~~panel~~grille and ~~plank~~wood slat panel ceilings or wood trim until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

B. Wood ceiling and trim materials shall be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design suspended wood ceilings, including attachments to building construction.

1. Pre-engineered ceilings installed in accordance with manufacturers' written instructions for manufactured ceiling system and manufactured metal suspension grid do not require additional delegated design.

B. Seismic Performance: Suspended ceilings and wood trim shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Acoustic Performance: Provide ceiling system with acoustical insulation providing NRC no less than value indicated on Drawings.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

D. Fire Performance Characteristics: Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: Tested per ASTM E 84 and complying with ASTM E 1264 for Class B products.

a. Flame Spread: 75 or less.
b. Smoke Developed: 450 or less.

2.2 PANELIZED WOOD SLAT CEILING SYSTEMS

A. Panelized Wood Slat Ceiling System (WD-1): Ceiling finish system consisting of transparent-finished wood veneer slats, panelized with open joints, and screw- or clip-attached to metal suspension system.

1. Product: 9Wood; 2100 Panelized Linear, SKU 2114-3.

B. Panels: Wood veneer slats of species, cut, finish, and profile indicated in open-joint linear plank formation (wider than deep) with cross-piece backer.

1. Wood Slats:

a. Species: Douglas fir.
b. Plank Size: 3/4-inch thick by 3-1/4 inches wide.
c. Configuration: Three (3) slats per panel with 3/4-inch reveal between slats, per manufacturer's standard for product specified.
d. Attachment: Fastened with self-tapping screws to cross-piece backer and attached to linear metal suspension carriers.
e. Trim: None. Provide floating installation.
f. Installation Methods:

1) Direct-Applied: Screw-attached through backers and hat channel, penetrating into both layers of gypsum board ceiling above.
2) Suspension Grid: Screw-attached through backers to metal suspension grid carriers.

2. Shield Fabric (Scrim): Black, unless otherwise indicated.
3. See "Acoustic Insulation" article in this Section for insulation installed above panels.

2.3 CUSTOM-FABRICATED WOOD GRILLE PANEL CEILING SYSTEMS

A. Wood Grille Panel Ceiling~~s~~: Transparent-finished wood blades of two different depths arranged in custom grille configuration and secured in place with crosspiece backers, then screw attached to furring channels over framed gypsum board ceiling.

B. Wood Species and Grade: Douglas fir, D & Better (Clear), surfaced 4 sides.

C. Blade Dimensions: 1x8 and 1x12 boards installed with narrow dimension exposed. Lengths vary according to custom design.

D. Backers: 1/2-inch thick, dimensions per accepted Shop Drawings.

E. Coordinate integration of indirect light coves above grille panel ceiling as detailed on Drawings.

~~F. Product: As indicated in Finish Schedule on Drawings (WD-1).~~

~~1. 9Wood, Inc; 1100 Cross Piece Grille Series.~~
~~2. Grille member dimensions and configuration on panel, including reveals, shall be manufacturer's standard for system indicated.~~
~~3. Species and Finish: Per manufacturer's designations for product scheduled.~~

~~2.4 MANUFACTURED WOOD PLANK CEILING SYSTEMS~~

~~A. Transparent-finished solid wood tongue-and-groove planks with V-groove closed reveal for screw and clip attachment to concealed standard heavy-duty metal ceiling suspension system.~~

~~B. Product: As indicated in Finish Schedule on Drawings (WD-2).~~

~~1. 9Wood, Inc; 2400 Tongue and Groove Linear Series.~~

~~A. Species and Finish: Per manufacturer's designations for system scheduled.~~

~~B. Plank dimensions and configurations shall be per manufacturer's standard for system scheduled.~~

2.4 WOOD TRIM AT MANUFACTURED WOOD CEILINGS

A. Solid Wood Trim: Trim profiles fabricated from solid Western hemlock, finished to match wood slat ceiling panels, for installation where indicated on Drawings.

1. Product: 9Wood, Inc; 0100 Series Wood Trims.

a. Profiles: As indicated on Drawings.

~~2.~~ -

2.5 WOOD TRIM OVERLAY AT ACOUSTIC-PANEL-FINISHED VAULTED CEILING

A. Custom Decorative Wood Trim Overlay: Solid wood trim screw-attached over acoustic panel joints on long sides of panels installed at vaulted (sloped) ceiling.

1. Trim Species and Grade: Douglas fir, D & Better (Clear), surfaced 4 sides.
2. Trim Member Dimensions: 3-by-4 inches.
3. Finish: Shop-applied clear penetrating oil finish specified in Section 09 93 00 "Staining and Transparent Finishing."
4. Complete Ceiling Finish: Acoustic panels, 24-by-48 inches, glued to ceiling substrate with joints staggered in a running bond (half-offset) pattern, with joints caulked and wood trim installed over long-side joints.

2.6 ACOUSTIC INSULATION

A. Acoustic Insulation: Above wood ~~grille~~plank panels. High-density fiberglass board containing no added urea formaldehyde, with black mat facer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved equal:

a. Knauf Insulation; Black Acoustical Board Theater Insulation.

2. Performance:

a. Fire: Flame spread index of less than 25, smoke developed index of less than 50, when tested according to ASTM E 84, NFPA 255, and UL 723.
b. Indoor Air Quality: Certified GREENGUARD Gold.

2.7 MISCELLANEOUS INSTALLATION ACCESSORIES

A. Adhesive: Manufacturer's standard, recommended, or approved adhesive for adhering acoustical panels directly to compatible ceiling substrates.

1. Available Product: Subject to compliance with requirements, available product includes, but is not limited to, the following:

a. Titebond GREENchoice Acoustical Ceiling Tile Adhesive.

B. Acoustical Sealant: Manufacturer's standard, recommended, or approved sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Available Product: Subject to compliance with requirements, available product includes, but is not limited to, the following:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.

2.8 METAL SUSPENSION SYSTEMS

A. Metal Suspension-System, Wood ~~Grille~~Slat Ceiling: Provide wood ~~grille~~slat panel manufacturer's standard, recommended, or approved direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635 M.

B. Wide-Faced, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges.

1. Basis-of-Design Product: See Section 09 51 13 "Acoustical Panel Ceilings" for 15/16-inch wide-faced capped double-web suspension system.
2. Structural Classification: Heavy-duty system.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type.

4. Face Design: Flat, flush.
5. Cap Material: Cold-rolled steel.
6. Finish: Black.

2.9 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
3. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- (3.5-mm-) diameter wire.

C. Seismic Clips: Manufacturer's standard seismic clips designed to secure wood ~~grilleslat~~ panels in place during a seismic event.

D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

~~E. Solid Wood Trim: Trim profiles fabricated from solid Western hemlock, finished to match wood plank and wood grille ceiling panels, for installation where indicated on Drawings.~~

~~1. Product: 9Wood, Inc; 0100 Series Wood Trims.~~

EXECUTION

3.1 EXAMINATION

A. General: Examine suspension system to which ceilings attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Layout: Measure each ceiling area and establish the layout of ~~suspended~~ wood ceiling system to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width planks or panels at borders, and conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer’s approved Shop Drawings.

1. Perimeter Conditions: As indicated on Drawings.

B. Ceiling Insulation at Wood ~~Grille~~Slat Panels: Install acoustical board with wood grille panels as detailed on Drawings, according to manufacturer's written instructions. Coordinate installation with requirements for installation of wood ~~grilleslat~~ panels.

3.3 INSTALLATION, CEILINGS

A. General:

1. Install wood ~~grille~~slat panel and wood ~~plank~~grille ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
2. Install wood ~~grille~~slat panels and wood ~~planks~~grilles with undamaged edges, and fit accurately into pattern~~s~~ indicated in Drawings

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. When framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Do not attach hangers to steel deck tabs.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install wood ~~grille~~slat panels and wood ~~planks~~grilles with undamaged edges, and fit accurately into patterns indicated in Drawings.

1. At panelized ceiling, ~~i~~install according to manufacturer's instructions for providing individually removable panels and full access to above-ceiling spaces.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Compliance of seismic design at ceilings.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Perform the following tests and inspections of completed installations of ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 ADJUSTING AND CLEANING

A. Adjust wood grille panels and wood planks to be level, aligned, and evenly spaced.

B. Clean exposed wood surfaces. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. ~~Resilient~~Rubber base.
2. Rubber stair treads with integral risers.
3. Rubber stair landing tile, matching stair treads.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Division 03 and Division 09 for hard-surface flooring installed with resilient cove base.

1.2 ACTION SUBMITTALS

A. Product Data: Product Data: For each type of product.

1. For adhesives, provide printed statement of VOC content.

B. Sustainable Design Submittals:

1. Documenting compliance with Section 01 81 13 "Sustainable Design Requirements" as pertains to the products and Work of this Section.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, and pattern.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resilient base and accessories, from manufacturer, for inclusion in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed. Package with protective covering for storage and identify with labels describing contents. Provide amount equivalent to 5 percent of item installed for each accessory.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide resilient base~~, moldings,~~ and stair accessories by the following:

1. Johnsonite, a Tarkett USA company.

B. Manufacturers of Comparable Products: Subject to compliance with requirements, comparable products by the following will be considered:

1. Roppe Corporation.

2.2 THERMOPLASTIC RUBBER BASE

A. Basis-of-Design Product:

1. Tarkett; Traditional Wall Base (Rubber).

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic), Group I (solid, homogeneous).

C. Style: Style B, cove.

D. Thickness: 0.125 inch (3.2 mm).

E. Height: 4 inches (102 mm).

F. Lengths: 100-foot coils. Provide seamless installation wherever possible.

G. Outside Corners: Job formed.

H. Inside Corners: Job formed.

I. Colors: Per manufacturer's designations for product scheduled.

2.3 RUBBER STAIR ACCESSORIES

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Accessibility: Include ADA and California Title 24 compliant contrasting color stripe at lead edge of top and bottom stair of each stair run. Stripe may be co-extruded contrasting color strip or applied grit tape.

1. Contrasting color stripe shall be 2-inches thick, to be installed within 1 inch of lead edge at all treads.

C. Basis-of-Design Product:

1. Johnsonite; Angle Fit Rubber Stair Treads with Integrated Risers.

D. Stair Treads: ASTM F 2169.

1. Type: TS (rubber, vulcanized thermoset).
2. Class: 2 (pattern; embossed).
3. Group 2 (with contrasting color rubber insert as aid for the visually impaired).
4. Nosing Style: Square.
5. Nosing Height: 2 inches (51 mm).
6. Size: Lengths and depths to fit each stair tread in one piece.
7. Integral Risers: Smooth, flat; in height that fully covers substrate.
8. Colors and Textures: As selected by Architect from manufacturer's full range.

E. Landing Tile: ASTM F1344, Class I-A (solid color) or Class I-B (through-mottled); by manufacturer of stair accessories; color and pattern to match stair treads.

1. Dimensions: 24-by-24 inches (610-by-610 mm).
2. Thickness: Not less than 0.125 inch (3.2 mm); thickness at raised texture (raised disks or squares), if applicable, shall not be more than 0.155 inch (4.0 mm).

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for ~~resilient~~ products and substrate conditions indicated.

1. Adhesives shall comply with VOC limits set forth in Section 01 81 13 "Sustainable Design Requirements."

C. Stair Tread Installation Accessories: As recommended by manufacturer and as required:

1. Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Miter or cope corners to minimize open joints.

3.4 RESILIENT STAIR ACCESSORIES INSTALLATION

A. Stair Treads with Integral Risers:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

B. Landing Tile:

1. Install resilient landing tile to comply with manufacturer's written instructions for installing tile at plywood substrates.
2. Adhere resilient landing tile to substrate using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
3. Flush Time: After installation, allow flush time for air quality, as indicated in Section 01 81 13 "Sustainable Design Requirements."

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

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SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linoleum sheet flooring.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 09 05 61.13 "Moisture Vapor Emission Control" for moisture testing and amelioration (if required) of concrete substrates prior to installation of resilient sheet flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Data for Low-Emitting Materials: For adhesives, documentation including printed statement of VOC content.

B. Samples for Initial Selection: For each type of resilient sheet flooring indicated.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of resilient sheet flooring required.

1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches (230 mm) long, of each color required.

D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch (150-by-230-mm) Sample applied to a rigid backing and prepared by Installer for this Project

E. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. For all flooring products, submit approved "SCS FloorScore" Product Certification for each installed product or system.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Sheet Flooring: Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, in roll form and in full roll width for each type, color, and pattern of flooring installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required.

B. First-in-Place Mockup: Build mockup to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for resilient sheet flooring, including accessories.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) in location directed by Architect.

2. Approval of mockup does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

B. Warranty Period: 10 years from date of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1. Sheet Flooring: Store rolls upright.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive resilient sheet flooring during the following time periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during resilient flooring installation.

D. Close spaces to traffic for 48 hours after resilient flooring installation.

E. Install resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
2. FloorScore Compliance: Resilient flooring shall comply with requirements of FloorScore certification.

2.2 MANUFACTURER

A. Provide resilient flooring from a single source, single manufacturer.

B. Basis-of-Design Manufacturer:

1. Forbo Flooring Systems.

RESILIENT SHEET

A. Linoleum Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.

B. Product: As indicated in Finish Schedule on Drawings (RS prefix).

1. Forbo Flooring Systems; Marmoleum.

a. Provide up to 4 colors/patterns as selected by Architect from manufacturer's full range of standard colors and patterns.
b. Provide each selected color and pattern of flooring from the same production run.

C. Roll Size: In manufacturer's standard length but not less than 78 inches (1980 mm) wide.

D. Thickness: 0.010 inch (2.5 mm).

E. Colors and Patterns: Per manufacturer's designations for products selected.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

a. Colors: Match flooring.

D. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: 1-inch (25.4-mm) radius provided or approved by manufacturer.
2. Cove-Base Cap Strip: Square metal cap provided or approved by manufacturer.

E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete substrates shall be tested for alkalinity, moisture, and adhesion according to provisions in Section 09 05 61.13 "Moisture Vapor Emission Control."

1. Prepare concrete substrates that do not meet requirement for installation of moisture vapor (MVE) control system as indicated in Section 09 05 61.13. Install MVE control system according to instructions in that Section.

a. Do not install resilent sheet flooring until concrete with MVE control system has passed inspections.

B. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to linoleum sheet flooring manufacturer's written instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum sheet flooring manufacturer. Do not use solvents.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as space where it is to be installed.

1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 LINOLEUM SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing sheet flooring.

B. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out linoleum sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.
5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

D. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, and thresholds.

E. Extend flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. Seamless Installation:

1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

I. Integral-Flash-Cove Base: Unless otherwise indicated, cove flooring 6 inches (152 mm) up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting linoleum sheet flooring.

B. Perform the following operations immediately after completing linoleum sheet flooring installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect linoleum sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from linoleum sheet flooring before applying liquid floor polish.

1. Apply two coats.

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum sheet flooring until Substantial Completion.

END OF SECTION

SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Linoleum tile flooring.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 09 05 61.13 "Moisture Vapor Emission Control" for moisture testing and amelioration (if required) of concrete substrates prior to installation of resilient tile flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Data for Low-Emitting Materials: For adhesives, documentation including printed statement of VOC content.

B. Samples for Initial Selection: For each type of resilient tile flooring indicated.

C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each different color and pattern of resilient tile flooring required.

D. Product Schedule: For linoleum tile flooring. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. For all flooring products, submit approved "SCS FloorScore" Product Certification for each installed product or system.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient tile flooring to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient tile flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient tile flooring manufacturer for installation techniques required.

B. Mockup: Build mockup to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for resilient tile flooring, including accessories.

a. Size: Minimum 100 sq. ft. (9.3 sq. m) for instance in location directed by Architect.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

B. Warranty Period: 10 years from date of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store linoleum flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1. Tile Flooring: Store on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C), in spaces to receive linoleum sheet flooring during the following time periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during resilient tile installation.

D. Close spaces to traffic for 48 hours after resilient tile installation.

E. Install resilient tile flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2. FloorScore Compliance: Resilient flooring shall comply with requirements of FloorScore certification.

2.2 MANUFACTURER

A. Provide linoleum flooring from a single source, single manufacturer.

B. Provide each scheduled color and pattern of flooring from the same production run.

C. Basis-of-Design Manufacturer and Material:

1. Forbo Flooring Systems; Marmoleum.

LINOLEUM FLOOR TILE

A. Linoleum Floor Tile: ASTM F 2195, Type I, linoleum floor tile with fibrous backing.

B. Products: As indicated in Finish Schedule on Drawings (RT).

1. Forbo; Marmoleum Modular.

a. Provide up to 6 colors/patterns as selected by Architect from manufacturer's full range of standard colors and patterns.
b. Provide each selected color and pattern of flooring from the same production run.

C. Thickness: 0.010 inch (2.5 mm).

D. Color and Pattern: Per manufacturer's designations for products selected.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient tile flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete substrates shall be tested for alkalinity, moisture, and adhesion according to provisions in Section 09 05 61.13 "Moisture Vapor Emission Control."

1. Prepare concrete substrates that do not meet requirement for installation of moisture vapor (MVE) control system as indicated in Section 09 05 61.13. Install MVE control system according to instructions in that Section.

a. Do not install resilent tile flooring until concrete with MVE control system has passed inspections.

B. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient tile flooring manufacturer's written instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient tile flooring manufacturer. Do not use solvents.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as space where it is to be installed.

1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 RESILIENT TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay floor tiles in pattern indicated.

C. Match resilient floor tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

1. Lay floor tiles with grain running in one direction.

D. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient tile flooring.

B. Perform the following operations immediately after completing resilient tile flooring installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient tile flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient tile flooring before applying liquid floor polish.

1. Apply two coats.

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

END OF SECTION

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SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resinous flooring system at commercial kitchen.
2. Integral cove base accessories.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

1. For liquid-applied flooring components, documentation including printed statement of VOC content.

B. Sustainable Design Submittals: Submit documentation evidencing compliance with applicable requirements set forth in Section 01 81 13 "Sustainable Design Requirements."

C. Samples for Initial Selection: For each type of exposed finish required.

D. Samples for Verification: For each resinous flooring system required, stepped sample, 12 inches (302 mm) square, applied to a rigid backing by Installer for this Project.

1.4 INFORMATIONAL SUBMITTALS

A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

B. Material Certificates: For each resinous flooring component, from manufacturer.

C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , unopened, in manufacturer's original packaging, to reproduce resinous flooring system installed. Provide quantity required to reapply an entire restroom floor.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Apply full-thickness mockups on 96-inch- (2400-mm-) square floor area approved by Architect.

a. Include integral cove base with inside and outside corner.

2. Simulate finished lighting conditions for Architect's review of mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace resinous flooring that fails in materials or workmanship within specified warranty period.

B. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Work of this Section shall comply with VOC content limits, materials restrictions, and general emissions limits specified in Section 01 81 13 "Sustainable Design Requirements."

B. Flammability: Self-extinguishing according to ASTM D 635.

C. Slip Resistance: One of the following:

1. Dynamic Coefficient of Friction (DCOF): Not less than 0.42 per ANSI B101.3.

2. Static Coefficient of Friction (SCOF): Not less than 0.6 on level surfaces and 0.8 on ramps in dry conditions, per ASTM D 2047.

2.2 MANUFACTURERS

A. System Manufacturer: Subject to compliance with requirements, provide resinous flooring system indicated in Appendix A - Interiors Finishes and Fixtures Schedule (EPOXY) by the following:

1. Diverse Technologies Industrial Coatings & Supplies, Inc. (DTIC&S)

B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 RESINOUS FLOORING

A. Resinous Flooring System: Polyurethane-cement base coat with aggregate, epoxy intermediate coat with aggregate, and polyurea topcoat.

B. System: As indicated in Finish Schedule on Drawings (EP), with scheduled epoxy base (EPB).

C. System Characteristics:

1. Color and Pattern: As scheduled; if not scheduled, as selected by Architect from manufacturer's full range.
2. Wearing Surface: Textured slip-resistant finish.
3. Overall System Thickness: Between 3/16 inch (4.7 mm) and 3/8 inch (9.5 mm), as recommended by manufacturer for application.

D. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested in accordance with test methods indicated:

1. Compressive Strength: 8,500 psi minimum in accordance with ASTM C579.
2. Tensile Strength: 1,400 psi minimum in accordance with ASTM C307.
3. Flexural Modulus of Elasticity: 2,700 psi minimum in accordance with ASTM C580.
4. Hardness: 75 to 80, Shore D in accordance with ASTM D2240.
5. Flammability: Self-extinguishing when bonded to concrete; tested per ASTM D 635.

E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated, capable of depths required for sloping to drain as indicated in Drawings.

F. Base Coat: Cementitious polyurethane slurry.

1. Product: DTIC&S; Extreme Crete SL.
2. Resin: Two-component polyurethane blended on site with curing agent.

a. Include pigment and anti-microbial additives.

3. Aggregate: Manufacturer's recommended angular aggregate for improved slip resistance.
4. Application Method: Gauge rake and trowel.
5. Number of Coats: One.

6. Thickness: 1/8-inch to 1/4-inch.

G. Intermediate Coat: Low-viscosity, 100 percent solids epoxy.

1. Product: DTIC&S; Epoxy 400.
2. Resin: Two-component epoxy blended on site with curing agent.
3. Aggregate: Manufacturer's recommended angular aggregate for improved slip resistance.
4. Application Method: Trowel.
5. Number of Coats: One.
6. Thickness: Per manufacturer recommendation for overall system performance at Project conditions.

H. Topcoat: Low-viscosity, solvent-free 100 percent solids polyurea hybrid.

1. Product: DTIC&S; Polyurea 5100.
2. Resin: Two-component aliphatic polyurea/polyaspartic hybrid.
3. Aggregate: None.
4. Application Method: Brush and roller.
5. Number of Coats: One.
6. Thickness: Maximum 16 mils.
7. Finish: High gloss.

2.4 INTEGRAL COVE BASE ACCESSORIES

A. Precast, Integral Cove Base: Impact-resistant, polymer-resin, cove base moldings with a grit profile to promote adhesion of resinous flooring and recommended in writing by resinous flooring manufacturer.

1. Basis-of-Design Manufacturer:

a. SpeedCove, Inc.

2. Cove Base Height: As indicated on Drawings.

B. Installation Adhesive: As recommended in writing by accessory manufacturer.

1. Adhesives: Do not use adhesives that contain urea formaldehyde.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

a. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.

2. Cut 1/4 inch deep by 3/16 inch wide keyways 6 inches from all perimeter walls, machinery pedestals, and both sides of control joints, and at regular intervals spaced 10 to 12 feet apart. Cut 1/4 inch deep by 1/4 inch wide keyways around floor drains, transitions, and termination points.

    a. Always turn resinous flooring into a keyway; do not feather edge base coat or subsequent coats.

3. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
4. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels for primer application according to manufacturer's written instructions.
5. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

D. Waterproofing Membrane Installation: Install waterproofing membrane according to manufacturer's written instructions in thickness sufficient to produce 23 mils (0.71 mm) dry film thickness.

E. Moisture Mitigation Membrane: At concrete substrates that exceed manufacturer's recommended moisture limits or are outside acceptable pH, install system-standard moisture mitigation membrane according to manufacturer's written instructions.

F. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

1. Do not thin base coat, intermediate coat, or topcoat.

3.2 APPLICATION

A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.

    a. When placing cementitious polyurethane base coat, keep a wet edge between mixes. Place each batch within working time of the prior one.

2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

B. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details, including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.

1. Integral Cove Base: Height indicated in Drawings, not less than 6 inches.

C. Troweled Body Coats: Apply troweled body coats in thicknesses indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.

D. Topcoats: Apply topcoatr indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 FIELD QUALITY CONTROL

A. Ponding Testing: Test each floor for positive drainage. Correct slopes of floors that exhibit standing water. Retest until passing.

3.4 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular carpet tile at offices and where indicated on Finish Schedule.
2. Metal transition strips.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 09 65 13 "Resilient Base and Accessories" for straight-profile base installed with tile carpeting.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Initial Selection: For each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

D. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, and pattern.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II or better certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup not less than 100 sq. ft., at location selected by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.9 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Product: As indicated in Finish Schedule on Drawings (CPT).

1. Interface, Inc.; Platform Collection

B. Backing: CQuestGB (updated version of GlasBac).

C. Colors and Patterns: As scheduled.

D. Performance Characteristics, as follows:

1. Critical Radiant Flux Classification: Not less than 0.22 W/sq. cm., per ASTM E 648.
2. Smoke Density: Not more than 450, per ASTM E 662.
3. Flammability: Passes Methenamine Pill Test (DOC -FF1-70.)
4. Fiber Modification Ratio: Not more than 2.2.
5. Total Recycled Content: Exceeding 50 percent.
6. Preservative Efficiency and Mold Reduction: Meet or exceed AATCC 174 Parts 2 and 3, and comply with ASTM E 2471.
7. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program or SCS Global Services FloorScore program.

2.2 INSTALLATION ACCESSORIES

A. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following, or approved equivalent:

a. Schluter Systems; Schluter SCHIENE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method:

1. Spot-Adhered; Install carpet tiles with manufacturer's proprietary adhesive "dots" or spray adhesive, as indicated.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

I. Install metal edge strips at flooring transitions, as indicated on Interior Design Drawings.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

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SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

1. Galvanized steel.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements" for low-VOC requirements that pertain to the products specified in this Section.
2. Division 05 Sections for shop priming of metal surfaces for field painting.
3. Section 09 91 23 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements"

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of exterior paint to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Apply mockups as follows:

1. For paint systems, apply first-in-place mockup of each color and finish to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

a. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

1) Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
2) Other Items: Architect will designate items or areas required.

b. Final approval of color selections will be based on mockups.

1) If preliminary color selections are not approved, apply mockups of additional colors selected by Architect at no added cost to Owner.

c. Subject to compliance with requirements, approved in-place mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: All paint products shall be from a single source, from a single manufacturer.

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: Provide materials that comply with VOC limits in Section 01 81 13 "Sustainable Design Requirements."

C. Colors: As indicated in a color schedule.

2.3 METAL PRIMERS

A. Primer, Galvanized: As recommended in writing by topcoat manufacturer.

1. Basis of Design Product: Pittsburgh Paints: Pitt-Tech Plus EP Interior/Exterior Acrylic DTM Primer, 90-1912 Series.
2. If topcoat product is considered self-priming by manufacturer, provide topcoat as primer.

2.4 WATER-BASED PAINTS

A. Acrylic Enamel, Exterior Semi-Gloss (Gloss Level 5): 100 percent acrylic premium paint.

1. Basis of Design Product: Pittsburgh Paints; Pitt-Tech Plus EP Interior/Exterior Acrylic DTM Industrial Enamel Semi-Gloss, 90-1610 Series.
2. Comparable Product: Sherwin-Williams Company (The); B42 Metalatex Semi-Gloss.

2.5 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

1. Factory-Primed Substrates: Verify compatilbility of factory primer. Provide barrier coat over incompatible primers.
2. Remove pretreatment by mechanical methods, for galvanized sheet metal fabricated from coil stock.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

1. Latex System: At steel doors, galvanized stairs and railings, and at flashing indicated to be painted.

a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.

1) Basis of Design DFT: 2.0 mils minimum.

b. Intermediate Coat: Latex, exterior, matching topcoat product and DFT.
c. Topcoat: Latex, exterior semi-gloss (Gloss Level 5).

1) Basis of Design DFT: 2.0 mils minimum.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Steel.
3. Galvanized metal.
4. Aluminum (not anodized or otherwise coated).
5. Wood.
6. Gypsum board.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements" for VOC limits for paints and coatings.
2. Section 09 91 13 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
3. Section 09 93 00 "Staining and Transparent Finishing" for transparent finish at interior wood, where indicated.

1.2 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 gallons of general paint, 1 gallon of each trim sheen.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Surfaces painted in Unit Mockup as specified in Section 01 43 39 "Mockups."
b. Vertical and Horizontal Surfaces, Other than at Unit Mockup: Provide samples of at least 100 sq. ft. (9 sq. m).
c. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer for Paint Products: Subject to compliance with requirements, provide products by the following:

1. The Sherwin-Williams Company

B. Manufacturers of Comparable Products: Subject to approval by Owner, products by the following may be considered comparable to basis-of-design products:

1. Benjamin Moore & Co. (Canada).

C. Products: Subject to compliance with requirements, provide product indicated in Finish Schedule on Drawings where applicable, or basis-of-design product from specifications. Comparable products by Owner-approved manufacturer, from the products listed in Part 2 articles for the paint category indicated, may be considered.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits set forth in Section 01 81 13 "Sustainable Design Requirements."

D. Colors: As selected by Architect from manufacturer's full range. See Finish Schedule in Drawings for locations.

1. Control Colors:

a. White White: Benjamin Moore Super White.
b. Off-White: Benjamin Moore White Dove.
c. Creamy Off-White: Sherwin Williams Alabaster.

2.3 BLOCK FILLER

A. Block Filler, Latex, Interior/Exterior: As recommended in writing by topcoat manufacturer for exterior use in paint system indicated.

1. Sherwin-Williams Company (The): B25W25 Block Filler.

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior, for Wood, Gypsum Board and Metals:

1. Basis-of-Design Product:

a. The Sherwin-Williams Company; ProMar 200, Zero-VOC Latex Primer, B28W2600.

2. Comparable Product:

a. Benjamin Moore; Super Spec, Latex Enamel Undercoater and Primer Sealer, 253.

B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: VOC-compliant primer recommended in writing by topcoat manufacturer for use in paint systems indicated.

B. Primer, Galvanized, Water Based: VOC-compliant primer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1):

1. Basis-of-Design Product:

a. The Sherwin-Williams Company; ProMar 200 Zero VOC Interior Latex Flat, B30W02651.

b. Comparable Product:

1) Benjamin Moore; Ultra Spec 500, Interior Paint, Flat Finish, N536.

B. Latex, Interior, Institutional Low Odor/VOC, Eggshell (Gloss Level 3), or Owner-approved product from the following:

1. Basis-of-Design Product:

a. The Sherwin-Williams Company; ProMar 200 Latex Eg-Shel, B20W02651 series.

2. Comparable Product:

a. Benjamin Moore; Ultra Spec 500 Interior Paint, Eggshell Finish, 538.

C. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5):

1. Basis-of-Design Product:

a. The Sherwin-Williams Company; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31W02651 series.

2. Comparable Product:

a. Benjamin Moore; 376 Eco Spec WB, 376.

D. Waterborne Epoxy, Interior, Semi-Gloss (Gloss Level 5):

1. Basis-of-Design Product:

a. The Sherwin-Williams Company; Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss.

2. Comparable Product:

    a. Benjamin Moore; Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341.

3. Subject to compliance with requirements, Owner-approved equivalent product by one of the named manufacturers may be used in lieu of basis-of-design product.
4. For use at trash rooms and janitor closet.

2.7 DRY FOG/FALL COATINGS

A. Dry Fall, Latex, Flat:

1. Basis-of-Design Product:

    a. The Sherwin William Company; Pro Industrial Waterborne Acrylic Flat B42.

2. Comparable Product:

    a. Benjamin Moore; Super Kote 5000 Dry Fall Coating, Latex - Flat N110.

3. Subject to compliance with requirements, Owner-approved equivalent product by one of the named manufacturers may be used in lieu of basis-of-design product.
4. For use at cementitious wood fiber acoustical panels. See Section 09 51 13 "Acoustical Panel Ceilings."

PART 3 - EXECUTION

3.1 GENERAL

A. Unless specifically noted, prefinished and factory finished items are NOT to be painted. Contractor shall confirm where prefinished or factory-finished items are used in Project.

3.2 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3, "Power Tool Cleaning."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.4 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint exposed surfaces except as otherwise noted. Request clarification from Architect for questions or for extent of colors and paint systems where not indicated in Drawings.
3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
4. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
3. Provide 3 coats of paint for all sprinkler pipes exposed to exterior or at unconditioned interior spaces.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, flat (Gloss Level 1).

B. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

C. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, galvanized, water based.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

D. Wood Substrates: Including wood trim, doors, and wood-based panel products indicated to be painted.

1. Institutional Low-Odor/VOC Latex System: For substrates indicated for painting.

a. Prime Coat: Primer, latex, for interior wood.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

E. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

1) Provide intermediate coat at gypsum board to receive vinyl mural covering.
2) Omit intermediate coat inside units.

c. Topcoat:

1) Unless otherwise indicated: Latex, interior, institutional low odor/VOC, eggshell (Gloss Level 3).

2) At WCs and shower rooms, maintenance rooms and laundry rooms, doors, and trim: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).
3) Transition between gloss levels at door frames and cased openings.

END OF SECTION

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SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface preparation and application of penetrating oil stain on exterior and interior substrates.
2. Penetrating sealer for exposed glulam beams at exterior.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 20 13 "Exterior Finish Carpentry" for trellises and fascias receiving transparent finish.
3. Section 06 20 23 "Interior Finish Carpentry" for interior paneling and trim receiving transparent finish.
4. Section 07 46 23 "Wood Siding" for siding receiving transparent finish.
5. Structural Drawings for exposed glulam beams to receive transparent Drawings.

1.2 COORDINATION

A. Coordinate compatibility of transparent finish with fire-retardant treatment applied after finish. Comply with transparent finish and fire retardant treatment manufacturer's written recommendations to ensure products can be used together while fulfilling their intended functions.

1. See wood products sections in "Related Requirements" paragraph for fire-retardant treatments.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of product indicated. Provide stepped Samples on actual substrates, with each coat exposed at part of Sample.

C. Samples for Verification: For each type of finish system.

1. Submit Samples on representative samples of actual wood substrates, 8 inches (200 mm) square or 8 inches (200 mm) long.
2. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
3. VOC content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Transparent Finishes: 5 gal. (19 L) of each material applied.

1.5 QUALITY ASSURANCE

A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface or item to represent surfaces and conditions for application of each type of finish system and substrate.

2. Final approval of finishes will be based on mockups.

a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the category indicated, or comparable products by another manufacturer.

2.2 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 WOOD FILLERS AND PRE-TREATMENTS

A. Wood Filler Paste: As recommended by finish manufacturer for application indicated.

B. Primer or Cleaner: As recommended by finish manufacturer for application indicated.

2.4 PENETRATING OIL FINISH

A. Exterior Penetrating Oil Finish: Premium penetrating oil finish with high UV-inhibitor rating, designed for use at exterior redwood siding and trim.

1. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable:

a. WOCA Woodcare; WOCA Exterior Wood Oil.

2. Comparable Products: Subject to compliance with requirements and Architect's approval, the following may be used in lieu of basis-of-design product:

a. AFM; Safecoat Naturals, Clear Penetrating Oil.
b. Cabot; Australian Timber Oil.
c. Performance Coatings; Penofin Ultra Premium Red Label and Penofin Redwood All Heart.
d. Rubio; MonoCoat Oil Plus 2C.

B. Interior Penetrating Oil Finish: Premium penetrating oil finish with UV-protection and low-VOC, designed for use at interiors.

1. Basis of Design Product: Subject to compliance with requirements, provide the following or comparable:

a. Performance Coatings; Penofin Verde.

2. Comparable Products: Subject to compliance with requirements and Architect's approval, the following may be used in lieu of basis-of-design product:

a. AFM; Safecoat Naturals, Clear Penetrating Oil.

C. Interior Waterborne Acrylic wood finish, low VOC, for use at interior running trim and where indicated.

1. Deft Clear Wood Finish, or equal.

2.5 PENETRATING SEALER

A. Penetrating Waterproofing Sealer: Solvent-based rosin and oil-modified urethane; non-film-forming penetrating sealer that hardens and waterproofs wood. For use at exterior glulam beams.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following or approved comparable:

    a. Daly's Wood Finishing Products; Seafin Ship 'N Shore.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 13 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
3. Remove mill glaze by sanding.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.

3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

C. Penetrating waterproofing sealer for glulam requires a minimum of 2 coats. Allow first coat to fully dry before applying second coat; wait a minimum of 24 hours between coats.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

END OF SECTION

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SECTION 10 12 00 - DISPLAY CASES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Display cases.

B. Related Sections:

1. Section 01 21 00 "Allowances" for allowance to be allocated for the Work of this Section.

1.2 DEFINITIONS

A. Display Case: Glazed cabinet with tackboard panel back surface and adjustable shelves.

B. Tackboard Panel: A material for holding push-pins or tacks, typically consisting of a facing such as fabric, vinyl, or cork; adhered to a substrate such as fiberboard, hardboard, or particleboard.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For display cases.

1. Include plans, elevations, sections, and attachment details.
2. Show location of seams and joints in tackboard panels.
3. Include sections of typical trim members.
4. Include diagrams for wiring of illuminated display cases.

C. Samples for Initial Selection: For each type of exposed finish.

1. Include Samples of tackboard panels and factory-finished trim involving color finish selection.

D. Samples for Verification: For each type of exposed finish for the following:

1. Tackboard Panel: Not less than 8-1/2 by 11 inches (215 by 280 mm), with facing and substrate indicated for final Work. Include one panel for each type, color, and texture required.
2. Trim: 6-inch- (150-mm-) long sections of each trim profile including corner section.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For display cases to include in maintenance manuals.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install display cases for indoor installations until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain display cases from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

2.3 DISPLAY CASES

A. Display Cases:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ASI Visual Display Products.
    b. Claridge Products and Equipment, LLC.
    c. Platinum Visual Solutions.
    d. Tablet & Ticket Co. (The).

2. Recessed Display Case: Factory-fabricated display case; with finished interior, operable glazed doors at front, and trim on face to cover edge of recessed opening.

    a. Display Case Cabinet: Extruded aluminum.

    b. Face Frame:

        1) Aluminum.

    c. Aluminum Finish: Color anodic.

        1) Color: Dark bronze.

3. Glazed Hinged Doors: Tempered glass; set in frame matching cabinet material and finish. Equip each door with full-height continuous hinge and cylinder lock with two keys.

    a. Thickness: Not less than 5 mm thick.
    b. Number of Doors: As indicated on Drawings.

4. Shelves: 6-mm-thick tempered glass; supported on adjustable shelf standards and supports.

5. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface or BHMA A156.9, B04071; with shelf rests, B04081; mounted on sides. Provide standards extending full height of display case.
6. Natural-Cork Back Panel: Natural-cork tackboard panel.

2.4 TACKBOARD PANELS

A. Natural-Cork Tackboard Panel:

1. 1/8-inch- (3-mm-) thick, natural-cork sheet factory laminated to 3/8-inch- (9.5-mm-) thick, fiberboard backing.

2.5 MATERIALS

A. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.

B. Hardboard: ANSI A135.4, tempered.

C. Fiberboard: ASTM C208.

D. Particleboard: ANSI A208.1, Grade M-1.

E. Hardwood Plywood: HPVA HP-1.

F. Natural-Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

G. Extruded-Aluminum Bars and Shapes: ASTM B221 (ASTM B221M), Alloy 6063.

H. Aluminum Tubing: ASTM B429/B429M, Alloy 6063.

I. Clear Tempered Glass: ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering.

J. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

K. Adhesives: Use adhesives that comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 FABRICATION

A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.

B. Use metals and shapes of thickness and reinforcing required to produce flat surfaces, and to impart strength for size, design, and application indicated.

C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

D. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500 for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine roughing-in for electrical power systems to verify actual locations of connections before installation of illuminated units.

C. Examine walls and partitions for proper backing for display cases.

D. Examine walls and partitions for suitable framing depth if recessed units will be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.

C. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended in writing by manufacturer.

B. Touch up factory-applied finishes to restore damaged areas.

END OF SECTION 10 12 00

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cutout dimensional characters at Project signage at Building entry.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Half-size Sample of each type of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.
3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.

E. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.

1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Deterioration of finishes beyond normal weathering.
    b. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design sign structure and anchorage of dimensional character signs according to structural performance requirements.

B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.

1. Uniform Wind Load: As indicated on Drawings.

C. Seismic Performance of Signage: Dimensional signage shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.0.

D. Thermal Movements: For exterior dimensional signage, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:

1. Character Material: Sheet or plate aluminum.
2. Character Height: Minimum height acceptable to AHJ, but not less than 9 inches (229 mm).
3. Thickness: 1/2 inch (12.6 mm).

    a. Integral Aluminum Finish: Color anodized.

4. Mounting: Projecting studs.
5. Typeface: As selected by Architect from manufacturer's full range.

2.3 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.

2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices unless otherwise indicated.
3. Sign Mounting Fasteners:

    a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 14 23 - PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panel signs.
2. Field-applied, vinyl-character signs.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements" for low-emitting materials, including adhesives.

1.2 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.3 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Data for Low-Emitting Materials: For adhesives, documentation including printed statement of VOC content.

B. Shop Drawings: For panel signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Panel Signs: Not less than 12 inches (300 mm) square, including corner.
2. Room-Identification Signs: Full-size Sample.
3. Field-Applied, Vinyl-Character Signs: Full-size Sample of characters on glass.
4. Exposed Accessories: Full-size Sample of each accessory type.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC for signs.

1. Only the following three methods for achieving code-required 1/32-inch raised characters on panel signs will be accepted. Surface-adhered raised characters are not permitted.

a. Inserted contrasting-color letters in solid-sheet sign.
b. Thermoformed integral raised characters in solid-sheet sign, with painted character surfaces in contrasting color.
c. Laminated-sheet sign with contrasting laminate top surface with reverse-engraved letters.

2.2 SIGNS

A. Panel Signs: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated-Sheet Sign: Polymer face sheet laminated to contrasting color phenolic backing sheet to produce composite sheet. Reverse-engrave to form raised characters, by sandblasting or other mechanical means.

    a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.

2. Solid-Sheet Sign: Acrylic sheet with finish specified in "Surface Finish and Applied Graphics" Subparagraph below and as follows:

    a. Thickness: Manufacturer's standard for size of sign.
    b. Surface-Applied Graphics: Applied baked enamel or powder coat paint.
    c. Etched and Filled Graphics: Sign face etched or routed to receive enamel-paint infill.
    d. Raised Graphics: Inserted letters embedded minimum 1/32 inch and adhered or fused, or thermoformed integral raised characters.

3. Mounting: Manufacturer's standard method for substrates indicated with concealed anchors, adhesive, and/or two-faced tape.

    a. At room identification signs, coordinate installation of metal clip on door to receive sign. See Section 08 71 00 "Door Hardware."
    b. See Drawings and Section 01 23 00 "Alternates" for alternate mounting of room identification signs and metal clip.

4. Surface Finish and Applied Graphics:

    a. Integral Acrylic Sheet Color: As indicated in Signage series of Drawings.
    b. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as indicated in Signage series of Drawings.
    c. Painted Finish and Graphics: Manufacturer's standard, factory-applied acrylic polyurethane, in color as indicated in Signage series of Drawings.

5. Text and Typeface: Accessible raised characters and Braille typeface as indicated in Signage series of Drawings.

    a. Raised Characters: Contrasting color, minimum 1/32 inch deep.
    b. Braille: Same color as background, raised and spaced according to ANSI A117.1, Grade 2 Braille.

6. Flatness Tolerance: Sign panel shall remain flat or uniformly curved under installed conditions as indicated and within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

2.3 FIELD-APPLIED, VINYL-CHARACTER SIGNS

A. Field-Applied, Vinyl-Character Sign Insert drawing designation: Prespaced characters die cut from 3- to 3.5-mil (0.076- to 0.089-mm) thick, weather-resistant vinyl film with release liner on the back and carrier film on the front for on-site alignment and application.

1. Size: As indicated.

2. Substrate: As indicated.
3. Text and Font: As indicated.

2.4 PANEL-SIGN MATERIALS

A. Steel Materials:

1. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

C. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

D. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish hot-dip galvanized devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
b. Fastener Heads: For nonstructural connections, use screws and bolts with tamper-resistant or one-way-head slots unless otherwise indicated.

4. Sign Mounting Fasteners:

a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.
b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material or screwed into back of sign assembly, unless otherwise indicated.

5. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Adhesives: As recommended by sign manufacturer and with a VOC content complying with limits set forth in Section 01 81 13.34 "Sustainable Design Requirements - CALGreen."

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
    b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
5. Shim-Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other direct mounting methods are impractical. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to plate using adhesive or two-face tape method specified above.

C. Field-Applied, Vinyl-Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

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SECTION 10 14 26 - POST AND PANEL/PYLON SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonilluminated post and panel signs.

B. Related Requirements:

1. Section 10 14 19 "Dimensional Letter Signage" for wall-mounted dimensional characters.
2. Section 10 14 23 "Panel Signage" for wall-mounted sign panels.

1.2 COORDINATION

A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For post and panel/pylon signage and accessories.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring for pedestrian warning sign.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly, showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Post and Panel Signs: Not less than 12 inches (300 mm) square, including corner and post.
2. Variable Component Materials: 8-inch (200-mm) Sample of each base material, character or graphic element, in each exposed color and finish not included in other Samples.
3. Exposed Accessories: Full-size Sample of each accessory type.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design sign structure and anchorage of post and panel sign type(s) to withstand design loads indicated in Structural Drawings, including seismic loads.

B. Thermal Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

C. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC for signs.

D. Signage Program: Provide post and panel signs that comply with signage program approved by Owner and authorities having jurisdiction.

2.2 POST AND PANEL/PYLON SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product of SignCraft Architectural Signage, or comparable product by one of the following:

1. Allen Industries, Inc.
2. ASI Sign Systems, Inc.
3. Garnett Sign Studio.

B. Post and Panel Sign: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Solid-Sheet Sign Panels: Aluminum sheet with finish specified in "Sign-Panel-Face Finish and Applied Graphics" Subparagraph below and as follows:

a. Thickness: Manufacturer's standard for size of sign.
b. Surface-Applied Graphics: Applied vinyl film or paint.

2. Posts: Aluminum or galvanized steel.

a. Shape: Round.
b. Size: 2-inch (50-mm) diameter or larger, as required for performance indicated.
c. Installation Method: Direct burial or reverse sleeve.
d. Finish and Color: Mill.

3. Sign-Panel-Face Finish and Applied Graphics:

a. Baked-Enamel or Powder-Coat Finish and Graphics: Manufacturer's standard, in color as selected by Architect from manufacturer's full range.
b. Painted Finish and Graphics: Manufacturer's standard, factory-applied exterior-grade sign paint, in color as selected by Architect from manufacturer's full range.

1) Provide retroflective graphics where required.

c. Overcoat: Manufacturer's standard baked-on clear coating.

4. Text and Typeface: Typeface as indicated by manufacturer's designation.

2.3 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial or forming steel.
2. Steel Tubing or Pipe: ASTM A 500, Grade B.
3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

D. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.

3. Exposed Metal-Fastener Components, General:
    a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant, Allen-head slots unless otherwise indicated.
4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Anchoring Materials:

1. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
2. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
    a. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
2. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
3. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
4. Internally brace signs for stability and for securing fasteners.

B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
2. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
3. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.

C. Post Fabrication: Fabricate posts designed to withstand wind pressure indicated for Project location and of lengths required for installation method indicated for each sign.

1. Aluminum Posts: Manufacturer's standard 0.125-inch- (3.18-mm-) thick, extruded-aluminum tubing unless otherwise indicated, with brackets or slots to engage sign panels. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
2. Steel Posts: Fabricate from minimum 0.120-inch- (3.05-mm-) thick steel tubing unless otherwise indicated. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
    a. Hot-dip galvanize post assemblies after fabrication according to ASTM A 123/A 123M.
3. Direct Burial: Fabricate posts 36 inches (910 mm) longer than height of sign to permit direct burial or embedment in concrete foundations or concrete-filled postholes.
4. Reverse Sleeves: Provide inserts by sign manufacturer, sized for close fit inside posts. Size inserts for direct embedment in concrete foundations and to attach sign posts securely and prevent sign movement, but of a height not less than one-third of post height plus 36 inches (910 mm) for embedment.
    a. Provide through bolts to fasten posts to inserts.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to accessibility standard.
3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING POSTS

A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

B. Direct-Burial Method:

1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches (300 mm), backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
2. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete in posthole or for concrete foundation as indicated.
3. Setting in Preformed Hole in Concrete Foundation: Form or core drill holes in concrete foundation not less than 3/4 inch (20 mm) larger than outside dimension of post for installing posts in concrete. Set post in position, shim to prevent movement, and fill annular space between post and hole with nonshrink, nonmetallic grout oranchoring cement, mixed and placed to comply with manufacturer's written instructions.

a. Leave anchorage joint exposed with 1/8-inch (3-mm) anchoring material sloped away from post.

C. Reverse-Sleeve Method: Set post in position over the projecting insert and support post to prevent movement, drill posts and inserts for through bolts, and install and tighten through bolts.

3.4 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

SECTION 10 21 13.19 - PLASTIC DRESSING COMPARTMENTS AND TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic panels configured as dressing compartments and toilet compartments.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking for compartments.
2. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on compartments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for dressing compartments and toilet compartments.

B. Shop Drawings: For dressing compartments and toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Initial Selection: For each type of panel material indicated.

1. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for compartments, prepared on 6-inch-(152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

E. Product Schedule: For dressing compartments and toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for enclosure and compartment material(s).

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of assembly.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For dressing compartments and toilet compartments, to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents and source.

1. Door Hinges: Two hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.
5. Fasteners: Ten fasteners of each size and type.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of fixtures, walls, columns, ceilings, and other construction contiguous with dressing compartments and toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

B. Recycled Content of Solid-Plastic Components: Postconsumer recycled content not less than 100 percent.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and CBC for toilet compartments designated as accessible.

2.2 MATERIALS

A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface.

B. Aluminum Castings: ASTM B 26/B 26M.

C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M). 6463-T5 alloy and temper.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

E. Stainless-Steel Castings: ASTM A167, Type 304..

F. Rubber: Abrasion resistant Styrene Butadiene Rubber, 65 to 80 Shore A durometer, black

2.3 SOLID-PLASTIC DRESSING COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Scranton Products; Dressing Compartments.

B. Configuration: Dressing compartments installed in front of tiled shower surrounds, as indicated on Drawings.

C. Compartment Style: Privacy type.

D. Panel Construction: Solid, HDPE panel material, not less than 1 inch (25 mm) thick, seamless, with eased edges and with homogenous color throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's continuous, [extruded-aluminum] [or] [stainless steel] strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color: As selected by Architect from manufacturer's full range.

E. Pilaster Construction: Match panels.

F. Door Construction: Material matching panels, with molded door design. Equip door and pilasters with lapped edge no-sightline system.

G. Brackets (Fittings):

1. Dressing Compartment Brackets:

a. Full-Height (Continuous) Type: Manufacturer's standard design.

H. Headrail with Hooks: Installed between dressing compartment and tiled shower surround. Manufacturer's standard, continuous, extruded-aluminum headrail or cap with curtain hooks running in concealed track; with antigrip profile; in manufacturer's standard finish.

1. Clear anodized.
2. Fastened to headrail brackets and top of pilaster using stainless steel, tamper-resistant Torx head screws.

I. Headrial: Manufacturer's standard continuous, extruded-aluminum headrail.

1. Finish: Clear anodized.
2. Fastened to headrail brackets and top of pilaster using stainless steel, tamper-resistant Torx head screws.

J. Headrail Brackets: 20 gage stainless steel.

2.4 DRESSING COMPARTMENT HARDWARE AND ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.

1. Hinges: Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.

a. Material: Stainless steel.

2. Occupancy Indicator Latch and Housing: Satin-finish stainless steel with interior slide bolt, which activates exterior "occupied" indicator when closed, and reveals "not occupied" indicator when compartment is open. Exterior indicator has integral pull for opening door.
3. Clothing Hooks: Manufacturer's clothing hooks in each dressing compartment.
4. Changing Bench: See Section 10 28 00 "Toilet and Shower Accessories."

2.5 SOLID-PLASTIC TOILET COMPARTMENTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Scranton Products; Eclipse Series, High-Privacy model.

a. Height: 96 inches (2438 mm).
b. Mounting Height: As indicated on Drawings.

B. Toilet-Enclosure Style: Overhead braced.

C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, seamless, with shiplap edges as part of no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Panel and Door Thicknesses: 1 inch (25 mm).
2. Pilaster Thickness: 1-1/4 inches (32 mm).
3. Color and Pattern: Per manufacturer's designations for product scheduled.
4. Heat-Sink Strip: Manufacturer's standard continuous Class B extruded aluminum strip fastened to exposed bottom edges of solid plastic components, to prevent burning.

D. Posts: Metal Posts: 82-3/4 inches (2102 mm) high, heavy-duty extruded aluminum, clear anodized finish unless otherwise indicated, fastened to stainless steel plinth with stainless steel tamper resistant screw.

E. Concealed Shoe: One-piece molded polyethylene shoe inserted into metal post and secured to post with stainless steel tamper-resistant screw.

F. Headrail and Corner Caps: One-piece molded polyethylene secured to metal post with stainless steel tamper-resistant screw; adjustable, for leveling headrail to finished floor.

G. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum, clear anodized, inserted into slotted panel and fastened to panels with stainless steel tamper-resistant screws.

H. Headrail: Heavy duty extruded aluminum, anti-grip design, clear anodized finish, fastened to headrail bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper resistant screw.

2.6 TOILET COMPARTMENT HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard operating hardware and accessories.

1. Material: Stainless steel.
2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position, edge mounted, allowing emergency access by lifting door.
3. Occupancy Indicator: Manufacturer's standard slide bolt latch with integrated occupancy indicator; device shows green for occupied and red for not occupied.
4. Occupancy Indicator Latch and Housing: Satin-finish stainless steel with interior slide bolt, which activates exterior "occupied" indicator when closed, and reveals "not occupied" indicator when compartment is open. Exterior indicator has integral pull for opening door.

5. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
6. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
7. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.7 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Toilet Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Floor-and-Ceiling-Anchored Dressing Compartments: Manufacturer's standard, corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

D. Toilet Compartment Door Size and Swings: Unless otherwise indicated, provide minimum 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and minimum 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

E. Dressing Compartment Door Sizes and Swing: Unless otherwise indicated, provide minimum 24-inch- (610-mm-) wide, in-swinging doors for standard dressing compartments and minimum 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 3/8 inch (9 mm).
b. Panels and Walls: 1/2 inch (13 mm).

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
b. Align brackets at pilasters with brackets at walls.

B. Floor and Ceiling Anchored Dressing Compartments: Secure pilasters to supporting construction, and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.

C. Overhead-Braced Toilet Compartments: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION

SECTION 10 21 23 - CUBICLE CURTAINS AND TRACK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cubicle-curtain tracks and carriers at Exam Rooms and where indicated on drawings.
2. Cubicle curtains.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for concealed blocking, where required.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For each type of curtain fabric indicated, include durability, laundry temperature limits, fade resistance, applied curtain treatments, and fire-test-response characteristics.

B. Shop Drawings: For curtains and tracks.

1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
2. Include details of blocking for track support.

C. Samples for Initial Selection: For each type of curtain material indicated.

D. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

1. Curtain Fabric: Not less than 10 inches (254 mm) square and showing complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 10 inches (254 mm) square.
3. Curtain Track: Not less than 10 inches (254 mm) long.
4. Curtain Carrier: Full-size unit.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For curtains, tracks, and hardware to include in operation and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed for each size indicated, but no fewer than 10 units.

2. Curtains: Full-size units equal to 10 percent of amount installed for each size indicated, but no fewer than two units.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Cubicle Curtains: Provide curtain fabrics with the following characteristics:

1. Laundering: Launderable to a water temperature of not less than 160 deg F (71 deg C).
2. Flame Resistance: Provide fabrics identical to those that have passed NFPA 701 when tested by a qualified testing agency acceptable to authorities having jurisdiction.

a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CUBICLE-CURTAIN SUPPORT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Construction Specialties, Inc.
2. InPro Corporation (IPC).
3. Salsbury Industries.

B. Extruded-Aluminum Curtain Track: Not less than 5/8 inch wide by 1/2 inch high (16 mm wide by 13 mm high).

1. Track Minimum Wall Thickness: Manufacturer's standard.
2. Curved Track: Factory-fabricated, 12-inch- (305-mm-) radius bends.
3. Finish: Satin anodized.

C. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

1. End Stop: Removable with carrier hook.

D. Curtain Roller Carriers: Two nylon rollers and nylon axle with nylon hook.

E. Curtain Glide Carriers: One-piece nylon glide with nylon hook.

F. Concealed Fasteners: Stainless steel.

2.3 CURTAINS

A. Fabric: Curtain manufacturer's standard, 100 percent polyester; inherently and permanently flame resistant, stain resistant, and antimicrobial.

1. Product: [TBD].

B. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches (152 mm) o.c.; machined into top hem.

C. Mesh Top: Not less than 22-inch- (559-mm-) high mesh top.

D. Snap Attachments: Provide manufacturer's standard nickel-plated brass snap attachments for modular panels.

2.4 CURTAIN FABRICATION

A. Continuous Curtain Panels:

1. Width: Equal to track length from which curtain is hung plus 10 percent of added fullness, but not less than 12 inches (305 mm) of added fullness.
2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor of 12 inches (305 mm) unless otherwise indicated.
3. Top Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lockstitched.
4. Mesh Top: Top hem of mesh not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch (13-mm) triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than 1 inch (25.4 mm) and not more than 1-1/2 inches (38 mm) wide, double thickness and double lockstitched.
6. Side Hems: Not less than 1/2 inch (13 mm) and not more than 1-1/4 inches (32 mm) wide, with double turned edges, and single lockstitched.
7. Vertical Seams: Not less than 1/2 inch (13 mm) wide, double turned and double stitched.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install tracks level and plumb, according to manufacturer's written instructions.

B. For tracks of up to 20 feet (6.0 m) in length, provide track fabricated from single, continuous length.

C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows, as applicable to substrate:

1. Mechanically fasten directly to bottom of concrete deck with post-installed anchors.
2. Mechanically fasten to furring through suspended ceiling with screw and tube spacer.
3. Attach track to suspended ceiling grid with manufacturer's proprietary clip.

D. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

E. Curtain Carriers: Provide curtain carriers adequate for 6-inch (152-mm) spacing along full length of curtain plus an additional carrier.

F. Cubicle Curtains: Hang curtains on each curtain track.

END OF SECTION

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel cornerguards.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each form of wall protection.

B. Product Schedule: Indicating location, material, height, and finish.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store wall protection in area protected from weather, moisture, and soiling.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall protection until building is enclosed and weatherproof, and wet work is complete and dry.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards, Stainless Steel: Fabricated as one piece from formed or extruded metal with formed edges; with 90-degree turn and beveled edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

    a. Construction Specialties, Inc.; Acrovyn CO-8 Stainless Steel Corner Guard.

2. Material: Stainless-steel sheet, Type 304.

    a. Thickness: Minimum 0.0590 inch (1.5 mm).
    b. Finish: Directional satin, No. 4.

3. Legs: 2 inches (51 mm), unless otherwise indicated.
4. Height: As indicated in Drawings
5. Corner Radius: Not to exceed 3/16 inch (4.8 mm).
6. Mounting: Flat-head, tamper-resistant countersunk screws through factory-drilled mounting holes.

2.2 FINISHES, GENERAL

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine walls to which wall protection will be attached for blocking, grounds, and other solid backing that has been installed in the locations required for secure attachment of support fasteners.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before installation of wall protection, clean substrates to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Install all wall and door protection level, plumb, and true. Do not install items with scratches, dents, or defects on gypsum board walls or doors.

B. Corner Guards: Install at locations and heights indicated on Drawings by screw-attaching through pre-drilled holes on guards.

END OF SECTION

SECTION 10 28 00 - TOILET AND SHOWER ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use toilet accessories at all toilet and shower rooms except where noted otherwise.
2. Guest-use toilet accessories.
3. Shower accessories
4. Healthcare accessories.

B. Related Requirements:

1. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf (1112 N) concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Manufacturer:

1. Bobrick Washroom Equipment, Inc.

B. Toilet Tissue (Roll) Dispenser:

1. Product: Bobrick; B-2888.
2. Description: Double-roll dispenser.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with theft-resistant spindle.
5. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Paper Towel (Folded) Dispenser:

1. Product: Bobrick; B-262.
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

D. Waste Receptacle:

1. Product: Bobrick; B-3644.
2. Mounting: Open top, recessed.
3. Minimum Capacity: 12 gallon.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Liner: Reusable vinyl liner.
6. Lockset: Tumbler type for waste receptacle.

E. Soap Dispenser:

1. Product: Bobrick; B-2111
2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40 fl oz.
5. Materials: Manufacturer's standard for product indicated.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

F. Grab Bars:

1. Product: Bobrick; B-6806.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch (1.3 mm) thick.
    a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin).
4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

G. Sanitary Disposal Unit:

1. Product: Bobrick; B-353.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
4. Receptacle: Removable, leakproof 1.2 gallon polyethylene receptacle.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

H. Seat-Cover Dispenser:

1. Product: Bobrick; B-221
2. Mounting: Surface mounted.
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

I. Mirror Unit:

1. Product: Bobrick; B166-2436
2. Frame: Stainless steel channel.
    a. Corners: Welded and ground smooth.
3. Size: 24-by-36 inches, unless otherwise indicated on Drawings.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

2.3 GUEST-USE BATHROOM ACCESSORIES

A. Basis-of-Design Manufacturer and Collection:

1. Moen; CSI Donner.

B. Guest-Use Toilet Tissue Dispenser:

1. Description: Single-roll dispenser.
2. Mounting: Surface mounted.
3. Capacity: Designed for 4-1/2- or 5-inch- (114- or 127-mm-) diameter tissue roll.
4. Material and Finish: Manufacturer's standard metal with chrome finish.

C. Guest-Use Towel Bar:

1. Description: 3/4-inch- (19-mm-) square tube with rectangular end brackets.
2. Mounting: Flanges with concealed fasteners.
3. Length: As indicated.
4. Material and Finish: Manufacturer's standard metal with chrome finish.

D. Guest-Use Grab Bars

1. Same as public use accessories.

2.4 SHOWER ACCESSORIES

A. Folding Shower Seat, where indicated on drawings:

1. Product: Bobrick; B-5181.
2. Description: Stainless steel frame with reversible seat, solid phenolic slats in off-white color.

B. Shower Curtain:

1. Basis-of-Design Product: InPro Corp.; Clickeze "Chalet."
2. Description: 100 percent Dacron polyester or polyester/cotton blend, opaque, washable in water up to 160 degrees F, anti-microbial, meeting NFPA Standard 701 flame-resistant requirements and State of California CCR Title 19.
3. Fabricate in one piece with triple turned top hem and grommets, seamless where possible, and sanitary "no-scum" side and bottom edges.
4. Color: Manufacturer’s standard solid white or off-white color, to be selected by Architect.

C. Shower Hooks and Track: See Section 10 21 13.19 "Plastic Dressing Compartments and Toilet Compartments" for headrail that accommodates aluminum curtain hooks with self-lubricating Delrin slides. Headrail shall be installed at back of dressing compartment, in front of tiled shower enclosure.

2.5 HEALTHCARE ACCESSORIES

A. Source Limitations: Obtain healthcare accessories from single source, from single manufacturer.

B. Specimen Pass-Through Cabinet:

1. Product: Global Model 647108.
2. Description: Two-sided type, with self-closing, interlocking doors on both sides, that prevent both from being open at same time, and removable stainless steel tray.
3. Nominal Wall Opening: 12 by 11-1/4 inches (305 by 286 mm), width by height.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type.

2.6 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- (0.8-mm-) minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- (0.9-mm-) minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 (Z180) hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

F. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.7 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET AND SHOWER ACCESSORIES

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION

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SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for portable fire extinguishers.
2. Emergency responder access key lock boxes.

B. Related Requirements:

1. Section 10 44 16 "Fire Extinguishers."

1.2 COORDINATION

A. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.3 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches (150 by 150 mm) square.

D. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 INTERIOR FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fire-End & Croker Corporation.
b. Larsens Manufacturing Company.
c. Nystrom, Inc.
d. Potter Roemer LLC.

B. Cabinet Construction: Nonrated or 1-hour fire rated, to match partition rating.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet: Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.
2. For use at interior locations, other than at mechanical room.

F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

1. For use in mechanical room.

G. Cabinet Trim Material: Steel sheet.

H. Door Material: Steel sheet.

I. Door Style: Solid opaque panel with frame.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

K. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat.
b. Color: As selected by Architect from full range of industry colors and color densities.

2.3 EXTERIOR FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher and for mounting on exterior wall.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fire-End & Croker Corporation.
b. Larsens Manufacturing Company.
c. Nystrom, Inc.
d. Potter Roemer LLC.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Stainless steel sheet.

D. Semi-recessed cabinet, fabricated to shed water.

E. Cabinet Trim Material: Galvanized steel sheet.

F. Door Material: Stainless steel sheet.

G. Door Style: Full glazing with frame.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide lock, projecting door pull, and break-glass handle.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
3. Lettering: Vertical, red, on glass.

I. Materials:

1. Stainless Steel: Type 304.

a. Finish: Manufacturer's standard, not less than #4.

2. Break Glass: Clear annealed float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.

2.4 EMERGENCY RESPONDER ACCESS KEY LOCK BOXES

A. Product: Subject to compliance with requirements, provide the following:

1. Supra Systems; TRACcess TRAC-Vault with optional tamper switch.

B. Capacity: Designed for storage of two keys.

C. System must be acceptable to authority having jurisdiction.

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.

4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Provide inside latch and lock for break-glass panels.

2. At exterior cabinets, provide sealant joint between cabinet trim and substrate at top and side edges; keep bottom edge free to drain or provide weep holes. See Section 07 92 00 "Joint Sealants."

C. Emergency Responder Key Lock Boxes:

1. Install as shown on Drawings to comply with requirements of authority having jurisdiction.
2. Install key boxes no higher than 72 inches.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 10 44 13 "Fire Protection Cabinets."

1.2 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of portable fire extinguisher product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

B. Product Schedule: For portable fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For portable fire extinguishers to include in maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated. Provide fire extinguishers with metal valves.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Amerex Corporation.
b. ANSUL.
c. Badger Fire Protection.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. Larsens Manufacturing Company.
g. Nystrom Building Products.
h. Potter Roemer LLC.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Regular Multi-Purpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

C. Purple-K Dry-Chemical Type in Aluminum Container: 30-B:C, 5-lb (2.3-kg).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Knocked-down metal lockers at staff locker room.

B. Related Sections:

1. Section 10 51 23 "Plastic-Laminate-Clad Lockers" for lockers at staff break room.

1.2 ACTION SUBMITTALS

A. Shop Drawings: For metal lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locker trim and accessories.
3. Include locker identification system and numbering sequence.

B. Samples: For each color indicated, in manufacturer's standard size.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Experienced with installation of lockers of type indicated and approved or accepted in writing by locker manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.
3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CBC.

2.2 KNOCKED-DOWN METAL LOCKERS

A. General Description: Knocked-down metal lockers with sloped tops and 6-inch legs.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ASI Storage Solutions Inc.
2. Hadrian Manufacturing Inc.
3. Republic Storage Systems Company.

C. Configurations: Two-tiered configurations as indicated on Drawings.

D. Doors: One piece; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Doors less than 12 inches (305 mm) wide may be fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet.
2. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches (381 mm) wide; welded to inner face of doors.
3. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch (1.21-mm) nominal-thickness steel sheet; welded to inner face of doors.
4. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
5. Door Style: Vented panel as follows:

a. Louvered Vents: No fewer than three louver openings at top and bottom for double-tier lockers.

E. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Intermediate Dividers: 0.024-inch (0.61-mm) nominal thickness, with single bend at sides.
2. Backs and Sides: 0.024-inch (0.61-mm) nominal thickness, with full-height, double-flanged connections.

3. Shelves: 0.024-inch (0.61-mm)nominal thickness, with double bend at front and single bend at sides and back.

F. Frames: Channel formed; fabricated from 0.060-inch (1.52-mm) nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Hinges: Manufacturer's standard, steel, continuous or knuckle type.

H. Projecting Door Handle and Latch: Finger-lift latch control designed for use with either built-in combination locks or padlocks; positive automatic latching, chromium plated; pry and vandal resistant.

1. Latch Hooks: Equip doors 48 inches (1219 mm) and higher with three latch hooks and doors less than 48 inches (1219 mm) high with two latch hooks; fabricated from 0.105-inch (2.66-mm) nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
2. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Locks: Combination padlocks.

J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch (9 mm) high.

K. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.

L. Coat Rods: Manufacturer's standard.

M. Legs: 6 inches (152 mm) high; formed by extending vertical frame members with rear legs fastened.

N. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.048-inch (1.21-mm) nominal-thickness steel sheet with 1-inch (25-mm) vertical rise at front and slope of 1/3 of depth.

1. Closures: Vertical -end type.
2. Sloping-top corner fillers, mitered.

O. Finished End Panels: Fabricated from 0.024-inch (0.61-mm) nominal-thickness steel sheet.

P. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

Q. Finish: Baked enamel or powder coat.

1. Color: As selected by Architect from manufacturer's full range.

2.3 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Equipment: Provide each locker with an identification plate and the following equipment:

1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.

D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.

1. Provide for field attachment of legs.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches (381 mm) above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches (1219 mm) above the floor.

F. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

2.4 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings to completely close openings.
2. Attach finished end panels using fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

A. Clean interior and exposed exterior surfaces and polish steel and non-ferrous metal surfaces.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION

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SECTION 10 51 23 - PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes plastic-laminate-clad wood lockers for staff break room.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 10 51 13 "Metal Lockers" for lockers at staff locker room.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of plastic-laminate-clad wood locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.

B. Sustainable Design Submittals: Documentation demonstrating compliance with requirements in Section 01 81 13 "Sustainable Design Requirements" that pertain to the Work of this Section.

C. Shop Drawings: For plastic-laminate-clad wood lockers and wood-topped benches.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show details full size.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in lockers.
5. Show locker fillers, trim, base, sloping tops, and accessories.
6. Show locker numbering sequence.

D. Samples for Verification: For the following products:

1. Plastic-laminate-clad panels, not less than 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
2. Thermoset decorative-overlay-surfaced panels, not less than 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
3. Corner pieces of locker front frame joints between stiles and rail, as well as exposed end pieces, not less than 18 inches wide by 18 inches high by 6 inches deep (457 mm wide by 450 mm high by 152 mm deep).
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Sample Warranty: For special warranty.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Full-size locker doors, complete with specified door hardware. Furnish five door of each type and color installed.
2. Full-size units of the following locker hardware items, two units:

a. Hinges.
b. Pulls.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install lockers until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 17 and 50 percent during the remainder of the construction period.

B. Field Measurements: Where lockers are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of concealed wood support bases.

1. Requirements are specified in Section 06 10 53 "Miscellaneous Rough Carpentry."

B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that lockers can be supported and installed as indicated.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of locks or hardware.
c. Deterioration of wood and other materials beyond normal use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products by the following manufacturer or comparable products by another manufacturer.

1. Club Resources Group, Clubline Locker Systems.

B. Manufacturers of Comparable Products: Subject to compliance with requirements, approved comparable products may be used in lieu of products by basis-of-design manufacturer. Manufacturers of comparable products include, but are not limited to, the following:
1. Hollman, Inc.: Model B2 Laminate Locker.
2. Salsbury Industries; Designer Wood Lockers.

C. Products: Provide two-tiered lockers in configurations and dimensions indicated on Drawings.

D. Construction Style: Flush overlay.

E. Locker Body: Fabricated from particleboard-core panels covered on both sides with thermoset decorative overlay (melamine).

1. Side, Back, and Top Panels: Not less than 5/8 inch (16 mm) thick.
2. Bottom Panel: Manufacturer's standard thickness.
3. Exposed Panel Edges: 1.5-mm-thick PVC.

F. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade HGS, over both sides of particleboard core.

1. Thickness: 5/8 inch (16 mm) thick.
2. Panel Edges: 1.5-mm-thick PVC.

G. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.

H. Plastic-Laminate Finishes:

1. As selected by Architect from plastic-laminate manufacturer's full range of colors and wood grains.

2.3 MATERIALS

A. Materials shall comply with requirements in Section 01 81 13 "Sustainable Design Requirements."

B. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no added formaldehyde (NAF).
2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade VGS.

D. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

E. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

F. Wood Support Base: Manufacturer's standard size 2-by-4-inch nominal-size (51-by-102-mm, lumber treated with manufacturer's standard preservative-treatment, pressure process.

2.4 HARDWARE

A. General: Provide manufacturer's standard factory-installed locker hardware complying with the requirements in this Section.

B. Keyless Mechanical Locks: Reprogrammable cylinder lock, accepting user-provided 4-digit code, with master-key reset key, allowing for management access, if required.

1. Finish: As selected by Architect from manufacturer's full range.

C. Frameless Hinges (European Type): Fully concealed, self-closing, nickel-plated steel, with not less than 110 degrees of opening.

1. Provide two hinges for doors 36 inches (910 mm) high and less.
2. Provide three hinges for doors more than 36 inches (910 mm) high.

D. Accessible Handle: Metal, fixed, graspable lever handle and rose trim; surface mounted.

E. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; finished to match other locker hardware. Attach hooks with at least two fasteners.

1. Provide one double-prong wall hook for each compartment of double-tier lockers.

F. Coat Rods: 1-inch- (25-mm-) diameter steel; finished to match other locker hardware.

1. Provide coat rod for each compartment of double-tier lockers.

G. Exposed Hardware Finishes: Satin chrome unless otherwise indicated.

H. Exposed Hardware Finishes: Unless otherwise indicated, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

2.5 ACCESSORIES

A. Charging Raceways: Provide integrated raceways with low-voltage USB-A and USB-C charging outlets. Provide complete system of transformers, wiring, and outlets housed in UL-listed raceway.

1. Location:

a. Preferred: If acceptable to authorities having jurisdiction, provide concealed raceways at backs of lockers, allowing charging of devices inside lockers.
b. Second Choice: Horizontal between tiers or vertical between groups of lockers, providing minimum 10 percent of charging outlets at accessible reach range heights.

2. Finish: As selected by Architect from manufacturer's full range.

2.6 FABRICATION

A. Fabricate all lockers and benches to the same grade of woodwork according to AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom or better.

B. Fabricate each locker with an individual door and frame, an individual top, a bottom, and a back, and with common intermediate uprights separating compartments.

1. Fabricate lockers to dimensions, profiles, and details indicated.
2. Ease edges of corners of solid-wood members to 1/16-inch (1.5-mm) radius.

C. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately factory machine components for attachments. Make joints tight and true.

1. Fabricate lockers using manufacturer's standard doweled, glued, and nailed construction.

D. Accessible Lockers: Fabricate as follows:

1. Locate bottom no lower than 15 inches (381 mm) above the floor.
2. Where hooks are provided, locate no higher than 48 inches (1219 mm) above the floor.

E. Venting: Fabricate lockers with space between doors and locker assembly of not less than 1/2 inch (12 mm).

F. Number Plates: Inlay number plates flush in each locker door, near top, centered.

G. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

H. Shop cut openings, to maximum extent possible, to receive hardware and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

I. Attach PVC edging to panels by thermally fusing edging to panels after panel fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition lockers to average prevailing humidity conditions in installation areas before installation.

B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

C. Coordinate installation of lockers, grooming station, towel drop, and benches with work of other trades.

1. Lighting in Grooming Stations shall be installed to be turned on and off by room switch.

3.3 INSTALLATION, LOCKERS

A. Install lockers according to manufacturer's written instructions.

B. Install wood support base with 1/2-inch- (13-mm-) thick plywood top.

C. Install lockers level, plumb, and true; use concealed shims.

D. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.

1. Install lockers without distortion so doors fit openings properly and are accurately aligned. Adjust hardware to center doors in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.
2. Installation Tolerance: No more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line. Shim as required with concealed shims.

E. Locker Anchorage: Fasten wood lockers through back, near top and bottom, at ends with No. 8 flush-head wood screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or furring and spaced not more than 16 inches (400 mm) o.c.

F. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.

G. Attach sloping-top units to lockers, with end panels covering exposed ends.

H. Install number plates after lockers are in place.

1. Attach number plate on each locker door, near top, centered, with at least two screws with finish matching number plate.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding.

B. Verify that integral locking devices operate properly.

C. Verify that integral charging devices operate properly.

D. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

E. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 23

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SECTION 10 56 13 - METAL STORAGE SHELVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Four-post welded-wire metal storage shelving for dry storage at Clinic areas.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Shop Drawings: For metal storage shelving. Include plans, elevations, sections, details, and attachments to other work. Include installation details of connectors, lateral bracing, and special bracing.

C. Samples for Verification: For the following components, of size indicated below:

1. Vertical Posts: 12 inches (305 mm) tall.
2. Shelves: Full size, but not more than 24 inches wide by 12 inches deep (610 mm wide by 305 mm deep).
3. Connectors for Shelf to Post: Full size.

D. Product Schedule: For metal storage shelving.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain metal storage shelving from single source from single manufacturer.

1.4 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall and ceiling assemblies.

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, speakers, sprinklers, access panels, electrical switches or outlets, and floor drains.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance for Four-Post Metal Storage Shelving: Capable of withstanding the loads indicated according to ANSI MH 28.1.

B. Welded wire shelving used for storage in Clinic areas shall be NSF International (formerly National Sanitation Foundation) Certified for dry use.

C. Seismic Performance: Metal storage shelving shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Component Importance Factor: 1.0.

2.2 MATERIALS

A. Steel Tubing: ASTM A 513, Type 2.

B. Steel Wire: ASTM A 899.

2.3 FOUR-POST METAL STORAGE SHELVING

A. Wire-Type, Four-Post Metal Storage Shelving: Factory-formed, field-assembled, freestanding system without back or end panels, designed for truss-type welded wire shelves to span between and be supported by corner posts, with shelves adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units as indicated in Drawings. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Eagle Group.
    b. InterMetro Industries Corporation.
    c. Lyon Workspace Products, LLC.
    d. Safco Products; a division of LDI.

2. Load-Carrying Capacity per Shelf: Standard for product and size indicated in Drawings.
3. Posts: Fabricated from 1-inch- (25-mm-) OD, round tubing of indicated material; with grooves or notches at 1 inch (25 mm) o.c. to receive shelf-to-post connectors. Label posts with numbers at not less than 2 inches (51 mm) o.c. for determining shelf height.

    a. Post Material: Steel.
    b. Post Base: Bolt leveler, except provide casters where shown.
    c. Post Cap: Nylon or plastic.

4. Truss-Type Wire Shelves: Manufacturer's standard, chrome-plated wire-over-wire construction, with downturned wire truss edges; with manufacturer's standard post collar, designed to engage collet (wedge), welded at each corner.

5. Steel Finish: Manufacturer's standard chrome-plated.

2.4 FABRICATION

A. Shop Fabrication: Prefabricate shelving components in shop to greatest extent possible to minimize field fabrication; temporarily preassemble shelving components where necessary to ensure that field-assembled components fit together properly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate metal storage shelving square and rigid, with posts plumb and true and shelves flat and free of distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.3 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, true, and with shelves flat and free of sagging or other distortion. Make connections to form a rigid structure, free of buckling and warping.

1. Install exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
2. Adjust post-base bolt leveler to achieve level and plumb installation.
3. Anchor shelving units to floor with floor anchors through floor plate. Shim floor plate to achieve level and plumb installation.
4. Install seismic restraints.
5. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.

3.4 ERECTION TOLERANCES

A. Erect four-post metal storage shelving to a maximum tolerance from vertical of 1/2 inch (13 mm) in up to 10 feet (3 m) of height, not exceeding 1 inch (25 mm) for heights taller than 10 feet (3 m).

3.5 ADJUSTING

A. Adjust metal storage shelving so that connectors and other components engage accurately and securely.

B. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

C. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13

SECTION 10 81 00 - PEST CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insect control installed in walls.

B. Related Sections:

1. Section 07 92 00 "Joint Sealants."
2. Section 09 29 00"Gypsum Board."

1.2 COORDINATION

A. Coordinate installation of pest control products with installation of gypsum board and sealing of partition walls.

1.3 SUBMITTALS

A. Product Data. Include certified test reports indicating compliance with specified requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Experienced in installation of system specified, and the following.

1. Approved or accepted by pest control product manufacturer in writing.
2. Successfully completed five or more projects of comparable scale and complexity, using system specified.

B. Regulatory Requirements: Conform to requirements of California EPA and authorities having jurisdiction.

C. Mock-Up: Perform insecticidal treatment and field testing at Unit Mockup or adjacent construction.

D. Preinstallation Meeting: At Project Site.

1. Attendees shall include Owner, manufacturer's representative, and installers of pest control and related work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: In manufacturer's sealed, unopened containers.

B. Storage: In manufacturer's sealed, unopened containers, in compliance with manufacturer's instructions.

1.6 SEQUENCING

A. Install insecticidal spray after gypsum board is installed on one side of partitions, and before application of textured finishes or paint.

B. Coordinate application of insecticidal dust with joint sealant application.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insecticidal Dust:

1. Composition: Diatomaceous earth and boric acid dust, blended for application with compressed air power duster.
2. Properties: Non-toxic, odorless, non-chemical, with a physical mode of killing action.
3. Purpose: To prevent bedbug infestation and inhibit spread of bedbugs to neighboring units through walls and floors.

B. Joint Sealants: See Section 07 92 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing insecticidal spray.

B. Do not dilute or alter product.

C. Apply with compressed air power duster with tip of application nozzle less than 1/2 inch in diameter.

D. Apply to one side of wall, prior to enclosing framing.

3.3 FIELD QUALITY CONTROL

A. Field Testing: With Owner and manufacturer's representative present, remove gypsum board from mock-up or another representative treated area not less than 100 square feet. Examine extent and concentration of insecticidal dust.

1. If concentration and coverage do not meet manufacturer's recommendations, take manufacturer's representative's recommended action, including additional treatment holes.
2. Treat and examine an additional test area. Continue until installation meets manufacturer's recommendations.

B. Install remainder of Work using methods identical to those used for successful tested installation.

3.4 ADJUSTING AND CLEANING

A. As work progresses, clean spillage and overspray from adjacent surfaces using methods recommended by manufacturer. Remove protective coverings from surfaces when no longer needed.

END OF SECTION

SECTION 11 23 00 - COMMERCIAL LAUNDRY EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes commercial washers and dryers for on-premises common-use laundry rooms and commercial kitchen. ~~at East House and West House.~~

B. Related Requirements:

~~1. Section 11 31 00 "Residential Appliances" for stacked washer/ventless dryer appliances at commercial kitchen and at laundry closet adjacent to guest suites at West House.~~

1. Mechanical Drawings for ducting for vented exhaust hoods.
2. Plumbing Drawings for scheduled plumbing fixtures and requirements.
3. Electrical Drawings for scheduled electrical requirements for appliances.

1.2 COORDINATION

A. Coordinate laundry equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.

B. Coordinate locations and requirements of utility service connections.

C. Coordinate sizes, locations, and requirements of the following:

1. Equipment bases.
2. Floor depressions.
3. Floor areas with positive slopes to drains.
4. Floor drains serving laundry equipment.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Coordination Drawings: For laundry rooms.

1. Indicate locations of scheduled laundry equipment and connections to utilities.
2. Include plans and elevations, clearance requirements for equipment access and maintenance, details of equipment supports, and utility service characteristics.
3. Include details of seismic bracing for equipment.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with laundry equipment by field measurements before installation. Indicate measurements on Coordination Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Install equipment to comply with the following:

1. NFPA 70, "National Electrical Code."

2.2 COMMERCIAL LAUNDRY EQUIPMENT

A. General:

1. Appliances in laundry rooms at dormitory wings shall be installed in configurations shown on Drawings.

a. Two washers, side-by-side.
b. Two dryers, stacked.

2. Appliances at Kitchen Laundry: One washer and one dryer, stacked.
3. See Plumbing Drawings for water supply, drainage, and plumbing.
4. See Electrical Drawings for scheduled Electrical Requirements.

B. Basis-of-Design Manufacturer: Unless otherwise indicated, provide the following:

1. Alliance Laundry Systems, LLC.

C. Front-Loading Washing Machine: ENERGY STAR Certified, with ADA-compliant front controls, 1200 RPM spin speed, stainless steel tub, wide front opening, and 180-degree door swing.

1. Basis-of-Design Product: Unless otherwise indicated, provide the following:

a. Speed Queen Commercial; Front Control, Front-Load Washer, LFNE5BSP115TW01.

2. Weight Capacity: 21.5 lbs (9.5 kg).
3. Volume: 3.42 cu ft (96.8 liters).
4. Exterior Finish: White enamel.

D. Stacked Electric Dryers: Stacked dryer sets with independent front controls for each dryer installed together on single panel at lower dryer. Quiet, high-efficiency blower with 220 cfm (105 l/sec), galvanized steel cylinder, large door opening, serviceable from the front. Bottom dryer shall be ADA-compliant.

1. Basis-of-Design Product: Unless otherwise indicated, provide the following:

a. Speed Queen Commercial; Electronic Control Stacked Electric Dryer, LSEE5AGS173TW01, 240 V/ 60 HZ/1 Phase.

2. Weight Capacity: 18 lbs (8.2 kg) each.
3. Volume: 7.0 cu ft (198 liters) each.
4. Motor: Thermally protected 1/3 hp.
5. Electrical Requirements: 240 Volts/60 Hz/1-30 Amp/single-phase.
6. Heating Element: 5350W, 240V.
7. Temperature Control: Multiple levels/cycles.
8. Exterior Finish: White enamel.

2.3 MISCELLANEOUS MATERIALS

A. Installation Accessories, General: NSF-certified for end-use application indicated.

B. Power Cords: Each stack dryer pocket requires its own separate power cord; not supplied by dryer manufacturer.

C. Elastomeric Joint Sealant: ASTM C 920; silicone. Type S (single component), Grade NS (nonsag), Class 25, Use NT (nontraffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.

1. Cylindrical Sealant Backing: ASTM C 1330, Type C, closed-cell polyethylene, in diameter greater than joint width.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install laundry equipment level and plumb, according to manufacturer's written instructions.

1. Comply with provisions indicated to ensure ADA-compliant installation.

a. At washers, turn legs from base 1/2 inches (13 mm).

2. Connect equipment to utilities.
3. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.

B. Complete equipment assembly where field assembly is required.

1. Provide closed butt and contact joints that do not require a filler.
2. Grind field welds on stainless-steel equipment until smooth and polish to match adjacent finish.

C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.

D. Install cabinets and similar equipment on bases in a bed of sealant.

E. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.

F. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

A. After completing installation of equipment, repair damaged finishes.

B. Clean and adjust equipment as required to produce ready-for-use condition.

C. Protect equipment from damage during remainder of the construction period.

END OF SECTION 11 23 00

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SECTION 11 31 00 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Appliances as indicated on Drawings at Common Building and West House.
    a. Child Watch, Room 107, Common Bldg.
    b. Staff Locker Room, 135, Common Bldg.
    c. West House Lounge kitchen, Room W109.
2. ~~Stacked washer/dryer unit at Commercial Kitchen and at laundry closet adjacent to guest suites at Common Building.~~

B. Related Sections and Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 11 23 00 "Commercial Laundry Equipment" for washers and dryers in laundry rooms at East House and West House, and at kitchen.
3. Division 22 for plumbing.
4. Division 26 for power.
5. Contractor shall provide power and water (if required) for Owner-furnished appliances indicated on Drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.

1. For appliances indicated, documentation that products are ENERGY STAR rated.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of appliance, from manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

B. Appliance Schedule: Provide spreadsheet organized by room number and appliance type, indicating model number and serial number for each appliance.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Regulatory Requirements: Comply with the following:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and CBC.

D. Preinstallation Conference: Conduct conference at Project site.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Products shall comply with the following:

1. All appliances shall be electric, and UL-listed.

2.2 MANUFACTURERS

A. Product: Subject to compliance with requirements, provide products indicated by the following manufacturers:

1. GE Appliances.
2. LG Electronics.
3. Whirlpool.

2.3 ELECTRIC RANGES

A. Electric Range. Drop-in electric range with oven, complying with AHAM ER-1 and ADA requirements.

1. Basis-of-Design Product: Whirlpool WEE515SALW.
2. Dimensions:

a. Width: Nominal 30 inches (762 mm).
b. Depth: Nominal 29 inches (737 mm).
c. Height: 34 inches (864 mm).

3. Electric Burner Elements: Four smooth radiant cooktop heating elements.
4. Cooktop Surface: Ceramic Glass.
5. Oven: Self-cleaning type, 4.8 cu. ft. capacity.
6. Controls: Dial controls, located on front.
7. Anti-Tip Device: Manufacturer's standard.
8. Electric Power Supply: 240 V, 60 Hz, 1 phase, 40 A.
9. Finish: White.
10. Location: Staff Break Room (203).

a. Contractor to provide outlet for future installation of range at West House Lounge (W109).

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood:

1. Basis-of-Design Product: Whirlpool; WVU17UC0JW.
2. Type: Under-cabinet-mounted exhaust-hood system.
3. Provide ADA wall-mounted control.
4. Nominal Dimensions:
   a. Width: 30 inches (762 mm).
   b. Depth: 18-1/2 inches (470 mm).
5. Exhaust Fan: Variable Two-speed fan built into hood and with manufacturer's standard capacity.
   a. Venting: Ducted.
   b. Fan Control: Rocker switches on front.
      1) Provide wall-mounted fan switch (ADA-compliant), with separate hood-light control switch at all installations.
6. Duct Type: Manufacturer's standard.
7. Finish: Baked enamel.
   a. Color: White.
8. Features:
   a. Removable, washable aluminum mesh filter(s).
   b. Damper.
   c. Built-in LED lighting.
9. Location: Staff Break Room (203).
   a. Contractor to provide outlet for future installation of over-range exhaust hood at West House Lounge (W109).

2.5 REFRIGERATOR/FREEZERS

A. French Door Refrigerator/Freezer ~~at Amenity Areas~~: Bottom-freezer refrigerator complying with AHAM HRF-1, with in-door icemaker.

1. Basis-of-Design Product: GE; GFE24JGKWW.
2. Type: Freestanding.
3. Dimensions: 69-7/8 inches high, 32-3/4 inches wide, 37-1/2 inches deep.
4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
5. Capacity: 23.6 cu. ft.
6. Appliance Color/Finish: White enamel.
7. Locations: Staff Break Room (203) and West House Lounge (W109).

B. Refrigerator/Freezer: Top-freezer refrigerator complying with AHAM HRF-1.

1. Basis-of-Design Product: GE; GIE22JTNRWW.
2. Type: Full-size, freestanding.
3. Dimensions: 66-3/8 inches high, 32-3/4 inches wide, 34-1/2 inches deep.
4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
5. Capacity: 21.9 cu. ft.
6. Appliance Color/Finish: White enamel.
7. Location: Staff Locker Room (135).

C. Under-Counter Refrigerator: Compact under-counter top-freezer refrigerator complying with AHAM HRF-1 and ADA requirements.

1. Basis-of-Design Product: GE Appliances; GDE03GLKLB Top-Freezer Compact Refrigerator.
2. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
3. Front Panel(s): Stainless steel.
4. Appliance Color/Finish: Black.
5. Location: Child Watch (107).

~~2.6 WASHERS AND DRYERS~~

~~A. Stacked front-loading washer and ventless condenser dryer pair.~~

~~1. Basis of Design Product: GE; 966741 - Stacking Laundry Pair, with white finish, consisting of the following:~~

~~a. Compact Washer: GE; GFW148SSMWW.~~
~~b. Ventless Dryer: GE; GFT14ESSMWW.~~
~~c. Stacking Kit: GE; GFA24KITL.~~

~~2. Compact Washer:~~

~~a. Dimensions: 33-1/4 inches high, 24 inches wide, 42-13/16 inches deep (with door fully opened).~~
~~b. Type: Front-loading.~~
~~c. Wash Tub: Stainless steel.~~
~~d. Capacity: 2.5 cu. ft.~~

~~3. Electric Ventless Condenser Compact Dryer:~~

~~a. Dimensions: 33-1/4 inches high, 24 inches wide, 42-13/16 inches deep (with door fully opened).~~
~~b. Type: Front-loading.~~
~~c. Dryer Drum: Stainless steel.~~
~~d. Capacity: 4.1 cu. ft.~~
~~e. Dryer Volts: 240 V AC.~~
~~f. LED Light.~~

~~4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.~~

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine floors, walls, and ceilings for suitable conditions where appliances will be installed.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Stacking Washer/Dryer Units: Install with stacking kit, according to manufacturer's written instructions, complying with minimum clearances and National Electric Code. If units are to be enclosed in closet, ensure closet doors are louvered, and contain a minimum 120 square inches of open area, equally distributed.

E. Utilities: Comply with plumbing and electrical requirements.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

B. An appliance will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 11 40 00 - FOODSERVICE EQUIPMENT SPECIFICATIONS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish all equipment and materials specified below by manufacturer, model number, options, accessories, and parts.

B. Furnish all equipment and materials specified to be custom fabricated from a recognized and approved foodservice equipment fabricator.

C. Verify and coordinate all items noted on plans as existing or as owner or vendor-furnished.

D. Provide labor and materials required to deliver, uncrate, assemble, set in place, hang, level, install, supervise and coordinate the installation of all foodservice equipment and accessories as indicated on drawings and as specified, exclusive of utility connections.

E. General Contractor to include the following work as applicable:

1. All electric, gas, steam, water and waste services to rough-in points at equipment locations.
2. Exhaust ductwork beyond the exhaust hood collar, connection to the exhaust hood, controls, interlocking devices, switches, etc., necessary for complete installation and system operation, unless otherwise noted in specification.
3. Installation of faucets, pot fillers, pre-rinse assemblies, hose reels, quick disconnect assemblies, vacuum breakers, check valves, flow control valves, drain assemblies, indirect waste piping, unless otherwise noted in specification.
4. Electric disconnect switches as required by local code.
5. Conduit and conductors between controls and equipment and from the rough-in location to equipment.
6. Concrete curbs, floor depressions, tile overlays, cement finishes, raised bases, sleeves, penetrations, fire rated duct enclosure, wall openings, and ceiling openings.
7. Disconnect and removal of existing equipment, unless otherwise specified.
8. Storage of existing equipment to be reused, unless otherwise specified.
9. Installation of existing equipment to be reused, unless other specified.
10. Coordinate and provide holes and grommets in foodservice counters for foodservice and POS equipment. Final cutout locations to be approved by Operator/Owner.

F. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

G. Project management including on site meetings and verification of rough-ins for final approved equipment items with general contractor and trades.

1.2 DISCREPANCIES

A. If contract drawings and/or specifications contain any discrepancies, conflicts, omissions, or ambiguities, Kitchen Equipment Contractor (KEC) is to notify the Architect in writing as soon as possible. Architect will issue an addendum to the contract documents clarifying conditions when a discrepancy, conflict, omission, or ambiguity exists.

B. Neither the Architect nor the Consultant will be responsible for any oral instructions.

1.3 DELIVERY, STORAGE, HANDLING

A. Coordinate delivery of equipment with General Contractor at an agreed upon time and place. If the construction jobsite is not ready and delivery must be delayed, arrange to hold delivery in a secure and protected warehouse until jobsite is ready.

B. Take adequate precautions to ensure equipment is protected during construction, including safeguards against other trades usage of equipment as workbenches, ladders or scaffolding.

C. Safely handle equipment to avoid damage to equipment components and finishes. Replace any damaged equipment prior to project completion.

1.4 QUALITY ASSURANCE

A. Manufacturers' Qualifications: Products and equipment furnished shall be standard catalog items from manufacturers regularly producing such items. Equipment shall be the manufacturer's latest design of the specified item unless otherwise noted.

B. Kitchen Equipment Contractor Qualifications: KEC shall have at least 3 years of successful experience furnishing and installing foodservice equipment on projects of similar size and scope. The KEC shall have financial resources to enable him/her to deliver and complete the required work in a timely manner. KEC shall be fully capable of fulfilling the terms and conditions of warranty provisions required in this contract.

C. Fabricator's Qualifications: Fabricator shall be a recognized and approved foodservice equipment fabricator with at least three years of experience producing similar items.

D. Installers' Qualifications: KEC shall use thoroughly trained and skilled installers in their respective trades. Installers shall be knowledgeable in the work requirements in this section. Authorized service agents shall be used when required by manufacturer (for warranty purposes).

E. Coordination: KEC shall coordinate and field verify dimensions with respective trades for all field preparation work of equipment installation, including, but not limited to: depressions, trenches, pits, piping, curbs etc.

F. Conflicts: KEC shall submit written request for clarification wherever drawings and written specifications conflict or appear to conflict. Until clarification can be obtained, KEC shall use the higher quality or greater quantity assumption.

1.5 APPLICABLE CODES AND STANDARDS

A. All items shall comply with current applicable laws, codes, specifications, local ordinances, industry standards, and utility regulations of authorities having jurisdiction over project location. Kitchen Equipment Contractor (KEC) shall notify the Architect and Owner, in writing, of any design conflicts with above requirements. Additionally, all items shall comply with the latest standards from the following:

- Americans with Disabilities Act (ADA)
- American Gas Association (AGA)
- American Institute of Electrical and Electronics Engineer (AIEE)
- American National Standard Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- American Society for Testing and Materials (ASTM)
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
- Building Officials Code Administrators (BOCA)
- California AB1953
- Factory Mutual Research (FM)
- International Conference of Building Officials (ICBO)
- National Board of Fire Underwriters (NBFU)
- National Electric Code (NEC)
- National Electrical Manufacturer's Association (NEMA)
- National Fire Protection Associates (NFPA)
- National Sanitation Foundation (NSF)
- Occupational Safety and Health Administration (OSHA)
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- Underwriters Laboratories (UL)

B. Non-Compliance: KEC shall bear all costs arising from correcting any deficiencies in performance of work that does not comply with applicable laws, codes, specifications, local ordinances, or other regulations of authorities have jurisdiction. KEC shall hold owner or its agents harmless from any claim or loss that may result. Approval of KEC submittal data does not relieve KEC of responsibility to comply with codes and regulations.

1.6 SEISMIC RESTRAINTS

A. Contractor to install and anchor foodservice equipment as required by local jurisdictional code, if required. Method of installation and anchorage by Structural Engineer to comply with Health Department requirements for cleanability, and methods used shall not void warranty or inhibit serviceability of equipment. Installation detail to be reviewed by Consultant.

B. Kitchen Equipment Contractor shall:

1. Identify items requiring seismic restraints on the submittal drawings, including the method of restraint referencing the appropriate detail(s).
2. Obtain regulatory approval for all required seismic engineering details.

C. KEC or engineer must verify that the proposed detail's design is suitable for the building's structural condition.

1.7 WARRANTY

A. Kitchen Equipment Contractor (KEC) shall furnish a warranty covering all materials and labor for a period of one year from date of project completion or commissioning. KEC agrees to repair and make good, at its own expense, any and all defects in their work during that time, which arise from defective workmanship or imperfect or inferior material.

B. After one year, Manufacturer's full warranty shall remain valid and fully intact when applicable.

1.8 SUBSTITUTIONS

A. All contractors shall submit proposed substitution equipment in writing, ten days prior to submitting their bid for review. The Consultant will have final approval of any proposed substitutions.

B. All substitutions to be considered must be the same size and shape, constructed of the same finishes and materials, have the same features, accessories, and meet or exceed the performance of the primary specified item.

C. Any EnergyStar or Rebate-eligible specified item may only be substituted with equipment of similar or better energy efficiency status and rebate.

D. For any suggested substitutions, KEC must submit a comparison data table showing any impact on items pertaining to the sections listed above, in addition to rough-in requirements and utilities.

E. Changes or added costs incurred to the project as a result of the substitution shall be noted in substitution request and all cost borne by the KEC / GC

1.9 SUBMITTALS

A. General: Upon award of contract, Kitchen Equipment Contractor (KEC) shall provide dimensioned rough-in drawings if not provided in contract set. Required information on drawings include depression drawings, wall opening drawings, and shop drawings. Dimensioned rough-in drawings shall show location, size, height and capacity of all mechanical services required for each item. Reproduced copies of bid documents will not be accepted.

B. Manufacturer's Specification Data: Upon award of contract, KEC shall provide bound copies of manufacturers' brochure data for review prior to procurement. Models, utilities, accessories, and parts shall be clearly identified by marking the brochure.

C. Schedule: If substitutions are made, submit a schedule of equipment in numerical sequence indicating updated manufacturer, model, quantities, electrical requirements, mechanical requirements, HVAC requirements, and related notes.

D. Rough-In Drawings: Dimensioned rough-in drawings, if required, shall be prepared at a minimum scale of ¼" = 1'0" for plan and elevation views; 3/4"=1'0" for section views.

1. Depression, base, alternative wall, and wall opening drawings shall be prepared at a minimum scale of ¼" = 1'0".
2. Shop Drawings shall be prepared at a minimum scale of 3/4" = 1'0", plus necessary cross sections at a scale of 3/4" = 1'0".

E. Operations and Maintenance Manuals: Kitchen Equipment Contractor shall provide three copies of the operation, maintenance and parts manuals submitted for approval three weeks prior to project completion.

Manuals shall include:

1. Table of Contents (denoting manufacturer, model number and serial number)
2. Name and phone number of applicable service agencies for equipment

F. KEC submittals to be submitted through project channels and for review by Foodservice Consultants.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment, and all associated accessories and parts, shall be new and unused unless otherwise specified. Installation must allow serviceable parts to be accessible for repair or replacement.

B. Plastic engraved nameplates shall be furnished on fabricated items with controls to identify functionality. Nameplates shall have a beveled edge to prevent injury. Nameplates shall be attached using a manufacturer approved adhesive.

C. Material Gauge for sheet iron and steel to be US standard gauges of the following thickness:

Gauge	Thickness (in)	Thickness (metric)
#10	0.141"	3.5814
#12	0.109"	2.7686
#14	0.078"	1.9812
#16	0.063"	1.6002
#18	0.050"	1.2700
#20	0.038"	0.9652

2.2 ELECTRICAL REQUIREMENTS

A. Electrical systems, components, and accessories shall be certified to be in accordance with local code requirements and installed as specified.

B. Convenience receptacles in fabricated equipment shall be flush mounted with stainless steel cover plates. Convenience receptacles mounted “free standing” on equipment shall have stainless steel bodies and stainless steel cover plates.

C. Wall mount and floor mount convenience receptacles shall be Hubbell three wire or four wire grounding type connectors with matching material and finish.

D. Equipment switches and controls shall be UL recognized and installed recessed to prevent injury or damage. Controls shall be conspicuously labeled as to use with engraved plastic nameplates.

E. Electric thermostatically-controlled equipment shall include an “on-off” red light indicator to be mounted adjacent to controls.

F. Fabricated equipment with internal wiring shall be wired in conduit to a junction box within the item, ready for final connection. Equipment shall be listed and display UL label.

G. Wiring and connection diagrams shall be furnished with electrically operated machines or fabricated equipment

H. “Plug and cord” equipment shall include electric cords with grounding conductor, be UL type SO or SJO, and not to exceed six feet in length. Equipment to be furnished with UL caps or plugs.

I. Motors shall be drip-proof or totally enclosed type, having a continuous duty cycle and ball bearings, except for small timing motors, which may have sleeve bearings. Motors shall have windings impregnated to resist moisture. Motors located in areas subject to deposits of dust, lint, or other similar matter from the machine on which installed shall be totally enclosed-type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Horsepower requirements on driven equipment shall be determined by the manufacturer based on normal operation at maximum capacity. The nominal rated motor horsepower shall be not less than the horsepower required for normal operation of the equipment at maximum capacity.

J. All conduits to be concealed and protected in walls or within fabricated equipment.

K. All electrical fixtures, including junction boxes, receptacles, shut offs, electrical panels are to be recessed in walls or hidden in fabricated equipment.

2.3 PLUMBING REQUIREMENTS

A. Chrome plated vacuum breakers and check valves (except where prohibited) shall be furnished on all faucets, hose stations, and fixtures where water inlets are below water level to prevent siphoning.

B. Anti-siphon pressure type vacuum breakers shall be furnished for all hose reels.

C. Backflow preventers shall be furnished as required by code.

D. Special valves, strainers, thermometers, pressure gauges, water flow restrictors, regulators, control valves, pressure reducing valves and accessories shall be furnished as required by code or necessary for proper operation of equipment.

E. Supply and install code required dishmachine tempering kits.

2.4 REFRIGERATION REQUIREMENTS

A. Furnish and completely install refrigeration systems according to manufacturer's instructions and recommendations, using high quality fittings, controls, valves, thermostats, etc. Refrigeration condensing units to be properly ventilated and accessible for inspection, maintenance, and repair. Charge, startup, test, and adjust refrigeration system as needed for proper operation.

B. Run all remote refrigeration lines, using Type "A.C.R." refrigeration grade copper lines. Insulate lines outside walk-in box using ¾" closed cell foam insulation or in accordance with manufacturer's instructions or recommendations.

Use only long radius bends to reduce flow resistance and line breaking. Silver solder and/or Sil-Fos shall be used on all refrigerant piping. Soft solder is not acceptable. Use minimum 35% silver solder for dissimilar metals.

All piping shall be supported with hangers that can withstand the combined weight of tubing, insulation, valves, and fluid in the tubing.

Use dry nitrogen in the copper tubing during brazing to prevent formation of copper oxides. Liquid and suction lines must be free to expand independently of each other. Do not exceed 100 feet without a change in direction or an offset.

Installer shall plan proper pitching, expansion allowance, and P-Traps at the base of all suction risers and at every vertical rise. Install service valve at several locations for ease of maintenance. These valves shall be UL approved for 450 PSI working pressure.

C. Condensate drain piping shall be Type "M" seamless copper tubing with silver soldered joints pitched at ½" per foot of run. Heated drain lines from freezers must be insulated with minimum ½" armaflex insulation to prevent freezing.

D. All refrigerant piping to be pressure tested with nitrogen at 300 PSI with all valves open and held for 12 hours. Electronic leak detectors shall be used to locate all leaks.

Complete system shall be evacuated to 500 microns with vacuum pump before charging the system.

Once system is charged and running, adjust all controls including pressure controls, expansion valves, thermostats, and time clocks. Return after 24 hours to verify proper operation of systems.

E. Furnish an electric defrost evaporator coil where refrigeration systems are designed to operate at a room temperature of less than 35°F.

F. Refrigeration systems are designed and shall be installed to maintain the following temperatures:

1. Walk-in refrigerators, reach-in refrigerators, undercounter refrigerators shall operate at 35°F or 1.7°C.
2. Walk-in freezers, reach-in freezers, undercounter freezers shall operate at -10°F or -23.3°C.
3. Integrated cold pans shall operate at 0°F or -17.8°C.
4. Cold Work Rooms shall operate at 50°F or 10°C with adjustability to 70°F or 21°C.

2.5 FABRICATED EQUIPMENT

A. Materials

1. Stainless Steel shall be 18-8, Type 304, polished to a #4 finish.
2. Galvanized iron sheets shall have a zinc G-90 coasting. Sheets shall be cold rolled, stretcher leveled, bonderized, and re-rolled to ensure a smooth surface.
3. Aluminum shall be type 1110 with a #204-C1 finish for sheets exposed to viewing and type 6663-T5 with a #204 finish for rods and bars.
4. Tubing shall be seamless stainless steel, 1-5/8” diameter, 16 gauge, 18-8, type 304, polished to a #4 finish
5. Plastic Laminate (P-Lam) shall comply with NEMA LD 3 and NSF 35 requirements. P-Lam must also be NSF certified for end-use application and have a smooth texture that is easily cleanable.
6. Sealant shall be ASTM C 920; Type S, Grade NS, Class 25, Use, NT. Provide elastomeric sealant that is NSF approved for end use application. Sealant shall meet Food and Drug Administration’s 21 CFR, Section 177.2600 for use in food contact areas.
7. Tempered Glass shall be ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller-hearth) process, and 6mm thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.
8. Plastic shall comply with NSF standard 51.
9. Sound Deadening shall be NSF certified, hard drying, and non-absorbent. Coating shall adhere to metal at minimum 1/8” (3mm) thickness. Sound deadening to be applied on all tables, drainboards, sinks, undershelves, and other stainless surfaces.

10. Gaskets shall be rubber, neoprene, or PVC that is NSF certified for end-use application, nonabsorbent and nontoxic.
11. Cabinet Hardware shall be NSF certified and stainless steel as indicated. Same equipment locks shall be keyed alike and be strong enough to prevent unauthorized access.
12. Casters shall be NSF certified, 5" diameter, rubber, neoprene, or polyurethane tires with 1-1/4" tread width, sealed, self-lubricating, non-marking swivel type with minimum load capacity of 200lbs. Two casters to have toe brakes. Brakes to be located on operator's side when item is placed against a wall, and diagonally when item is in an island application.

B. Finishes

1. Stainless Steel shall be polished to a uniform grain, #4 finish.
2. Paint and Coatings shall be NSF approved for foodservice use and have a durable, non-flaking, nontoxic, mildew resistant quality.
3. Fabricated equipment shall be sprayed with an easily removable protective coating for transport. Coating shall be removed after installation.

C. Workmanship

1. Materials shall be free of warpage and surface imperfections.
2. Equipment shall conform to NSF 2 standards for foodservice. There shall be no exposed fasteners in the food area.
3. Equipment edges shall be chamfered to be free of burrs, fins, or other projections.
4. Seams shall be continuously TIG or MIG welded and polished. Visible seams shall be free of pits or flaws, and shall be ground smooth to a #4 finish. Seal with clear RTV silicone as needed.
5. All fasteners shall be corrosion resistant steel. Fasteners joining like metals shall be of the same metal. Fasteners joining dissimilar metals shall be of the higher grade metal.
6. Concealed fasteners shall be used wherever possible. Exposed fastener threads shall be sheared and capped with a stainless steel washer and an acorn nut.

D. Construction

1. Sinks and Drainboards

a. Sinks shall be 14-gauge, 18-8, Type 304 stainless steel and produced as an integral part of the top. All corners to be radius coved and conform to NSF standards. Sink bowl back, bottom, and front shall be one continuous sheet with ends welded into place. Bowl shall be die pressed star for positive drainage to 3-1/2" center drain. Drains shall be T&S Brass B-3972 for 3 compartment sink, and T&S Brass B-3972-01 with overflow for 1- and 2- compartment food preparation sinks. Sinks with two or more compartments shall come with full length, full height, flush stainless steel front panel to conceal joint between sinks. Where partitions occur, there shall be no beads nor straps on the outside of sink. Backsplash to be 8" high with 2" return on 45 degree angle break and ¾" flange turned down, with all exposed ends closed, welded, ground, and polished. Legs to be tubular 16-

gauge stainless steel with NSF adjustable bullet feet fitted into stainless steel leg sockets. Sockets to be welded to a re-enforced plate which is welded to the sinks.

b. Sinks with integral drainboards shall be 14-gauge, 18-8, Type 304 stainless steel, sized per drawings, and welded to the sink frame to become an integral unit. Drainboards shall be pitched toward sink bowls.
c. Tops shall be reinforced with 12-gauge, 18-8, Type 304 stainless steel channel. One channel shall be provided on tops up to 36" wide and two channels shall be provided on tops over 36" wide. Top to be attached to channel reinforcements with studs welded to the underside of the top.
d. Where placed against wall or stationary fixed equipment, splash shall be turned up on sides 6" high and sloped back 2" on 45 degree angle break and ¾" flange turned down, with all exposed ends closed, welded, ground, and polished.
e. All sinks shall be furnished with faucets and drains as specified. Faucets shall be T&S Brass model B-0231 for splash mount and B-0221 for deck mount, or equivalent, unless otherwise specified.
f. Each sink compartment shall be furnished with 3-1/2" basket type waste drain and lever waste valve with overflow on sinks 12" or more.
g. Furnish provisions for installing faucets, pre-rinse faucets with backflow preventers, vacuum breakers, and drains.

2. Dishtables

a. Tops shall be 14-gauge, 18-8, Type 304 stainless steel, sized per drawings. Tops shall be reinforced with 12-gauge, 18-8, Type 304 stainless steel channel. One channel provided on tops up to 36" wide and two channels on tops over 36" wide. Attach top to channel reinforcements with studs welded to the underside of top. Slope top with an integral pitch so water drains toward dishmachine. All corners to be radius coved and conform to NSF standards.
b. Tops shall be furnished with a coved 10" backsplash sloped back 2" on 45 degree angle and down at least 1" to receive 14-gauge, 18-8, Type 304 stainless steel 'Z' clip for anchoring to wall. All exposed ends to be closed, welded, ground, and polished.
c. Sound deaden underside of tops with NSF approved sound deadening mastic.
d. Furnish provisions for installing pre-rinse faucets with backflow preventers, vacuum breakers, and lever wastes.

3. Faucets

a. Faucets shall be T&S Brass model B-0231 for splash mount, B-0221 for deck mount, and B-0133-A12-08C for Pre-Rinse units, or equivalent unless otherwise specified.
b. Furnish water saving devices where required by local codes. Spray valves shall be 0.65 GPM for water conservation, be fitted with backflow prevention device (where required), and furnished complete with nipples, lock nuts, and washers for secure and proper installation.
c. All faucets intended to dispense water for human consumption shall be manufacturer of materials that contain no lead intentionally added to the product.

d. Finish shall be polished stainless steel.
e. All faucets specified to have standard lever type handle with internationally coded handle identification buttons for hot and cold and ADA easy turn stems. All faucets shall have internal stainless steel seats and two part swivel stems.
f. All plumbing fixtures shall be ANSI/NSF 61 section 9 certified, CSA certified, California AB1953 Compliant, Vermont S152 Compliant, and EPAct 2005 Compliant.

4. Tables

a. Island style tables shall be 14-gauge, 18-8, Type 304 stainless steel, #4 finish. All corners to be radius coved conforming to NSF standards. Legs to be 1-5/8" tubular, 16-gauge stainless steel tubing with NSF adjustable bullet feet fitted into stainless steel leg sockets. Sockets to be welded to a re-enforced plate which is welded to the sinks. Tables longer than 72" to have 6 legs.
b. Wall mounted tables shall include a back/side splash to be 6" high sloped back 2" on 45 degree angle break and ¾" flange turned down at all instances where placed against a wall or other fixed equipment. All exposed ends to be closed, welded, ground, and polished.
c. Tables with undershelves to have 16-gauge, 18-8, Type 304 stainless steel undershelf, #4 finish. All corners to be welded, ground and polished. Undershelves shall be reinforced with 12-gauge, 18-8, Type 304 stainless steel channel. Top to attach to channel reinforcements with studs welded to the underside of shelf. Front edge of undershelf shall be turned down 1-1/2" and returned ½". Rear (and sides as specified) to be turned up 2". Corners shall be notched at legs and welded, ground, and polished to same finish. Where required, undershelves shall be provided with pipe slots and grommets of suitable size to accommodate necessary service lines.
d. All corners shall be reinforced on the underside with 1" x 4" x 1" stainless steel channels of not less than 14 gauge stainless steel. These channels shall be spaced not more than 30" apart in any direction and shall give full perimeter as well as interior support.
e. Open base tables with cross bracing shall have leg gussets welded to secured channel on the underside of the tabletop. Table to have 1-5/8" round stainless steel bracing. Cross bracing to be installed on the back and two sides welded to the legs 10" AFF. Tables longer than 72" to have 5 legs.

5. Overshelves shall be 16-gauge, 18-8, Type 304 stainless steel, #4 finish. All corners to be welded, ground and polished. Shelf to be support by four 1-5/8" round stainless steel polished tubing. Shelf to be 18" above table top. For double overshelves, top shelf to be 15" above bottom shelf. Shelves longer than 72" to have 6 legs.

6. Drawers shall be flush mounted, double pan construction with semi-rigid fiberglass insulation, recessed stainless steel pull handle, and heavy duty ball bearing slides. Each drawer consists of 18-gauge, 18-8, Type 304 stainless steel 20"x20"x5" die stamped drawer insert with horizontal and vertical corners 1-3/4" minimum coved. Insert shall be removable and rest in a stainless steel cradle. Cradle shall be welded to a 16-gauge, 18-8, Type 304 stainless steel double pan drawer face. Drawer face to have full-length

flush type stainless steel channel pull with heavy duty ball bearing drawer slides and adjustable stops at the fully opened position. Enclose drawers on open base table with 18-gauge, 18-8, Type 304 stainless steel enclosure.

7. Cabinet Base

    a. Enclosed cabinet with open shelf shall be 14-gauge, 18-8, Type 304 stainless steel, #4 finish top with 16-gauge shelves. Frame construction shall provide a box-like welded frame. Sides and back to be 18-gauges stainless steel. Legs to be 1-5/8" round stainless steel with NSF adjustable feet. Cabinets longer than 72" to have 6 legs.
    b. Enclosed cabinet hinged doors shall be double wall construction with ½" thick semi-rigid fiberglass board between the two panels. Door exterior shall be 18-gauge, 18-8, Type 304 stainless steel. Doors shall have stainless steel lift off hinge and full length stainless steel channel pull.

8. Wall Cabinets shall be 18-gauge, 18-8, Type 304 stainless steel all welded construction, sized per drawings, with edges turn down 1-1/2" on all sides. Cabinet back to be fitted with channels to attach to the wall. Top shall slope 6" from rear to front. Cabinet shall have a fixed bottom shelf with two adjustable intermediate shelves or as specified. Ends terminate at front with a 2" NSF-compliant mullion. Doors shall have stainless steel lift off hinge and full length stainless steel channel pull.

9. Wall Mounted Shelves shall be 16-gauge stainless steel, Type 304, #4 finish with a 2" turnup at the rear (and ends as indicated on drawings). Fronts (and sides unless otherwise indicated) to be turned down 1-1/2" and returned ½". Wall mount shelf corners to be welded, ground, and polished. Supports and brackets shall be 14-gauge, 18-8, Type 304 stainless steel and supplied no more than 36" on center. First shelf to be 18" above table top. For double overshelves, top shelf to be 15" above bottom shelf.

10. Pot/Utensil Rack, if specified, shall be stainless steel ¼" x 2" flat stock with pot hangers supplied one every 8".

11. Field Joints

    a. Field joints should be kept to a minimum and only used when equipment size must be limited for access into building or shipping.
    b. Field joints to be hairline butt joints, mechanically fastened, offset draw design and located on shop drawings.
    c. All field joints, including edges and splash must be fully welded, ground, and polished to match adjacent surface to achieve a seamless appearance.
    d. Acetylene welding or silver solder is not acceptable.
    e. All concealed or exposed welds on unpolished surfaces to be back-ground to surface of original metal to remove all impurities from welds. Make all welds smooth, without dips or bulges.
    f. All hidden weld joints shall be painted "gray".

2.6 ITEMIZED PRODUCT SPECIFICATIONS

A. Refer to PART 4 for complete itemized product specifications. Where manufacturer and model are listed, item shall be supplied with standard materials, components, and features for that model. Gas supplied equipment shall be provisioned for high altitudes, where applicable. Where item is listed as “custom fabricated,” it shall comply with the specifications listed above.

PART 3 - EXECUTION

3.1 PREPARATION AND COORDINATION

A. Submit and coordinate all work schedules with the Owner and General Contractor (GC).

B. Participate in required scheduling and coordination meetings.

C. Field inspect conditions and verify all measurements and dimensions related to foodservice equipment installation. Gaps larger than 3/8” filled with silicone or trim strips will not be accepted and require re-fabrication at Contractor’s expense.

D. Verify and coordinate with GC doorways, elevators, and hallways allow sufficient space for safe path of travel of equipment to be set in place and installed.

E. Coordinate and verify all wall reinforcement and support locations prior to GC closure of walls.

F. Verify water, steam, and gas pressure. Provide pressure regulating equipment where required for proper equipment operation. Verify quality of electrical supply.

G. Kitchen Equipment Contractor (KEC) to provide a competent project manager or foreman to supervise and coordinate all information necessary for timely installation of the kitchen equipment with other trades.

3.2 INSTALLATION

A. Deliver foodservice equipment as “assembled and complete units” with protective crating and covering.

B. Set equipment in place, level and plumb, ready for installation.

C. Anchor fasten equipment to floor, walls, or ceiling level and plumb with approved hardware. For floor anchors, seal flange and corresponding hardware to floor with silicone.

D. Perform necessary cutting, drilling and fitting of equipment to accommodate electrical outlets, fixtures, plumbing, and any other work required to be connected

E. Coordinate and supervise the connection of equipment to stub out locations so equipment controls are readily accessible to operator.

F. Field install electrical controls, switches, or other units in, on, or for furnished equipment as required by manufacturer.

G. Stationary equipment adjacent to a wall or other equipment shall be sealed with General Electric Clear Silicone RTV sealant. Joints exceeding 3/8" in width shall be trimmed with a stainless steel strip and caulk with approved silicone sealant. Equipment set on masonry bases shall be sealed with silicone.

3.3 PROTECTION

A. Protect equipment during construction, including safeguards against other trades usage of equipment as workbenches, ladders or scaffolding.

B. Repair or replace any lost or damaged equipment.

3.4 CLEAN-UP

A. Crating, boxes, protective wrapping, and trash to be removed daily.

B. When the kitchen equipment installation is complete, Kitchen Equipment Contractor shall clean up, adjust, and remove any temporary protection from equipment as necessary.

3.5 LABELING

A. All filtered water lines shall be labelled "FILTERED WATER" at point of connection.

B. Other Labelling – Kitchen Equipment Contractor (KEC) shall label equipment, conduits, line runs, parts and accessories as needed.

3.6 START-UP, TESTING, COMMISSIONING, DEMONSTRATION

A. Test each piece of equipment for proper and safe operation.

B. Lubricate moving parts according the manufacturer's written instructions.

C. Test liquid carrying equipment for leaks.

D. Kitchen Equipment Contractor (KEC) shall engage an authorized service agent or other manufacturer-approved representative to perform startup and to demonstrate and train the owner's selected personnel.

E. A representative of the KEC and Manufacturer shall be present in the kitchen during demonstrations.

F. Operating and Maintenance manuals shall be provided to the owner ten days prior to respective equipment demonstration day.

G. Repair or replace defective equipment as needed.

3.7 INSPECTION AND PUNCHLIST

A. Upon completion of installation and KEC internal quality check, KEC will notify Architect to schedule inspection of equipment and installation by the Consultant.

B. KEC shall make changes as indicated in punch list within 5 business days unless otherwise noted.

C. KEC shall provide a qualified representative to be present during Health Department inspection.

D. KEC shall make changes to comply with Health Department requirements without delay.

PART 4 – EQUIPMENT SCHEDULE

4.1 NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC)

A. Existing Equipment to be relocated and reused shall be disconnected by the appropriate trades and moved to a temporary storage area. Kitchen Equipment Contractor shall coordinate utilities and other requirements as if new, place at new location, install, and test equipment.

B. Existing, Owner, or Vendor furnished equipment and their utilities shall be coordinated by the Kitchen Equipment Contractor unless otherwise specified.

4.2 ITEMIZED EQUIPMENT SPECIFICATION

ITEM 01 - AIR CURTAIN
Mars Air Systems Model NH242-1UA-TS
High Velocity Series 2 air curtain for 42"W door, sanitation certified to ANSI/NSF 37 standards, unheated, galvanized steel cabinet with Titanium Silver powder coat finish, (1) 1 HP motor, cETLus
Mechanical switches
Door Limit Switch, indoor, plunger/roller type, remote mounted
Model 99-014 Door limit switch, plunger/roller type for indoor applications, single pole double throw, 1 HP max, 250v, NEMA 1 (remote mounted)

ITEM 02 - HAND SINK (KNEE-OPERATED), WALL MTD.
Advance Tabco Model 7-PS-82

Hand Sink, wall mounted, 14" wide x 10" front-to-back x 5" deep bowl, Deep Drawn™ sink bowl, 20 gauge 304 stainless steel, heavy duty splash mounted gooseneck faucet, knee valve, soap & towel dispenser, basket drain, keyhole wall mount bracket, NSF, cCSAus
Model K-08 Low-flow aerator 0.5gpm, fits 55/64-27 male or 15/16-27 female thread on spout, conforms to California AB 1953
Model K-425 Thermostatic Mixing Valve, for knee pedal, foot pedal and electronic hand sinks and valves
Model 7-PS-10 P-trap, heavy duty, 1-1/2", 17 gauge
Model 7-PS-17 Welded Side Splash, 7-3/4"H (installed height), both sides, for hand sinks with 14" wide x 10" front-to-back bowl, splash mounted faucets

ITEM 03 - TRASH CONTAINER, 15-GAL.
CFS Brands Model 34201523
Carlisle - Trimline™ Waste Container, 15 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, gray

ITEM 04 - FIRE EXTINGUISHER
NIKEC BY ARCHITECT
This item Not in Kitchen Equipment Contract

ITEM 05 - SPARE NUMBER

ITEM 06 - EXHAUST HOOD
Streivor Model CUSTOM
Refer to manufacturer drawing for details.
Add protection panels for proximity to combustible surfaces.

ITEM 07 - FIRE SUPPRESSION SYSTEM
Streivor Model CUSTOM
Refer to manufacturer drawings for details.

ITEM 08 - HOOD CONTROL PANEL
Streivor Model CUSTOM
Refer to manufacturer drawing for details.

ITEM 09 - WALL FLASHING
Custom Fabricated

Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 10 - SPARE NUMBER

ITEM 11 - ELECTRIC FLOOR FRYER
Pitco Frialator (Middleby) Model SE14R
Solstice™ Fryer, electric, floor model, full frypot, 40 - 50 lb. oil capacity, solid state controls, melt cycle, boil out capacity, drain valve interlock switch, stainless steel tank, front & sides, ENERGY STAR®, cULus, NSF, CE, GS
208v/50/60/3-ph, 62.0 amps, 22 kW, DIRECT
(D) Digital Controller
Model P6072145 Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
Model B3901504 Casters, 9" adjustable swivel (set of 4) non-lock rear & lock front casters, solstice supreme, SG, SE, VF and flat bottom fryers, pasta cookers, rethermalizers, BNB
Model P14 (QUICK SHIP) (MIDDLEBY ESSENTIALS ITEM) Fryer Filter, mobile, 55 lb. oil capacity, 18 gauge stainless steel lift-cover, low-profile design, with pump & hose assembly, stainless steel, for use with all 7, 12 (floor), & 14 size fryers, CSA, NSF, UL, CE (Ships within 1-2 days)
Quick Ship items have limited configurations & that standard configuration may not apply. Contact factory for details
1 year parts and labor warranty from the date of installation up to a maximum of 15 months from the date of manufacture (with appropriate documentation), standard
Contact factory for options and accessories

ITEM 12 - GRIDDLE, ELECTRIC, COUNTERTOP
AccuTemp Model EGF4803A3650-T1
AccuSteam™ Griddle, countertop, electric, 36" x 30" griddle area, 7 ga. 304 stainless steel cooking surface, digital thermostat & controls, 4" grease trough, 14 ga. stainless steel cabinet, 4" legs, cULus, UL EPH, ENERGY STAR®, Made in USA
Lifetime service and support guarantee

ITEM 13 - CHEF BASE
True Mfg. - General Foodservice Model TRCB-36-HC~SPEC3
Refrigerated Chef Base, 36-3/8"W base, SPEC Package 3 includes: one-piece 300 series 18 gauge stainless steel top with V edge, (2) drawers with locks (accommodates (1) 12" x 20" x 4" pans & (3) 1/6 size pans, NOT included), stainless steel front, sides & back, stainless steel interior, 4" castors, R290 Hydrocarbon refrigerant, 1/4 HP, , cULus, UL EPH Classified, CE, Made in USA
Self-contained refrigeration standard

Standard marine edge top
4" Castors, standard

ITEM 14 - FAUCET, KETTLE / POT FILLER
T&S Brass Model B-0592-LF20
Pot & Kettle Filler Faucet, wall mount, single temperature, 18" double-jointed nozzle, heat-resistant 4-arm handle, quarter-turn compression cartridge, insulated on/off control, low lead, 2.0 GPM, 1/2" NPT, NSF
Contact factory for options and accessories

ITEM 15 - SPARE NUMBER

ITEM 16 - INDUCTION RANGE, FLOOR MODEL
Garland Model GME36-I20C
Master Induction Range, electric, floor model, hobs, 28.5" x 28.5" cooking surface, RTCSmp technology, automatic pan detection & boil dry protection, convection oven base, (3) oven racks, Ceran® glass top, stainless steel construction.
Casters, non-height adjustable, non-marking polyurethane

ITEM 17 - CONVECTION OVEN, ELECTRIC
Blodgett (Middleby) Model ZEPH-100-E DBL
Zephaire Convection Oven, electric, double-deck, standard depth, capacity (5) 18" x 26" pans per compartment, (SSI-M) solid state infinite controls with 60 min. manual timer, two speed fan, vent connector, dependent glass doors, interior light, stainless steel front, sides and top, 6" stainless steel legs, ETL, NSF, ENERGY STAR®
Electrical connection direct, 1/2 hp (per deck), standard
Model SSI-M Top Oven: Solid State infinite control with 60 min. manual timer
Model SSI-M Bottom Oven: Solid State infinite control with 60 min. manual timer
Side shields, right hand side only, per deck
6" plate casters (set)
NOTE: DO NOT deduct cost of standard legs

ITEM 18 - HEATED CABINET, MOBILE
Alto-Shaam Model 1200-UP
Halo Heat® Low Temperature Holding Cabinet, double compartment, on/off simple controller with adjustable thermostats, indicator light, (2) sets of chrome plated universal side rails, (4) sets of pan slides, (16) 20" x 12" x 2-1/2" full size pan capacity, heavy stainless steel exterior, 5" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH Classified, CE, IPX4, TUV NORD, EAC
NOTE: Subject to Manufacturer’s Terms & Conditions. See Documents Section
Reach-in design, standard
Solid door, hinged on right, standard

ITEM 19 - SPARE NUMBER

ITEM 20 - SPARE NUMBER

ITEM 21 - WORKTABLE, MOBILE
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 22 - FLOOR TROUGH, SHALLOW-DEPTH
IMC/Teddy Model SFT-1224-SG-ADA
SFT Shallow Floor Trough, 24"W x 12"D x 2" deep, 14/304 stainless steel, with drain & (SG-ADA) subway grating
Model BSPC Basket Strainer w/ Handle & Chain

ITEM 23 - COUNTER W/SINKS AND OVERSHELF
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.
For faucets, see general requirements under section 2.5.

ITEM 24 - TRASH CONTAINER, 15-GAL.
CFS Brands Model 34201523
Carlisle - Trimline™ Waste Container, 15 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, gray

ITEM 25 - SPARE NUMBER

ITEM 26 - PASS-THRU UNDERCOUNTER REFRIGERATOR
Utility Refrigerator Model PT-CHR-75-3S-3S-N-EM
Undercounter Refrigerator, pass-thru, 18.7 cu. ft., three-section, expansion valve, high/low service valves, sight glass, low pressure burnout protection, digital temperature control, narrow depth, solid stainless steel doors, welded corners, stainless steel front & sides with stainless steel flat top, self-contained, 1/4 hp
Note: If freight quote is needed, please Contact Factory
Self-contained refrigeration, standard
Compressor on left side, standard

Cord with NEMA 5-15P, standard
Front: (kitchen control side) left door hinged on left, center & right door hinged on right, standard
Rear: (serving side) left door hinged on left, center & right door hinged on right, standard
(3) 5" casters, per pair

ITEM 27 - FOOD PROCESSOR, BENCHTOP / COUNTERTOP
Hobart Model FP150-1
Food Processor - Unit Only, angled continuous feed design, full-size hopper, 14 lb per/min production cap., 420 rpm, stainless steel cutting surfaces, planetary gear transmission, triple safety interlocks, aluminum housing, rubber feet, 1/2 HP, UL, NSF
Model 15SLICE-1/16-SS 1/16" Fine Slicing Plate, stainless steel (1.5mm) knives
Model 15SLICE-5/32-SS 5/32" Slicing Plate (4mm), stainless steel
Model 15SHRED-3/16-SS 3/16" Shredder Plate (4.5mm), stainless steel
Confirm with operator Plate package and all accessories for this item.

ITEM 28 - UTILITY CART, MOBILE
CFS Brands Model UC5031827
Carlisle - Utility Cart, 500 lb. capacity, 27"L x 18"W x 32-1/2"H, open design, (3) shelves, (2) with raised edges, (1) push handle, non-marking soft rubber bumpers, tig welded, (4) swivel casters, 18/10 stainless steel (29-3/4" OA length with handle)

ITEM 29 - SPARE NUMBER

ITEM 30 - SPARE NUMBER

ITEM 31 - CUSTOM COUNTER (STAINLESS STEEL)
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 32 - HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC
G.A. Systems Inc. Model HCDO2DI
Hot/Cold Dual Operation Drop-In Serving Counter, 32-11/16"W x 24-7/8"D x 29-1/2"H, 2-wells each accommodate (1) 12" x 20" pan, independent temperature controls, 3-way temp conversion switch per well (HOT/COLD/OFF), (2) pan lifting rings, stainless steel construction, side-mount self-contained refrigeration, adjustable leveling feet, (30-11/16" x 23-3/8" cutout required), cETLus, ETL-Sanitation
6' Cord with plug

Compressor located on left, standard

ITEM 33 - HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC
G.A. Systems Inc. Model HCDO3DI
Hot/Cold Dual Operation Drop-In Serving Counter, 48-7/16"W x 25-5/16"D x 29-1/2"H, 3-wells each accommodate (1) 12" x 20" pan, independent temperature controls, 3-way temp conversion switch per well (HOT/COLD/OFF), (3) pan lifting rings, stainless steel construction, side-mount self-contained refrigeration, adjustable leveling feet, (46-7/16" x 24-7/16" cutout required), cETLus, ETL-Sanitation
6' Cord with plug
Compressor located on left, standard

ITEM 34 - SNEEZE GUARD
BSI Model DECO 250-N
Refer to Manufacturer's Drawings for Details.
Model 705 Stealth™ Warmer & Light Combo, (specify voltage & length), cULus, NSF
Remote Infinite, standard
Wiring exit point to be specified
Tube Upright: 1-1/2" Round diameter, standard
Narrow flange, standard
Fitting finish to be specified
Tube finish to be specified
Glass end panel: 1/4" Tempered
Top Shelf: 1/4" Tempered glass, standard

ITEM 35 - COMPUTER
NIKEC BY OWNER
This Item Not in Kitchen Equipment Contract

ITEM 36 - WORKTABLE, W/SINK
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.
For faucets, see general requirements under section 2.5.

ITEM 37 - WALL SHELF, 2-TIER
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 38 - COFFEE GRINDER

FETCO Model GR-2.3 (G02013)

Coffee Grinder, portion controlled, (2) 5 lb. capacity removable-dishwasher-safe hopper, (3) portion sizes per side, digital, adjustable grind settings, 8 oz. per minute grind rate (medium), slicing type grinding burrs, adjustable brew basket rails, 0.5 HP motor power, NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation

ITEM 39 - STORAGE CABINET, 2-DOORS

Custom Fabricated

Constructed per 114000 specifications.
2 Doors w/ Locks
Slope Top
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 40 - WALL SHELF

Custom Fabricated

Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 41 - WORKTABLE, MOBILE

Custom Fabricated

Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 42 - HAND SINK, ADA, W/ ELECTRONIC FAUCET

Advance Tabco Model 7-PS-41

ADA Compliant Hand Sink, tapered bowl design, wall mounted, 14" wide x 16" front-to-back x 5" deep bowl, 18 gauge 304 stainless steel, electronic faucet (battery & 110v options both supplied), deck mounted soap dispenser (pump), undermounted front-loading paper towel dispenser, stainless steel skirt with removable access panel & enclosed bottom, drain with crumb basket, wall brackets, NSF, cCSAus
Model K-08 Low-flow aerator 0.5gpm, fits 55/64-27 male or 15/16-27 female thread on spout, conforms to California AB 1953
Model K-425 Thermostatic Mixing Valve, for knee pedal, foot pedal and electronic hand sinks and valves
Model 7-PS-10 P-trap, heavy duty, 1-1/2", 17 gauge

ITEM 42.1 - EYE WASH ATTACHMENT
T&S Brass Model EW-7610
Pull Down Eyewash, sink mounted, right mounting
Contact factory for options and accessories
GC to provide signage, verify requirements with owner.
KEC to coordinate mounting to deck of hand sink while maintaining functionality of any integrated soap dispenser location (see hand sink cutsheet)
Coordinate tepid water temperature per local code as required.

ITEM 43 - TRASH CONTAINER, 15-GAL.
CFS Brands Model 34201523
Carlisle - Trimline™ Waste Container, 15 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, gray

ITEM 44 - TRASH CONTAINER, 23-GAL.
CFS Brands Model 34202303
Carlisle - Trimline™ Waste Container, 23 gallon, rectangular, integrated corner tabs, bottom helper handles, heavy-duty, polyethylene, black

ITEM 45 - SPARE NUMBER

ITEM 46 - SOILED DISHTABLE
Custom Fabricated Model DTS
Soiled Dishtable with 1 Compartment Sink
Removable Scrap/Pre-Rinse Basket with Stainless Steel Slides
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 47 - PRE-RINSE FAUCET ASSEMBLY
T&S Brass Model B-0133
EasyInstall Pre-Rinse Unit, wall mount mixing faucet with 8" adjustable centers, quarter-turn Eterna cartridges with spring checks, lever handles with color-coded indexes, 18" EasyInstall riser, 44" flexible stainless steel hose with heat-resistant gray handle & hold down ring, 1.15 GPM spray valve (B-0107), finger hook, polished chrome-plated brass faucet body, 1/2" NPT female inlets, CSA
Model B-0109-01 Wall Bracket, 6"
Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male
Model B-0230-KIT Inlet Kit, 1/2" NPT nipple, close elbows, 24" flex supply hoses

ITEM 48 - RACK SHELF, TUBULAR

Advance Tabco Model DT-6R-21

Sorting Shelf, wall mounted, tubular design, 22"W, accommodates (1) full size dish rack, solid end brackets, stainless steel, KD

ITEM 49 - WALL FLASHING

Custom Fabricated

Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 50 - SPARE NUMBER

ITEM 51 - DISHMACHINE, DOOR-TYPE, VENTLESS

Hobart Model AM16VLT-ADV-2

Ventless Dishwashing Machine, tall chamber (27") door type, energy recovery, automatic soil removal (ASR), drain water energy recovery (DWER), high temp sanitizing, (field convertible to single phase), internal condensing system, 38 racks/hour, straight-thru or corner installation, user-friendly smart touchscreen controls, Sense-A-Temp™ booster, electric tank heat, X-shaped wash arms, scrap screen and basket, door actuated start, door lock, stainless steel tank, tank shelf, chamber, trim panels, frame & feet, pumped drain air gap, drain water tempering, cULus, NSF, ENERGY STAR®. Factory Startup - Free for installations within 100 miles of a Hobart Service Office during normal business hours with appropriate notice; installation beyond 100 miles will be quoted by Service.
Oversized units with crated shipping dimensions greater or equal to 72" in length and/or 90" in height. If delivery is to a facility without a standard height dock, additional shipping charges will apply depending on the service requested. consult Factory.
Model FLNG-FT-AM16 Flanged Feet, Bolt Down – Set of 4
NOTE: For water of 3-grains of hardness or more, Hobart suggests adding a water softener.

ITEM 52 - 3-COMPARTMENT SINK

Custom Fabricated

Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.
For faucets, see general requirements under section 2.5.
Model SCOV Sink Bowl Cover
T&S Brass Model B-0290 Sink Mixing Faucet, wall mount, 8" adjustable centers, 12" Big-Flo swing nozzle with plain end outlet, 4-arm kitchen handles with color coded indexes, 00LL street elbows with 3/4" female NPT inlets, ADA Compliant
T&S Brass Model B-0427 Supply Nipple, 3/4" x 2-1/2"

Component Hardware Model D50-7215 Encore® Twist Handle Waste Outlet, with 1-1/4" overflow assembly, 3-1/2" sink opening, 20 gpm max flow rate, flat snap-in stainless steel strainer, 4-1/2" self-centering stainless steel face flange, stainless steel twist handle, nickel plated cast brass body, 2" NPT, CSA

ITEM 53 - PRE-RINSE UNIT W/ ADD-ON FAUCET

T&S Brass Model B-0133-14CRBJSX

Pre-Rinse Unit, EasyInstall wall mount mixing faucet with adjustable 8" centers, quarter-turn Cerama cartridges with check valves, lever handles with color coded indexes, add-on faucet with 14" swing nozzle, 44" flexible stainless steel hose, 1.07 gpm spray valve with swivel, 6" wall bracket, finger hook, accessory fitting tee, 1/2" NPT male elbow installation kit

Model B-0230-K Installation Kit, (2) 1/2" NPT nipples, lock nuts & washers, (2) short "Ell" 1/2" NPT female x male

Contact factory for options and accessories

ITEM 54 - WALL SHELF, TUBULAR

Advance Tabco Model DT-6R-60

Drainage Shelf, wall mount, tubular design, 60"W x 15"D x 8"H, stainless steel, KD

ITEM 55 - SPARE NUMBER

ITEM 56 - DISHWASHER, UNDERCOUNTER

Hobart Model LXNR-2

Advansys™ Dishwasher, undercounter with 17” door opening height, 120/208-240/60/1, accommodates optional two-level racking accessory, high temperature sanitizing, Steam elimination and Energy Recovery, 30, 24, 13 Racks/Hour, (48 racks / hour with second level rack), Fresh Water Rinse, .62 gal/rack, Complete Delime™ with Delime Notification, Auto Dispensing, and Booster Guard™, 3 selectable cycles - light, normal, heavy (Pot & Pan cycle on heavy cycle), smart touchscreen controls with SmartConnect™ app, Service Diagnostics, Chemical Pumps with Auto Prime, 23-15/16"W x 26-13/16"D x 32-1/2"H, cULus, NSF, ENERGY STAR®. Free factory startup for installations within a 100 mile radius of a Hobart service office; installation beyond 100 miles will be charged at the quoted rate by the local Hobart service office

Model CORD-PWRKIT-H3LX Power Cord Kit - LXE, 120/208-240/60/1, plug included

Model DWT-ADV-LXN Drain water tempering kit for LXNR models

Installation of DWT kit only (NET)

Model EXTERN-CASTER-LXN External Height Adjustable Casters – Machine width increases by 4.25”, height is adjustable by +0-1”

Model DOORLOCK-LXN Automated door lock prevents opening of door before cycle is complete for LXnR models

Model DWTXAMINSTALL0 Installation of LXEDRLK-W/O-BD (NET)

ITEM 57 - MOP SINK CABINET
Eagle Group Model F1916-VSCS
Mop Sink Cabinet, single width, 25"W x 22-1/4"D x 84-1/4"H, slanted top, holds (2) mops, (2) hinged doors with transverse rod handles & keyed locks, 8" deep mop sink with service faucet, (1) 12"D fixed overhead shelf, includes 30" spray hose & spray hose bracket, 430 stainless steel construction, NSF
Model B-0665-CR-BSTRK Service Sink Faucet, wall mount, mixing faucet with 8" adjustable centers, Cerama cartridges with check valve, lever handles with color coded indexes, upper support bracket, vacuum breaker spout, built-in stops, chrome plated brass body, 1/2" NPT female inlets, low lead, cCSAus, ADA Compliant (B-0230-K)

ITEM 58 - FLOOR TROUGH, SHALLOW-DEPTH
IMC/Teddy Model SFT-1236-SG-ADA
SFT Shallow Floor Trough, 36"W x 12"D x 2" deep, 14/304 stainless steel, with drain & (SG-ADA) subway grating
Model BSPC Basket Strainer w/ Handle & Chain

ITEM 59 - SPARE NUMBER

ITEM 60 - SPARE NUMBER

ITEM 61 - LOCKERS 3-TIER
NIKEC BY GC, ARCHITECT TO SPECIFY
This Item Not in Kitchen Equipment Contract

ITEM 62 - ICE MAKER WITH BIN, CUBE-STYLE
Scotsman Model UC2724SA-1
Undercounter Ice Maker with Bin, cube style, air-cooled, 24" width, self-contained condenser, production capacity up to 282 lb/24 hours at 70°/50° (210 lb AHRI certified at 90°/70°), 80 lb bin storage capacity, small cube size, front facing removable air filter, recessed utility chase, unit specific QR code, ice scoop included, 6" adjustable legs, includes 5.5’ power cord with plug, NSF, cULus, engineered and assembled in USA
NOTE: Sale of this product must comply with Scotsman's MSRP Policy; contact your Scotsman representative for details
Connected to Water Filter Item #63

ITEM 63 - WATER FILTER
Scotsman Model AP1-P

AquaPatrol™ Plus Water Filtration System, single system, 2.1 gallons per minute max flow, designed for cubers up to 650 lb, and for flakers, nuggets & nugget dispensers up to 1,200 lb, cULus, NSF
NOTE: Sale of this product must comply with Scotsman's MSRP Policy; contact your Scotsman representative for details
Model APRC1-P AquaPatrol™ Plus Water Filter Replacement cartridge (1 each), cULus, NSF
Connected to Item #62

ITEM 64 - FLOOR TROUGH, SHALLOW-DEPTH
IMC/Teddy Model SFT-1224-SG-ADA
SFT Shallow Floor Trough, 24"W x 12"D x 2" deep, 14/304 stainless steel, with drain & (SG-ADA) subway grating
Model BSPC Basket Strainer w/ Handle & Chain

ITEM 65 - SPARE NUMBER

ITEM 66 - DUNNAGE RACK, MOBILE
Advance Tabco Model DUN-2036C
Special Value Dunnage Rack, mobile, square bar, one tier, 36"W x 20"D x 9-1/4"H, aluminum finish with 6" dia. casters, 36"H handle, 1800 lb. load capacity (evenly distributed)

ITEM 67 - SHELVING UNIT
Metro Model MAX Q SERIES
MetroMax Q™ Shelf, 5-tier, open grid polymer with Microban® antimicrobial product protection, epoxy coat steel frame, (4) wedge connectors, NSF
MQ74PE Quick Ship - MetroMax® Q Post, 74-3/16"H, for stationary use, epoxy coated steel with built in Microban® antimicrobial product protection, taupe
Install first shelf 10" above finished floor with remaining shelves spaced equally apart
Size and quantity per Plan
KEC to verify job site requirements.

ITEM 68 - SHELVING UNIT, MOBILE
METRO MAX Q SERIES
MetroMax Q™ Shelf, 5-tier, open grid polymer with Microban® antimicrobial product protection, epoxy coat steel frame, (4) wedge connectors, NSF
MQ74UPE MetroMax® Q Post, 73-3/16"H, for use with stem casters, epoxy coated steel with built in Microban® antimicrobial product protection, taupe

5PCXM Polymer Stem Caster, swivel, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, Microban® antimicrobial product protection, NSF (donut bumpers included)
5PCBXM Polymer Stem Caster, brake, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, Microban® antimicrobial product protection, NSF (donut bumpers included)
Install first shelf 10" above finished floor with remaining shelves spaced equally apart
Size and quantity per Plan
KEC to verify job site requirements.

ITEM 69 - SPARE NUMBER

ITEM 70 - SPARE NUMBER

ITEM 71 - WALK IN COMBINATION COOLER/ FREEZER
RMI Model WALK-IN COMPLEX
Size and shape per Plan
Fabricated per Manufacturer's Drawings
KEC to provide submittal drawings for review and approval prior to ordering

ITEM 72 - EVAPORATOR COIL, +35F
Airdyne Refrigeration Inc. Model CUSTOM
Connected to Remote Refrigeration Rack
Refer to Manufacturer's Drawing and specification for Item R1
KEC to provide submittal drawings for review and approval prior to ordering.

ITEM 73 - EVAPORATOR COIL, -10F
Airdyne Refrigeration Inc. Model CUSTOM
Connected to Remote Refrigeration Rack
Refer to Manufacturer's Drawing and specification for Item R1
KEC to provide submittal drawings for review and approval prior to ordering.

ITEM 74 - SHELVING UNIT, MOBILE
METRO MAX Q SERIES
MetroMax Q™ Shelf, 5-tier, open grid polymer with Microban® antimicrobial product protection, epoxy coat steel frame, (4) wedge connectors, NSF
MQ74UPE MetroMax® Q Post, 73-3/16"H, for use with stem casters, epoxy coated steel with built in Microban® antimicrobial product protection, taupe

5PCXM Polymer Stem Caster, swivel, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, Microban® antimicrobial product protection, NSF (donut bumpers included)
5PCBXM Polymer Stem Caster, brake, 5" dia., 1-1/4"W face, -20° F to 120°F temperature range, polyurethane wheel tread, 300 lb. capacity, Microban® antimicrobial product protection, NSF (donut bumpers included)
Install first shelf 10" above finished floor with remaining shelves spaced equally apart
Size and quantity per Plan
KEC to verify job site requirements.

ITEM 75 - SPARE NUMBER

ITEM 76 - BUS BOX / TUB STORAGE RACK / CART
Channel Manufacturing Model BBC-3
Box Bus / Mobile Cart, Bus Box Cart, Single Section, 21.5"W x 18"D x 41"H, Aluminum Construction, End Load, 10" Angle Spacing, (3) 7" deep bus boxes (BB5, sold separately), 5" Swivel Stem Casters model # CSS45O, Made in USA, NSF, 15lbs. (ITEM WEIGHT ONLY), weight does not include 50 lbs. for pallet weight

ITEM 77 - TRASH CONTAINER
NIKEC BY MILLWORK
This item Not in Kitchen Equipment Contract

ITEM 78 - SALAD BAR
G.A. Systems Inc. Model D3640
Speedee Serv® Speedline Merchandising Cabinet, 40"W x 30-3/8"D x 34"H, (2) locking pins, stainless steel top & trim, galvanized body, (4) 3" plate non-marking swivel casters with brakes, ADA Compliant, ETL-Sanitation (contact factory for price)
1 year parts & labor warranty,standard
High pressure laminate exterior finish, available in custom colors - contact factory for color options
16/304 stainless steel top, standard
No doors on under storage, standard
FULLY enclosed cabinet with no doors.
Access to base from ventilation grates area only.
No pins, in lieu of standard locking pins

Model DSN4030G Quick Click Adjustable Sneeze Guard, 40"W x 29"D x 22"H, double-sided, top mount, 1" round stainless steel tubing with brushed finish, 3/8" thick tempered glass with polished edges, independent angular adjustable, includes: hardware, ETL-Sanitation (contact factory for price)
1 year parts & labor warranty,standard

Model LF Light Fixture, for Sneeze Guards & Display Shelves (contact factory for price)

(2) Model TRS40 Tray Slide, drop-down design, 40"W x 8-5/8"D x 2"H, includes: chrome-plated fold-down brackets, 18 gauge stainless steel construction (contact factory for price)
(2) Model TS12 Tray Shelf, drop-down design, 29"W x 12"D x 2"H, stainless steel construction, includes: fold-down brackets (contact factory for price)

Model SB2DI Drop-In Refrigerated Salad Bar, 33-1/4"W x 26-1/2"D x 27-7/8"H, 8" deep stainless steel display well, stainless steel construction, 3 foot control conduit, side mount self-contained refrigeration, adjustable leveling feet, (32" x 25-5/8" cutout required), UL, ETL (contact factory for price))
1 year parts & labor warranty,standard
1/2 HP, 120v/60/1-ph, cord with NEMA 5-15P, standard
6' Cord with NEMA 5-15P plug
3' control conduit length, standard
Compressor located on left, standard
Model AD2 Adapter Pan, double well, stainless steel construction (contact factory for price)
VERIFY FINISHES WITH ARCHITECT
Refer to manufacturer drawings for details.

ITEM 79 - SPARE NUMBER

ITEM 80 - SPARE NUMBER

ITEM 81 - BEVERAGE COUNTER W/ ADA SINK
NIKEC BY MILLWORK
This item Not in Kitchen Equipment Contract

ITEM 82 - ICE & WATER DISPENSER
Scotsman Model HID312A-1
Meridian™ Ice & Water Dispenser, Touchfree® infrared dispensing, H2 Nugget Ice, air cooled, production capacity up to 260 lb/24 hours at 70°/50° (225 lb AHRI certified at 90°/70°), 12 lb bin storage capacity, sealed maintenance-free bearings, removable bin, removable air filter, removable spouts and sink, enlarged 0.8" sink drain, recessed utility chase, stainless evaporator and auger, enlarged 11" dispensing area, USB software upgrade port, unit specific QR code, stainless exterior, AgION™ antimicrobial protection, R-refrigerant, includes 7.5’ power cord with plug, cULus, NSF, CE, engineered and assembled in USA
NOTE: Sale of this product must comply with Scotsman's MSRP Policy; contact your Scotsman representative for details
Model KLP24A 4" Adjustable legs, plastic with metallic foot for HID models (set of 4)

Connected to Water Filter Item #83

ITEM 83 - WATER FILTER

Scotsman Model AP1-P

AquaPatrol™ Plus Water Filtration System, single system, 2.1 gallons per minute max flow, designed for cubers up to 650 lb, and for flakers, nuggets & nugget dispensers up to 1,200 lb, cULus, NSF

NOTE: Sale of this product must comply with Scotsman's MSRP Policy; contact your Scotsman representative for details

Model APRC1-P AquaPatrol™ Plus Water Filter Replacement cartridge (1 each), cULus, NSF

Connected to Item #82

ITEM 84 - COFFEE BREWER

FETCO Model CBS-2253-NG (E2253US-UB250-MA110)

Extractor NG™ Series Coffee Brewer, twin, 2.0 gallon capacity, LED touchscreen interface, brew status indicator light, ECO mode, USB plug-in feature, manual hot water service, stainless steel brew basket, dual phase (specify), 26 gallons per hour, cULus, NSF (Use with FETCO D449/D480/D009 - sold separately)

NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation

Black dispenser faucet, standard

NOTE: Pricing and specifications subject to change with or without notice - Please call 1.800.FETCO.99 for confirmation

heater, 3+G wires, 11.3-terminal block, 31.8-30.0 gal/hr

(2) Model D450 L4D-20 LUXUS® Thermal Dispenser, 2.0 gallon, Freshness Timer®, Volume Indicator™, vacuum insulated, flip & hide fill-through lid, base with built-in handles and drip tray

Connected to Water Filter Item #86

ITEM 85 - SPARE NUMBER

ITEM 86 - WATER FILTRATION SYSTEM, FOR COFFEE BREWERS

Everpure Model EV927200

QL3 Water Filtration System, QL3 BH², Single, (1) BH² Micro-Pure® II Precoat primary filtration cartridge, reduces chlorine, taste & odor, inhibits scale, 3,000 gallons, 0.5 gpm, 0.5 micron, 3/8" inlet, 3/8" outlet, NSF 42 & 53 (EV927200)

Model EV961250 BH² Water Filter Cartridge, BH² Cartridge, (1) BH² Micro-Pure® II Precoat primary filtration cartridge, reduces scale, chlorine, taste & odor, 3,000 gallons, 0.5 gpm, 0.5 micron, NSF 42 & 53 (EV961250)

Connected to Item #84

ITEM 87 - SPARE NUMBER

ITEM 88 - SPARE NUMBER

ITEM 89 - SPARE NUMBER

ITEM 90 - SPARE NUMBER

ITEM 91 - CHANNEL GUARD
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM 92 - CORNER GUARD
Custom Fabricated
Constructed per 114000 specifications.
Size & Shape per plan, Elevation and Details.
KEC to submit drawings for review and approval prior to fabrication.

ITEM R1 - REMOTE REFRIGERATION RACK
Airdyne Refrigeration Inc. Model MP-4
Refer to Manufacturer's Drawings

A. Airdyne shall Furnish and Install mechanical refrigeration work as indicated and specified, complete and ready for use. All systems shall comply with the latest edition of Title 24, 2016 Building Efficiency Standards. Airdyne to include complete refrigeration installation for the project so as to not void manufacturer warranty. Food Service Equipment Contractor shall contract directly with Airdyne for the procurement and installation of refrigeration system and install.

Principle Items of work include:

1. Mechanical refrigeration systems, including compressor units, condensers, receivers, refrigerant piping, evaporator coils, control valves, compressor racks, weather covers and required miscellaneous items. Refrigeration equipment shall consist of two major assemblies. One is the condensing unit assembly with all necessary components, factory installed and wired including single point electrical panel, circuit breakers and contactors, OSHA approved fan guards, aluminum flexible conduit for internal wiring,

suction/liquid filter driers, sight glasses, oil separator, hand valves, adjustable dual pressure controls, flexible pressure hoses, Rotolock compressor adaptors and necessary tubing. The other is the refrigeration evaporator coil assembly/heat exchanger with liquid line solenoid valve, electronic thermostat expansion valve with IntelliGen

Controller and on/off power switch, completely factory pressure tested with dry nitrogen.

Refrigeration package shall be a pre-engineered and factory assembled unit trade name "MULTI PAK" as manufactured by RMI-Airdyne Refrigeration, 17018 Edwards Road, Cerritos, CA 90703.

Phone: (562) 926-2006 – Fax: (562) 926-2007 – Email: sales@rmi-airdyne.com

Compressor shall conform to the Refrigeration Schedule as shown on Sheet R-1 or

as specified herein:

a. Utilize refrigerant with an ozone depleting potential of 0.

b. R-448a for all low and medium temperatures.

c. Other refrigerant approved by the Department of Energy for use in remote refrigeration system after December 31, 2017.

2. Refrigeration system shall be housed in a weather protected enclosure. The frame shall be fabricated of galvanized steel. Entire frame shall be pre-assembled, welded, cleaned, primed and powder coated epoxy enamel and baked. The condenser shall be sectional, removable with rifled tubing slotted finned and shall be designed for 20 F T.D. Condenser fins shall be coated to minimize salt air corrosion.

3. Furnishing of motor starters and walk-in refrigerator/freezer thermostats for installation under Electrical Section.

4. Sleeves, inserts, hangers, supports and other incidental items necessary to complete the work.

5. Cutting and patching of non-structural and other incidental items necessary to complete the work on this section.

6. Testing ,charging, adjusting, operational testing and cleaning of equipment. Conduct all tests as required by local inspecting agencies concerned with the project. Each refrigeration item specification is written to provide minimum specifications and scope of work.

7. Refrigeration equipment shall be designed and installed to maintain the following general temperature unless otherwise specified.

a. Walk-in Refrigerators 1.7 degrees C/ 35 degrees F

b. Walk-in Freezers -23.2 degrees C/ -10 degrees F

c. Reach-In Refrigerators 1.7 degrees C/ 35 degrees F

d. Reach-In Freezers -23.2 degrees C/ -10 degrees F

e. Undercounter Refrigerators 1.7 degrees C/ 35 degrees F

f. Undercounter Freezers -23.2 degrees C/ -10 degrees F

g. Cold Pans 4 degrees C/ 39 degrees F

h. Blast Chillers 1.7 degreesC/35 degrees F

B. Compressors and Condensing units shall be new and factory assembled Scroll type as manufactured by Copeland Corporation and as indicated on Refrigeration Schedule. Compressors and Condensing units shall operate at such speed within recommended range of section and discharge pressure for economical operation and with required BTUH rating per hour, sizes and capacities in accordance with specifications. Provide units of same manufacturer and type throughout, new standard cataloged, to operate with refrigerant R-448a, 100 ambient air, capacities selected on 16 hour running time basis for medium temperature fixtures and 18 hour running time basis for low temperature fixtures. For locations where the ambient exceeds 100 degrees Fahrenheit, the system is to be engineered for the maximum recorded ambient temperature. Additionally, all parallel systems shall include a minimum of one digital scroll compressor and be designed with 75% redundancy minimum.

Each compressor shall be neatly piped to a common suction and liquid manifold and extended to a central location to facilitate a single point field connections.

C. Compressor shall be completely factory installed and wired to a common load center panel for a single point connection.

D. Main power disconnect is to be weatherproof type as required by U.L. The entire electrical assembly shall meet all requirements of the National Electrical Code. All compressor motor contactor, capacitors, relays, fuses, defrost clocks and all required electrical components shall be neatly installed within the factory supplied pre-wired control panel.

E. Medium temperature evaporator coils shall be equipped with Electronically Commutated Motors (ECM) as indicate on Refrigeration Schedule. All evaporator coils shall be UL Listed, NSF approved units with inline fans and cross fins staggered. Provide copper tubing, aluminum cased, permanently lubricated motors with thermal overload protection. Unit shall be provided with IntelliGen Controller (or approved equal) capable of providing evaporator fan control, remote monitoring and diagnostics. Control system shall be interconnected to the local area network and be capable of sending alarm alerts via mobile telephone or e-mail. Water proof electrical system pre-wired to a single point connection.

Coils are designed to operate above 34 F Fahrenheit

F. Low temperature evaporator coils shall be equipped with Electronically Commutated Motors (ECM) as indicate on Refrigeration Schedule. All evaporator coils shall be UL Listed, NSF approved units with inline fans and cross fins staggered. Provide copper tubing, aluminum cased, permanently lubricated motors with thermal overload protection. Unit shall be provided with IntelliGen Controller (or approved equal) capable of providing evaporator fan control, on demand defrost, remote monitoring and diagnostics. Control system shall be interconnected to the local area network and be capable of sending alarm alerts via mobile telephone or e-mail. Water proof electrical system pre-wired to a single point connection.

Coils are designed to operate in a range from 30 degrees above Fahrenheit to -20 degrees Fahrenheit.

G. All evaporator coils shall be mounted tightly to the ceiling with ½" diameter nylon all thread rod. If any evaporator coil should weight more than 300 Lbs. then Unistrut channels shall be span across a minimum of two (2) walk-in ceiling panels.

H. Airdyne shall be responsible for final connection of all refrigeration installation for walk-in cooler/freezer and refrigerated piping.

I. Refrigerant tubing shall be type L ACR hard drawn or soft copper which is cleaned, capped and conforms to ASTM standard specifications. Hard drawn tubing shall be used in all applications except for piping runs within conduits or building chases. All copper fittings shall be of wrought type copper.

J. All solenoid and expansion valves shall be manufactured by Sporlan Valve Company with sweet type connections. Flare nut connections will not be allowed. Thermostat and water pressure regulator shall be manufactured by Johnson Controls Company.

K. All refrigerant piping shall be properly supported by adjustable hangers to insure a minimum horizontal line run slope of 1" per 20 feet toward the condensing unit. Where vertical suction line runs exceed 10 feet in height, a suction trap shall be installed at the bottom of the riser. All refrigerant piping shall be installed in accordance with ASHRAE standards.

L. All refrigerant suction lines shall be insulated with a minimum of 3/4" thick Armstrong Armaflex AP Pipe insulation sealed with adhesive foam insulation low temperature systems and 1/2" for medium.

Temperature. For glycol systems the minimum insulation shall be 3/4 ".

Tape fitting to be sufficient thickness to prevent condensation. Lines ran externally shall include a hard white PVC cover.

Metal pipe sleeves shall be provided and installed by the General Contractor where piping passes through a wall, ceiling or floor. All spaces around tubing shall be filled with a mastic insulating compound.

All refrigerant piping exposed to outside of building must be wrapped with aluminum pipe jacket.

M. All copper drain lines from evaporator coils to a point 1” above the floor. Drain lines shall be 1" Type M copper furnished and installed by the Plumbing Contractor. Route and pitch 1/2” per foot to drain. Plumber shall provide a brass union and cleanout connection at coil outlet to facilitate repair, cleaning and replacement. All drain lines shall be trapped immediately above the floor sink or drain. All exposed drain lines shall be painted with two (2) coats of Chromo-tone paint.

N. All freezer drain lines shall be wrapped and insulated with a continuous electrified 10 watts per feet heater tape provided and installed by the Electrician.

O. The Electrical Contractor shall provide and install the main power to each disconnect and shall also inter-wire power to all evaporator coil controllers as shown on refrigeration drawings.

P. It should be noted that the Food Service Equipment Provider will be required to supervise and instruct the Plumber and Electrician in their work of connection. Rack shall comply in all respects to design drawings and any discrepancies noted during the bidding process shall be immediately noted to the Consultant for interpretation and action. No extras will be considered after the bidding process for not following the above procedures.

Q. Total refrigeration system shall be furnished with a one (1) year service contract, covering all parts and labor, with service available seven (7) days per week, twenty-four (24) hours per day. Continuation of the service contract after the first year shall be at the option of the Owner. The refrigeration system shall be warranted for one (1)) year and the compressors shall carry the manufacturer’s extended four (4) year warranty. Food service equipment provider shall contract all aspects of installation for refrigeration systems directly with specified factory so as to not void warranty.

END OF SECTION

SECTION 11 66 13 – FITNESS EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, equipment, tools, accessories, transportation, and services as required to furnish and install Fitness Equipment, including signs.

B. Related Requirements
   1. Section 312200, Grading
   2. Section 321100, Base Courses

1.2 References

A. ASTM F2276-10(2015)

B. ASTM F1292, Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment, current version.

C. ASTM F1951: Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment, latest edition.

D. 2010 California Building Code (2010 CBC)

E. Department of Justice Title II regulation of ADA (28CFR Part 35)

F. Department of Justice Title III regulation of ADA (28 CFR Part 36)

G. Department of Justice 2010 American Disabilities Act Standards for Accessible Design ('2010 ADA').

1.3 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 20 00, Price and Payment Procedures.

1.4 SUBMITTALS

A. Fitness Equipment Shop Drawings: Prior to the purchase of the Fitness Equipment items and within ten (10) days after notice to proceed, Contractor shall submit the following items to Engineer for review and approval. No materials for this section shall be purchased until such approval is granted. Incomplete submittals shall be returned without review.
   1. Plan view drawing of playground equipment at eighth scale with overall dimensions, all components labeled, and deck heights shown.
   2. Isometric drawing of playground equipment.
   3. Listing of color and finish for posts, plastic components, decks and accessories.

4. Show locations and dimensions of footings and anchorage points.
5. Clearly identify mounting elevations in relation to a fixed survey point on site and to sub-grade elevation and depth of playground protective surfacing.
6. Show locations of underground utilities, storm drainage system, and irrigation system (where occurs).
7. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
8. Indicate capacity and numbers of play activities.
9. Shop drawings must be signed and sealed by a structural engineer registered in the State of California.
10. Calculations and drawings for fitness equipment footings shall be submitted, signed and sealed, by a structural engineer registered in the State of California.
11. Manufacturer's contact information.
12. Maintenance / repair instructions.
13. Manufacturer's Parts Lists.
14. Manufacturer's Installation instructions

B. Color chart showing full range of manufacturer's colors or six inches (6") length of actual units showing the full range of colors and textures available for components with factory applied color finishes.

C. Certificates
1. Supplemental insurance coverage as offered by manufacturer and/ or manufacturer's sale representative for equipment and surfacing indicating a limit of product liability of not less than $5,000,000.

D. Manufacturer's Instructions and Details and Installation of playground equipment.

E. Maintenance Data: Provide manufacturer's recommended maintenance instructions and list of replaceable parts for each equipment item, with address and phone number of source of supply.

F. Proposals for Substitutions: Substitutions that will increase the fall height, platform height, or maximum equipment height will not be considered.

1.5 PROPOSALS FOR MODIFICATIONS

A. Submit shop drawings with proposed modifications clearly identified and sufficient information to determine compliance with specified criteria.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications
1. Provide only playground equipment and play structure components bearing the IPEMA Certification Seal.

B. Installer Qualifications
1. An experienced installer who has a minimum of 5 installations of similar size and scope over the past three (3) years and is specialized in installing work similar in

material, design, and extent to that indicated for this Project and who is acceptable to manufacturer of playground equipment.

C. Testing Agency Qualifications
1. An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver manufactured products in manufacturer's unopened containers, fully identified with manufacturer's name, brand, type and grade.

B. Protect from weather, soiling and damage using handling equipment and storage techniques recommended by manufacturer.

C. Materials: All materials required to complete the work under this contract shall be furnished by the Contractor.

1.8 WARRANTY

A. Final Guarantee: Contractor shall provide guarantee

B. Manufacturer's warranty: Submit manufacturer's warranty and ensure that forms have been completed in the Tribe's name and registered with manufacturer.
1.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Fitness equipment shall be manufactured by Greenfields Outdoors Fitness, Inc, 2617 West Woodland Drive, Anaheim, CA 92801. Contact: Frank Vasquez, 888-315-9037 or Approved Equal.

B. Recumbent Bike (with resistance) (UBX249-01K), Color: Green

C. Accessible Rower Adjustable Resistance (UBX290W-01), Color: Green

All Equipment shall be galvanized metal, ground mount installation method.

2.2 SIGNAGE

A. Instructional Sign
1. Instructional sign shall consist of pipe frame and graphic panel. One piece pipe frame shall be 1-5/16" (33 mm) o.d. schedule 80 steel pipe formed into a "U" shape. Each frame leg shall embed 3'-0" (915 mm) below finished grade and have a 3/8" (10 mm) diameter hole to receive one No. 4 reinforcing bar (to be supplied by

installing contractor). Pipe frame shall be ground smooth, deburred, and powder coat finished in accordance with Section 4.0.

2. Sign panel shall be fabricated of 18 gauge (1.2 mm) mild steel plate and include a graphic illustration and written instructions for safe and proper use of the fitness apparatus. Panel shall be porcelain enamel finished BLUE or GREEN with white graphics in accordance with Paragraph 1.3. The manufacturer shall attach panels to sign frames with vandal-resistant fasteners.

B. Signage Finish

1. Graphic panel shall be coated on all sides with porcelain enamel, a colorful, glossy, tough, extremely weather-resistant finish. The porcelain enamel process shall permanently fuse a thick layer of glass to the metal substrate at temperatures exceeding 1,500□F (815□C). To assure adhesion, only glasses possessing thermal expansion qualities lower than those of the steel plate shall be accepted.

2.3 METAL MATERIALS

A. Posts

1. All posts shall be 4-1/2" (o.d.) schedule 40 steel galvanized pipe with a minimum wall thickness of 7/32" in accordance with ASTM A-53, Type E, Grade A. Thin wall tubing is not acceptable. Posts and their end caps shall be powder coast finished in accordance with Section 4.0.

B. End Treatment

1. Exposed ends of posts shall be fitted with a cast aluminum (384 alloy) hemi-dome end cap permanently adhered in place. Easily vandalized plastic and/or friction fit end caps are not permitted.

C. Post Embedment

1. Posts shall be embedded 3’-0" (915 mm) below grade in concrete footings as depicted on the erection drawings. Actual concrete footing sizes can vary and depend on job site and climatic conditions. Consult project engineer/owner for exact requirements. Posts shall include through holes to receive two No. 4 reinforcing bars (to be supplied by installing contractor).

D. Collars

1. Cast aluminum (384 alloy) two-piece attachment collars shall be provided in sufficient quantity to connect all rails to support posts. Collars must be formed to recess bolt fastener. Each collar set shall include two vandal-resistant stainless steel socket-head cap screws with nuts and two 1/4" x 1" drive rivets. Collars shall be Powder coat finished in accordance with Section 4.0.

E. Straight and Curved Rails

1. Unless otherwise noted, all steel straight and curved rails shall be 1-5/16" (33 mm) o.d. schedule 40 steel galvanized pipe in accordance with ASTM A-53, Type E, Grade A. Straight and Curved Rails shall be powder coat finished in accordance with Section 4.0.

F. Fabrication
1. All welds shall comply with AWS standard D1.1. All edges, ends, and welds shall be ground smooth by hand to a maximum grit of 36 and shotblasted to a uniform surface texture.

G. Quality Control
1. Inspectors shall examine metal components for correct fabrication, fastener hole alignment, and smoothness.

H. Additional Hardware
1. Additional hardware shall be provided in sufficient quantity to complete assembly of the fitness equipment. All hardware shall be non-ferrous, or color finished with powder coat, or galvanized, or electrostatic zinc plated in accordance with the manufacturer's standard.

2.4 METAL FINISH

A. Metal parts, except fasteners and sign panels, shall be finished with powder coat. Liquid, epoxy, or lead-containing powder coatings are not acceptable. The powder coat color shall be the manufacturer's standard or as selected by the owner's representative and designated on the project plans and/or specifications.

B. Cleaning
1. Substrate preparation shall consist first of mechanical cleaning to remove heavy mill scale, rust, varnish, grease, etc., then chemical cleaning in accordance with TT-C-490C, Methods I and III.

C. Phosphate Application
1. After cleaning, the metal substrate shall receive a corrosion-inhibiting iron phosphate coating in accordance with TT-C-490C, Type II, before application of the final color coat.

D. Powder Application
1. The coating powder shall be uniformly applied by the electrostatic method to a minimum thickness of six mils. Promptly after the application of the powder, the coating shall be oven-cured at 400□F (204□C) to chemically bond the finish to the substrate and to render the color finished surface resistant to abrasion, impact, household chemicals, weathering and rusting.

E. Chronological Importance
1. For a corrosion-inhibiting agent to be effective, all fabrication including cutting, coping, grinding, and welding must be completed before application of the corrosion-inhibiting agent. Corrosion-inhibiting agent applied prior to fabrication are not acceptable.

F. Quality Control

1. The applicator shall test the finish of each lot for correct millage, chemical resistance, hardness, and internal bond in accordance with established industry standard test methods.
2. Records of this quality control procedure shall be made and retained for two years.

PART 3 - EXECUTION

3.1 INSTALLATION INSTRUCTIONS AND AIDS

A. To guide installation, fitness equipment shall be accompanied by bills of materials, written instructions, and an erection plan view drawing to be furnished prior to or with the delivery of the fitness equipment. To facilitate assembly, each part shall be indelibly stenciled with an easily-read identification number keyed to the bills of materials and erection drawings. All components shall be shipped unitized, protectively wrapped, banded for mechanical handling and ready for assembly.

END OF SECTION

SECTION 11 70 00 - HEALTHCARE EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Specimen pass-through boxes.
2. Wall-mounted sharps receptacles.

B. Related Sections:

1. Section 10 28 00 "Toilet, Bath, and Laundry Accessories" for standard accessories at public-use restrooms and showers and at private-use bathrooms.

1.2 ACTION SUBMITTALS

A. Product Data: Provide for each unit of healthcare equipment specified, including rough openings, construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

B. Shop Drawings: Identify where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: Instructions, including replaceable parts and service recommendations.

1.4 SITE CONDITIONS

A. Coordination: Coordinate healthcare equipment locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of healthcare equipment items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 304, with brushed satin No. 4 finish, 0.050-inch (18-gage) minimum thickness.

B. Galvanized Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

2.2 HEALTHCARE EQUIPMENT

A. Specimen Pass-Through Box:

1. Basis-of-Design Supplier: WR Hardware.
2. Product: Bobrick; B-505 Recessed Specimen Pass-Thru Box.
3. Cabinet: 18-8, Type 304, 22 gage stainless steel, all welded construction.
4. Doors: Two, 18-8, Type 304, 18 gage stainless steel with satin finish, spring loaded, self-closing, and mounted with full-length stainless steel piano hinge.

5. Description: With removable drip tray.
6. Nominal Wall Opening: 11-3/8" W by 12-5/8" H by 6" D.
7. Material and Finish: Stainless steel, No. 4 finish (satin).
8. Lock: Interlock mechanism to prevent door opening on opposite side when in use.

B. Wall-Mounted Sharps Receptacle Cabinet with Drop Tube.

1. Basis-of-Design Manufacturer: Post Medical.
2. Model: SFP High-Security Sharps Cabinet, Lockable.
3. Description: Fabricated from 16-gage stainless steel, with external touchless vertical drop tube, robust steel lock housing, and four-point steel backplate, to receive 1.5 gallon plastic sharps container.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Lock: 7/8-inch standard flat key cam lock cylinder.

2.3 FABRICATION

A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of healthcare equipment. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Healthcare Equipment, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless-steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed and Semi-Recessed Healthcare Equipment, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install healthcare equipment according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure healthcare equipment to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

3.2 ADJUSTING

A. Adjust healthcare equipment for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Test installed electrical components to verify proper functioning.

3.3 CLEANING

A. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

B. Construction Waste Management: Manage construction waste in accordance with provisions of Section 01 74 19 Construction Waste Management. Submit documentation for Measure A2.1 to satisfy the requirements of that Section.

3.4 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operation, and daily maintenance of healthcare equipment.

B. Make a final check of healthcare equipment operation with Owner's personnel present and before date of Substantial Completion. Determine that operation systems and devices are functioning properly.

3.5 PROTECTION

A. Protect equipment from damage during remainder of the construction period.

END OF SECTION

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SECTION 12 21 16 - VERTICAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vertical louver blinds with aluminum vanes at dorm rooms.

1.2 ACTION SUBMITTALS

A. Certificates: Provide manufacturer certification that vertical louver blinds comply with product safety standard as set forth in "Vertical Louver Blind Fabrication" article in this Section.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver vertical louver blinds in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not install vertical louver blinds until construction and wet and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where vertical louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.5 WARRANTY

A. Provide manufacturer's standard warranty against defects in materials, workmanship, and operation.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain vertical louver blinds from single source from single manufacturer.

2.2 VERTICAL LOUVER BLINDS, ALUMINUM VANES

A. Basis-of-Design Product:

1. Hunter Douglas Contract; Somner Custom Vertical Blinds.

B. Manufacturers of Comparable Products: Subject to compliance with requirements, comparable products by the following will be considered:

1. Builder's Drapery Service.

2. Hunter Douglas Contract.
3. Springs Window Fashions (SWF Contract).

C. Vanes: Aluminum, alloy, and temper recommended by producer for type of use and finish indicated; with crowned profile and not less than 3/8-inch (9.5-mm) overlap when rotated fully closed.

1. Width: 3-1/2 inches (89 mm).
2. Profile: Crowned.
3. Features: Cordless operation.

D. Headrail: Channel, extruded aluminum with long edges returned or rolled and ends capped. Headrail encloses operating mechanisms including carrier-spacing mechanism that provides uniform vane spacing when blinds are traversed fully across headrail (closed).

1. Manual Traverse Control: Fiberglass wand with ADA-compliant 4-inch diameter looped end.

a. Basis-of-Design Product: Rowley Company; Handicap Fiberglass Baton.

2. Manual Rotation Control: Automatic rotation mechanically activated by traverse control.
3. Manual Control Locations: As indicated on Drawings.
4. Draw and Stack: One way, as indicated on Drawings.

E. Carriers: Engineered plastic with gears to align and synchronize vane rotation and stems that allow vane removal and replacement. Lead carriers have self-lubricating wheels or elongated bearing surfaces; following carriers have self-lubricating wheels.

F. Valance: None.

G. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.

1. Type: Wall.
2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.

H. Colors, Textures, and Patterns:

1. Vanes: As selected by Architect from manufacturer's full range.
2. Components: Provide materials exposed to view matching or coordinating with vanes unless otherwise indicated.

2.3 VERTICAL LOUVER BLIND FABRICATION

A. Product Safety Standard: Fabricate vertical louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to cover window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which blind is installed less 1/4 inch (6 mm) per side or 1/2 inch (13 mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which blind is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between blinds of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Rotation-and-Traverse Mechanisms: With permanently lubricated moving parts.

D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware and for bracket positions and blind mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to brackets and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view unless anodized or plated finish is indicated. Apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install vertical louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.

1. Locate so exterior vane edges are not closer than 2 inches (51 mm) from interior faces of glass through full operating ranges of blinds.
2. Install mounting and intermediate brackets to prevent deflection of headrails.
3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

A. Adjust vertical louver blinds to operate free of binding or malfunction through full operating ranges.

3.4 CLEANING AND PROTECTION

A. Clean vertical louver blind surfaces after installation according to manufacturer's written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that vertical louver blinds are without damage or deterioration at time of Substantial Completion.

C. Replace damaged vertical louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION

SECTION **12 24 13 –** ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Roller window shades at all windows, except at dorms. Provide the following:

1. Manually operated top-down single roller shades, except as otherwise indicated.
2. Motorized bottom-up single roller shades at high windows, where indicated.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 12 21 16 "Vertical Louver Blinds" for window coverings at dorm room windows.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Sustainable Design Submittals: As specified in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

D. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

E. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

F. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.
2. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

G. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. First-in-Place Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Provide mockup of one manual roller shade at a window below a window with a mockup of one motorized bottom-up shade with angled top.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source, from single manufacturer, as scheduled on Drawings.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Product: Subject to compliance with requirements, provide roller shades indicated in Finish Schedule on Drawings.

1. MechoShade Systems, LLC; Mecho/5 Manual Shade System.

B. Manual Operation: Top down.

C. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Nickel-plated metal.
    a. Loop Length: Full length of roller shade.
    b. Limit Stops: Provide upper and lower ball stops.
    c. Chain-Retainer Type: Chain tensioner, jamb mounted.
2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
    a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criteria are more stringent.

D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
    1. Direction of Single Roll: Regular, from back of roller.
    2. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.

E. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

F. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

G. Shadebands at Single Rollers:
    1. Shadeband Material: As scheduled in Drawings and indicated below in "Shadeband Material" article.
    2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
        a. Type: Enclosed in sealed pocket of shadeband material.

H. Installation Accessories: Provide all components required for installation and operation of roller shades in bottom-up configuration.
    1. Fascia: Aluminum extrusion that conceals front and top of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
        a. Shape: L-shaped.
        b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches (76 mm).
        c. Color and Finish: As selected from manufacturer's full range.
    2. Side Guidewires for Bottom-Up Shades: Manufacturer's side guidewires to ensure shade remains in flush alignment in bottom-up operation.

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Product: Subject to compliance with requirements, provide roller shades indicated in Finish Schedule on Drawings.
    1. MechoShade Systems, LLC; ElectroShade series.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Precision-controlled electronic drive unit (EDU), quiet operation, tubular, enclosed in roller.

    a. Electrical Characteristics: 24-V dc.
    b. Maximum Weight Capacity: As required to operate roller shades indicated.
    c. Maximum Sound Production: 38 dBA, measured at 3 ft. (0.91 m) from motor.
    d. Operating Temperature: 32 deg F (0 deg C) to 104 deg F (40 deg C).
    e. Operating Humidity: 0 to 90 percent, noncondensing.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

    a. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
    b. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.

        1) Power Failure Protection: Programming maintained after power interruption.

4. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
5. Operating Features:

    a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
    b. Capable of interface with multiroom control system.
    c. Capable of accepting input from building automation control system.
    d. Override switch.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade unless otherwise indicated.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method .
4. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers that are operated by one roller drive-end assembly.

F. Shadebands:

1. Shadebands at Single Rollers: As scheduled in Drawings.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).

2. Side Guidewires for Bottom-Up Shades: Manufacturer's side guidewires to ensure shade remains in flush alignment in bottom-up operation.

2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabrics: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Location: Except as otherwise indicated.
3. Product: As indicated in Finish Schedule on Drawings.

a. MechoShade Systems, LLC; EcoVeil 1550, dense basket-weave TPO.

4. Type: As indicated.
5. Color and Weave: As indicated by manufacturer's designations for shade scheduled.
6. Orientation on Shadeband: Up the bolt.
7. Openness Factor: 3 percent, unless otherwise indicated.
8. Special Fabrication: At high windows, factory-fabricate top of shade to match top angle of window opening. Shades shall be hemmed and include stiffener as required.

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION

SECTION 12 35 30 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Kitchen cabinets at Child Watch 107, Staff Locker Room 135, Staff Breakroom 203.
2. Cabinets and open shelving at administrative spaces, meeting rooms, and offices.
3. Credenzas at Classroom 211, Activity Room 213.
4. Cabinets at coffee and beverages station in Dining Hall 222.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 06 10 53 "Miscellaneous Rough Carpentry" for blocking in partition walls to receive casework, where indicated.
3. Section 09 22 16 "Non-Structural Metal Framing" for concealed supports in walls to receive casework, where indicated.
4. Section 12 35 70 "Healthcare Casework" for casework at healthcare areas of the Common Building, as designated on Drawings.

1.2 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets ~~or behind glass doors~~.

C. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.

D. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.3 COORDINATION

A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

B. Coordinate requirements for under-cabinet LED light strip at upper cabinets.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cabinets.
2. Cabinet hardware.

B. Product Data: For cabinets and cabinet hardware.

1. Include documentation of adhesive VOCs.
2. Include documentation that composite wood products contain no urea formaldehyde.

C. Sustainable Design Submittals: As specified in Section 01 35 20 "GreenPoint Rated Requirements."

D. Shop Drawings: Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, and hardware.

1. Indicate attachment and removal details for removable base cabinets.

E. Samples for Verification: 8-by-10-inch (200-by-250-mm) Samples for each type of finish and the following:

1. Exposed hardware, for each type of item.
2. One full-size, finished base cabinet complete with hardware, doors, and drawers but without countertop. Sample will be returned to Contractor for use on Project.
3. One assembled carousel with shelving for use at corner base cabinets. Sample will be retured to Contractor for use on Project.
4. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves. Sample will be returned to Contractor for use on Project.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

1.7 WARRANTY

A. Provide manufacturer's standard warranty against failures of materials, workmanship, and operation.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. Casework for the Project, other than healthcare casework, may be prefabricated in accordance with KCMA A161.1 or may be custom-fabricated in accordance with AWI "Architectural Wood Casework," Duty Level 3 for performance, Custom grade for aesthetics.

B. Environmental Requirements:

1. No added formaldehyde.
2. VOC content of field-installed adhesives shall be no more than 30g/L.
3. No endangered wood species for wood veneer door facings.

2.2 CABINETS, PREFABRICATED

A. Basis of Design Manufacturer:

1. Lanz.

B. Manufacturers of Comparable Products: Products of one of the following will be considered.

1. American Woodmark.
2. Aristocraft.
3. Grandview Cabinetry.
4. Republic.
5. Armstrong.

C. Quality Standard: Provide cabinets that comply with KCMA A161.1.

1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
2. KCMA ESP certified for low-emitting materials and environmentally preferred materials.

D. Environmental Requirements:

1. No added formaldehyde.
2. VOC content of field-installed adhesives shall be no more than 30g/L.
3. No endangered wood species for wood veneer door facings.

E. Cabinet Style: Face frame with flush overlay doors and drawer fronts.

F. Doors: 3/4-inch thick MDF flat slab doors with ~~wood veneer finish~~finish indicated on Drawings.

G. Drawer Fronts: 3/4-inch thick MDF flat slab drawer fronts with ~~wood veneer finish~~finish indicated on Drawings.

H. Face Frame: 3/4-inch (19-by-41-mm) solid wood joined with pocket screws and glue.

I. Cabinet End Construction and Finish: 1/2-inch (~~16-~~13-mm) thick plywood with ~~wood veneer~~same finish as doors and drawers.

1. Provide for removal of cabinets where indicated in Drawings at accessible and convertible units.

J. Cabinet Tops and Bottoms: 1/2-inch (16-mm) thick plywood, fully supported by and secured in rabbets in end panels, front frame, and back rail.

K. Back, Top, and Bottom Rails: 3/4-by-2-1/2-inch (19-by-63-mm) solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.

L. Wall-Hung-Unit Back Panels: Manufacturer's standard captured back construction.

~~1. Provide for under-cabinet LED light strips~~

M. Base-Unit Back Panels: Manufacturer's standard captured back construction.

N. Cabinet Interiors and Adjustable Shelves:

1. Fabricate from plywood finished to match exposed wood veneer surfaces, where applicable.
2. Fabricate from thermoset decorative panels (melamine), where applicable.

O. Drawers: Manufacturer's standard plywood box drawers.

1. Drawer bottoms shall be 1/4-inch prefinished plywood.

P. Cabinet Joinery: Dado backs into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops and bottoms into end panels.

Q. Factory Finishing: Finish cabinets at factory. Defer only final touchup until after installation.

2.3 CABINETS, CUSTOM FABRICATED

A. Architectural Wood Casework (ANSI/AWI) Performance Level: Duty Level 3.

1. Shelf Suspension Test (SS-1 Test): Level 3, must withstand 575 lbf.
2. Wall Cabinet Structural Integrity (WC-2 Test): 65 lbs/sq ft.

B. Architectural Wood Casework (ANSI/AWI) Aesthetics Grade: Custom grade.

C. Cabinet Style: Face frame with flush overlay doors and drawer fronts.

D. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides as detailed on Drawings.

2.4 CABINET MATERIALS

A. Architectural Wood Casework (ANSI/AWI): Provide materials that comply with requirements of quality standard for each type of woodwork, duty level, and quality grade specified, unless otherwise indicated.

1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

B. General:

1. Hardwood Lumber: Kiln dried to 7 percent moisture content.
2. Softwood Lumber: Kiln dried to 10 percent moisture content.
3. Hardwood Plywood: HPVA HP-1.
4. MDF: Medium-density fiberboard, ANSI A208.2, Grade MD.
5. Hardboard: ANSI A135.4, Class 1 tempered.

C. Wood Species and Cut for Transparent Finish: As scheduled.

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Book match.
3. Veneer Matching within Panel Face: Center-balance match.

D. High-Pressure Decorative Laminate:

1. KMCA Certified Cabinetry: Provide NEMA LD 3, VGS (Vertical General Purpose) grade plastic laminate, with finish(es) scheduled.
2. ANSI/AWI Certified Cabinetry: Provide ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
3. Grain Direction for Wood-Grain Plastic Laminate: Vertical with continuous vertical matching, except lengthwise for face frame members.
4. Edge Treatment: PVC-free edge banding, at least 3 mm thick, matching laminate, except provide solid wood edge band at credenzas.

~~E. High-pressure decorative laminate as selected by Architect from manufacturer's full range.~~

~~1. Edge Treatment: PVC-free edge banding, at least 3 mm thick, matching laminate.~~

E. Semiexposed Materials: Consistent with AWI or KMCA quality standard. Doors, drawers, and other panels where both sides are exposed shall be finished with plastic laminate of same grade as primary exposed surface. For all other instances, provide one of the following, subject to compliance with quality standard:

1. High-pressure decorative laminate.
2. Thermoset decorative panels ~~or~~ (melamine).
3. Thermally fused laminate (TLF), typical for manufactured cabinetry.

F. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility.

2.5 CABINET HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

B. Pulls: As scheduled, at cabinet doors and drawers.

C. Hinges: Surface-mounted butt type, openable to 180 degrees, with soft-close feature or add-on.

D. Door Silencers: Clear resilient pads, shaped for sound damping.

1. Basis of Design Product: 3M; Bumpon Molded Shapes, SJ6500 Series.

E. Drawer Guides: Minimum ~~75~~100-lb epoxy-coated steel, self-closing drawer guides ~~(100 lb preferred)~~; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091. Provide soft-close feature.

F. Door Locks: ANSI/BHMA A156.11, E07121.

G. Drawer Locks: ANSI/BHMA A156.11, E07041.

H. Shelf Pins: For side support of adjustable shelves. 1/4-inch diameter, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work and other cabinets, fill all gaps and scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.

B. Install cabinets without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

C. Install cabinets level and plumb to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

D. Install removable cabinets according to Drawings.

E. Fasten cabinets to adjacent units and to backing.

1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 12 35 70 - HEALTHCARE CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Enameled-steel healthcare casework with thermofoil-finished MDF doors and drawer fronts, at medical areas of clinic, including exam rooms, dispensary/medication room, lab and utility room, and soil work room.

2. Casework hardware.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for concealed blocking for anchoring healthcare casework.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.3 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of healthcare casework.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For healthcare casework.

1. Include plans, elevations, sections, and attachments to other work, including locations of blocking and reinforcements required for installation.
2. Show fabrication details, including types and locations of hardware.
3. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and equipment.
4. Include coordinated dimensions for equipment specified in other Sections.
5. Indicate manufacturer's catalog numbers for casework.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

D. Samples for Initial Selection: For casework and hardware finishes.

E. Samples for Verification: For the following:

1. Hardware Finishes: For each type of exposed hardware indicated, in full-size units.

F. Delegated Design Submittals: For healthcare casework indicated to comply with seismic performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. For enameled-steel casework, furnish complete touchup kit for each type and color of casework finish provided. Include fillers, primers, paints, and other materials necessary to perform permanent repairs to damaged casework finish.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.7 FIELD CONDITIONS

A. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

B. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes to allow for trimming and fitting.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before enclosing them, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain from single source from single manufacturer.

B. Product Designations: Drawings indicate sizes and configurations of healthcare casework by referencing designated manufacturer's catalog numbers. Other manufacturers' metal healthcare casework of similar sizes, of similar door and drawer configurations, and complying with the Specifications may be considered. See Section 01 60 00 "Product Requirements."

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design healthcare casework installation.

B. Seismic Performance: Healthcare casework, including attachments to other work, to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design earthquake spectral response acceleration, short period (Sds) for Project ~~is <Insert value>.~~: As indicated in Structural Drawings.
2. Component Importance Factor: 1.0.

2.3 ENAMELED-STEEL HEALTHCARE CASEWORK

A. Basis of Design System: Midmark; Synthesis Cllection.

B. Steel Sheet: Cold-rolled commercial steel (CS) sheet, complying with ASTM A1008/A1008M; matte finish; suitable for exposed applications.

1. Nominal Steel Thicknesses:

a. Sides, Ends, Fixed Backs, Bottoms, Cabinet Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch (1.21 mm). Bottoms may be 0.036 inch (0.91 mm) if reinforced.
b. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.036 inch (0.91 mm) except 0.048 inch (1.21 mm) for unreinforced shelves more than 36 inches (900 mm) long.
c. Intermediate Horizontal Rails, Center Posts, and Top Gussets: 0.060 inch (1.52 mm).
d. Drawer Runners and Hinge Reinforcements: 0.075 inch (1.90 mm).
e. Leveling and Corner Gussets: 0.105 inch (2.66 mm).

C. MDF Doors and Drawer Fronts: Low-emitting-materials compliant.

1. Finishes: Thermofoil seamless front, not less than 12 mils thick; melamine back.

D. Countertops: Integral with modular cabinets.

1. Material: Solid surfacing, 1/2 inch thick.
2. MDF subtops are acceptable.

2.4 CASEWORK HARDWARE

A. Provide healthcare casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Door Hinges: Stainless steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and hospital tips. Provide two hinges for doors 48 inches (1200 mm) high or less, and provide three for doors more than 48 inches (1200 mm) high.

C. Hinged-Door and Drawer Pulls: Back-mounted pulls of solid aluminum, stainless steel, or chrome-plated brass. Provide two pulls for drawers more than 24 inches (600 mm) wide.

D. Door Catches: Dual, self-aligning, permanent magnet catches. Provide two catches on doors more than 48 inches (1200 mm) high.

E. Drawer Slides: Manufacturer's standard; complying with ANSI/BHMA A156.9.

F. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches (25 by 50 mm), attached with screws or rivets. Provide where indicated.

G. Locks: Cam or half-mortise type; brass with chrome-plated finish; complying with BHMA A156.11, Type E07281, E07111, or E07021.

2.5 FABRICATION OF CASEWORK

A. General: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Integrally frame and weld to form a dirt- and vermin-resistant enclosure. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).

B. Hinged Doors: Mortise doors for hinges and reinforce with angles welded inside inner pans or hollow-metal stiles at hinge edge.

C. Metal Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal.

D. Polystyrene Drawers: One-piece molded polystyrene drawer bodies with rounded corners.

E. Metal Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.

F. Shelf Supports: Provide clips, brackets, pilasters, or other means to support shelves from cabinet ends and to allow height of shelves to be adjusted in increments of not more than 2 inches (50 mm).

G. Toe Space: Unless casework is fully recessed, provide metal toe space, fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.

H. Filler Strips: Provide as needed to close spaces between casework and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as casework and with hemmed or flanged edges.

I. Trim Flanges: Formed metal trim fabricated from same material and with same finish as casework. Provide at perimeter of recessed cabinets.

2.6 ENAMELED-STEEL FINISH

A. Surface Preparation: After assembly, clean surfaces of mill scale, rust, oil, and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Chemical-Resistant Finish: Immediately after cleaning and pretreating, apply healthcare casework manufacturer's standard two-coat, chemical-resistant, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of casework surface finish tests in SEFA 8 M. Acceptance level for chemical spot test to be no more than for Level 3 conditions.
2. Colors for Healthcare Casework Finish: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of healthcare casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install casework level, plumb, and true in line; shim as required using concealed shims. Where healthcare casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
3. Variation of Faces of Casework from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).

B. Recessed Cabinets: Set cabinets in openings and fasten to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

C. Base Cabinets: Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced not more than 16 inches (400 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through the back, near the top, at not less than 16 inches (400 mm) o.c. unless continuously hung from hanging strips.

E. Install door and drawer hardware uniformly and precisely.

F. Adjust operating hardware so doors and drawers align and operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish as approved by Architect.

END OF SECTION

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SECTION 12 36 61 - SIMULATED STONE COUNTERTOPS AND OTHER FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops, service counters, backsplashes, and wall caps.
2. Solid surfacing countertops, backsplashes, and privacy dividers between~~.~~ clinic personnel at service windows performing patient registration and dispensing medications.

B. Related Sections:

1. Section 01 81 13 "Sustainable Design Requirements."
2. Section 05 50 00 "Metal Fabrications" for concealed in-wall supports for countertops.
3. Section 12 35 30 "Residential Casework" for cabinetry receiving ~~quartz~~ countertops specified in this Section.
4. Section 12 35 70 "Healthcare Casework" for casework receiving ~~solid surfacing~~ countertops specified in this Section.
5. Plumbing Drawings for sinks and plumbing fittings.

1.2 COORDINATION

A. Coordinate installation of simulated stone countertops with installation of casework or upports to receive them.

B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials and installation accessories.

1. Product Data for Low-Emitting Materials:

a. For adhesives and sealants, documentation including printed statement of VOC content.
b. For wood panel products.

B. Sustainable Design Submittals: Documentation of compliance with applicable requirements in Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

D. Samples for Verification: For the following products:

1. One countertop of each type, with front edge, 8 by 10 inches (200 by 250 mm), of construction and in configuration specified.
2. Privacy Divider Brackets: One full size bracket.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Work of this Section shall comply with VOC content limits and general emissions limits specified in Section 01 81 13 "Sustainable Design Requirements."

2.2 SIMULATED STONE TOPS, BACKSPLASHES, DIVIDERS, AND TRIM

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.

1. Product: As indicated in Finish Schedule on Drawings.

    a. Caesarstone Ltd.; Caesarstone.

2. Colors and Patterns: Per manufacturer's designations for scheduled product.

B. Solid Surfacing: Solid sheets consisting of homogeneous-filled plastic resin complying with ICPA SS-1, Standard type.

1. Product: As indicated in Finish Schedule on Drawings.

    a. DuPont; Corian.

2. Colors and Patterns: Per manufacturer's designations for scheduled product.

~~C. Countertops: 3/4-inch- (19-mm-) thick, with front edge built up with same material and 1/2-inch thick backsplash.~~

~~D. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.~~

2.3 FABRICATION

A. General: Fabricate simulated stone items of types indicated on Drawings, from materials indicated, in configurations and with dimensions indicated, and with anchors and attachments to other construction as indicated. Fabricate items in one piece with shop-applied edges unless otherwise indicated. Comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing. Fabrication types include the following:

1. Countertops, including wall-mounted cantilevered counters and service counters, as well as countertops mounted on casework.
2. Separate-piece quartz backsplashes.
3. Quartz wall caps at partial-height walls of Nurse Station (123), including curved wall segments.
4. Solid-surfacing privacy dividers, mounted on countertops between personnel at operations side of service windows.

B. Countertops: 3/4-inch- (19-mm-) thick, with front edge built up with same material, unless otherwise indicated.

1. Solid surfacing countertops shall be fabricated with integral backsplashes, 3/4-inch thick, except where full-height backsplash (to bottom of upper cabinet) is indicated.

C. Backsplashes:

1. Quartz Agglomerate: Separate-piece backsplash, 3/4-inch thick, cut from the same slab as the countertop. Heights shall be as indicated on Drawings.
2. Solid Surfacing: Perform required cutting and other fabrication for wall outlet and other penetrations per solid-surfacing manufacturer's written instructions.

D. Wall Caps: Quartz agglomerate wall caps with eased edges, 3/4-inch thick, with 10-inch waterfall edges, as indicated on Drawings.

E. Privacy Dividers: Solid-surfacing dividers between countertop work stations at operations side of service windows at Patient Registration and Medicine Dispensary.

1. Dimensions: 30 inches high, 16 inches deep, and 3/4-inch thick, with 1/4-inch radius corners.
2. Provide metal bracket mounts, sized to receive privacy divider panels centered within brackets, with flanges (feet) for mounting to countertop.

a. Available Manufacturers: Including, but not limited to, Douglas Mockett and Richlieu Hardware.
b. Finish: As selected by Architect from manufacturer's full range of finishes.

2.4 COUNTERTOP SUBTOPS AND FABRICATION MATERIALS

A. General: Countertop substrates, adhesives, and varnish shall comply with low-emitting materials requirements in Section 01 81 13 "Sustainable Design Requirements."

1. Adhesives shall not contain urea formaldehyde.

B. Mounting Adhesives: Structural-grade adhesives of type recommended by countertop material manufacturer for application and conditions of use; typically silicone.

C. Jointing Adhesive:

1. Quartz Agglomerate: Polyester resin or epoxy-modified acrylic matching quartz material color.

a. Available Manufacturers: Including, but not limited to, the following:

1) Tenax, Integra, and Impa.

2. Solid Surfacing: Methacrylate-based adhesive.

a. Available Manufacturers: Including, but not limited to, the following:

1) Corian; Corian Adhesive.

D. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.

E. Plywood: Exterior softwood plywood, ~~minimum 1/2 inch,~~ complying with DOC PS 1, Grade C-C Plugged, touch sanded.

1. Countertop subtop thickness as indicated on Drawings. Typically 5/8 inch.

F. Varnish: For sealing cutouts in subtops.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Ensure metal angle supports concealed in partition and indicated to receive countertop have been installed at mounting heights and with levelness required for proper installation of countertops to heights indicated on Drawings. Do not proceed until supports are installed as required.

1. Vertical legs of steel L-bracket shall be concealed in partition and screw-fastened to wood studs, as indicated on Drawings.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

B. Casework Countertops: Install simulated stone countertops to subtops of casework according to manufacturer's written recommendations. Installation may be by mechanical fastening or through use of adhesive.

1. Screw-Fastened Installation: Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer.
2. Adhered Installation: Secure countertops to subtops with adhesive according to sheet manufacturer's written instructions.

C. Cantilevered Countertops (Including Service Counters): Fasten subtop to exposed horizontal legs of metal angle brackets. Shim as needed to align subtops in a level plane.

D. Separate-Piece Quartz Agglomerate Backsplashes: Dry-fit backsplashes to ensure they sit flush against the wall and match the length of the countertop. Adhere 4- to 6-inch backsplashes to gypsum board wall with 100-percent silicone adhesive, applied in dime-size dabs along the back of the backsplash. Press backsplash firmly against wall, then down onto the countertop. Seal joints with color-matched silicone where backsplash meets the counter and the wall. Allow to cure for 24 hours.

E. Wall Caps: Adhere wall caps to top surface of partial-height wall, complying with instructions of both adhesive manufacturer and quartz agglomerate manufacturer to ensure bond is secure and sufficient for the application.

F. Privacy Dividers: Attach dividers to countertops with two brackets per divider, as indicated on Drawings.

G. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with sheet manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

H. Install separate backsplashes and end splashes by adhering to wall and countertops with silicone adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

I. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

J. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

K. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION

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SECTION 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roll-up rail mats.
2. Recessed frames.

B. Related Requirements:

1. Section 01 81 13 "Sustainable Design Requirements."

1.2 COORDINATION

A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

B. Sustainable Design Submittals:

1. Low-Emitting Materials: Product data or manufacturer declaration, indicating compliance with requirements for field-applied coatings, adhesives, and sealants.

a. Retain packaging for fluid-applied products according to Section 01 81 13 "Sustainable Design Requirements."

C. Shop Drawings:

1. Items penetrating floor mats and frames, including door control devices.
2. Divisions between mat sections.
3. Perimeter floor frames.
4. Custom Graphics: Scale drawing indicating colors.

D. Samples: For the following products, in manufacturer's standard sizes:

1. Floor Mat: Assembled sections of floor mat.
2. Tread Rail: Sample of each type and color.
3. Frame Members: Sample of each type and color.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:

1. Wheel load of 1000 lb (220 kg) per wheel.

B. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

C. Provide entrance floor mats and frames by a single source and single manufacturer.

2.2 ROLL-UP RAIL MATS

A. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails with carpet inserts and LDPE hinges.

1. Basis-of-Design Product:

a. JL Industries - a Division of Activar Construction Products Group; Activ-Grate 600 Series.

2. Aluminum Tread Rails: ASTM B221/B221M Alloy 6063-T6, mill finish, unless otherwise indicated.
3. Tread Depth: 3/4 inch (19 mm).
4. Tread Spacing: 1-1/2 inches (38 mm) on center with 8 treads per foot in direction of travel.
5. Spacing Between Rails: 5/32 inch.
6. Tread Inserts: Ribbed-surface resilient vinyl.
7. Mat Sizes: As indicated.
8. Recessed Frame: Level-bed mechanically-fastened aluminum frame.

2.3 FRAMES

A. Recessed Frames: Manufacturer's standard recessed angle frame.

1. Basis-of-Design Product:

a. JL Industries - a Division of Activar Construction Products Group; EFRA6.

2. Material: ASTM B221/B221M Alloy 6063-T6 extruded aluminum, mill finish, unless otherwise indicated.

3. Exposed Surface: 1/8-inch (3 mm) wide.

2.4 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

2.5 FABRICATION

A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

B. Recessed Frames: As indicated, for permanent recessed installation, complete with reinforcement and anchorage devices.

1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

2.6 ALUMINUM FINISHES

A. Mill finish, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

1. Substrate shall be flat and level, with a tolerance of 1/8 inch over 10 feet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install recessed mat frames and mats to comply with manufacturer's written instructions so that tops of mats will be flush with adjoining finished flooring. Set mats with tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.

1. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.
3. Delay setting mats until construction traffic has ended.

3.3 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION

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SECTION 14 24 00 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hydraulic passenger elevators.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
2. Section 05 50 00 "Metal Fabrications" for the following:

a. Attachment plates and angle brackets for supporting guide-rail brackets.
b. Pit ladders.

3. Section 09 65 19 "Resilient Tile Flooring" for finish flooring in elevator cars.

1.2 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Service Elevator: A passenger elevator that is also used to carry freight.

1.3 COORDINATION

A. Coordinate requirements for pit depth and dimensions of elevator shaft to accommodate elevator and all associated equipment and devices.

B. Coordinate requirements for hoist beam, typically 8-inch beam having 5,000 lb. capacity.

1.4 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.

B. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing; machine room layout; coordination with building structure; relationships with other construction; and locations of equipment.
2. Include large-scale layout of car-control station.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.

C. Samples for Initial Selection: For finishes involving texture selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, 3-inch- (75-mm-) square Samples of sheet materials and 4-inch (100-mm) lengths of running trim members.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service[including standby-power generator], as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and Product: Subject to compliance with requirements, provide products by the following:

1. Schumakcher Elevator Company; Holeless Hydraulic Elevator.

2.2 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Standard: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility GuidelinesandCalifornia Building Code.

C. Seismic Performance: Elevator system withstands the effects of earthquake motions determined according to ASCE/SEI 7 and complies with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Project Seismic Design Category and Spectral Response (Sds): As indicated in Drawings.
3. Elevator Component Importance Factor: 1.0.
4. Provide earthquake equipment required by ASME A17.1/CSA B44.

2.3 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components are used, as included in standard elevator systems and as required for complete system.

B. Elevator Description: New single elevator with outdoor landings.

1. Type:

a. Holeless, beside-the-car, single-stage, dual cylinder.

2. Rated Load: 3500 lb (1589 kg).

3. Rated Speed: 100 fpm (0.51 m/s).
4. Operation System: Single automatic operation.
5. Auxiliary Operations:
    a. Battery-powered lowering.
    b. Automatic operation of lights and ventilation fans.
6. Dual Car-Control Stations: Provide two car-control stations; equip only one with required keyswitches if any.
7. Car Enclosures:
    a. Plan Dimensions: Standard gurney-accessible dimensions for model and capacity indicated.
    b. Inside Height: Not less than 96 inches (2438 mm) to underside of ceiling.
    c. Front Walls (Return Panels): Polished stainless steel, ASTM A480/A480M, No. 8 finish with integral car door frames.
    d. Car Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    e. Side and Rear Wall Panels: Textured stainless steel.
    f. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    g. Door Faces (Interior): Textured stainless steel.
    h. Door Sills: Aluminum.
    i. Ceiling: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
    j. Handrails: 1-1/2 inches (38 mm) roundsatin stainless steel, at sides of car.
    k. Floor prepared to receive tile carpeting specified in Section 09 65 19 "Resilient Tile Flooring."
    l. Floor Thickness, Including Setting Materials: 3/8 inch above plywood subfloor.
8. Hoistway Entrances:
    a. Width: 42 inches (1067 mm).
    b. Height: 84 inches (2134 mm).
    c. Type: Single-speed side sliding.
    d. Frames : Polished stainless steel, ASTM A480/A480M, No. 8 finish.
    e. Doors: Textured stainless steel.
    f. Sills : Aluminum.
9. Hall Fixtures : Satin stainless steel, ASTM A480/A480M, No. 4 finish.
10. Additional Requirements:
    a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/A480M, No. 4 finish.
    b. Provide hooks for protective pads in and one complete set(s) of full-height protective pads.

2.4 SYSTEMS AND COMPONENTS

A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

1. Pump is submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mountsoris tank-top-mounted type with fan-cooled, squirrel-cage induction motor, and is mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch-(25-mm-) thick, glass-fiber insulation board.
2. Motor has variable-voltage, variable-frequency control.

B. Hydraulic Silencers: System has hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.

C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

1. Cylinder units are connected with dielectric couplings.

D. Hydraulic Fluid: Nontoxic, biodegradable fluid, made from vegetable oil with antioxidant, anticorrosive, antifoaming, and metal-passivating additives, that is approved by elevator manufacturer for use with elevator equipment.

E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

F. Car Frame and Platform: Welded or bolted steel units.

G. Guides: Roller guides. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Single-Car Battery-Powered Lowering:

a. If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it is lowered to a preselected floor, opens its doors, and shuts down. If car is below the preselected floor, it is lowered to the next lower floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
b. When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

2. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.

2.6 DOOR-REOPENING DEVICES

A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.

2.7 CAR ENCLOSURES

A. Provide enameled- or powder-coated-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor:

a. Exterior, C-C Plugged grade plywood, not less than 7/8-inch (22.2-mm) nominal thickness.

2. Floor Finish: Linoleum floor tile.

a. Specified in Section 09 65 43 "Linoleum Flooring."

3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch (6.4 mm) thick.
9. Metal Ceiling: Flush panels, with four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Light Fixture Efficiency: Not less than 35 lumens/W.
11. Ventilation Fan Efficiency: Not less than 3.0 cfm/W (1.4 L/s per W).

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames are self-supporting with reinforced head sections.

B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252or UL 10B.

1. Fire-Protection Rating: 1-1/2 hours.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Stainless Steel Frames: Formed from stainless steel sheet.
2. Star of Life Symbol: Identify emergency elevators with star of life symbol, not less than 3 inches (76 mm) high, on both jambs of hoistway door frames.

3. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch (6.4 mm) thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Firefighters' Two-Way Telephone Communication Service: Provide telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service specified in Section 28 46 21.11 "Addressable Fire-Alarm Systems."

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall or jamb-mounted units.
2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.

G. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide one of the following:

1. Units with flat faceplate for mounting with body of unit recessed in wall and with illuminated elements projecting from faceplate for ease of angular viewing.
2. Units mounted in both jambs of entrance frame.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.

D. Textured Stainless Steel Sheet: ASTM A240/A240M, Type 304, with embossed texture rolled into exposed surface.

1. Texture and finish as selected by Architect from manufacturer's full range.

E. Stainless Steel Bars: ASTM A276, Type 304.

F. Stainless Steel Tubing: ASTM A554, Grade MT 304.

G. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Install piping above the floor, where possible. Install underground piping in casing.

E. Lubricate operating parts of systems as recommended by manufacturers.

F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

G. Leveling Tolerance: 1/4 inch (6 mm), up or down, regardless of load and travel direction.

H. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

I. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, adjust, and maintain elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies are manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION

SECTION 21 00 00 – FIRE SPRINKLERS

PART 1 – GENERAL

1.1 INCLUSION OF GENERAL CONDITIONS AND GENERAL REQUIREMENTS

A. The Bidding Requirements, Contract Forms, General Conditions, Supplemental General Conditions, and Division 01 - General Requirements are a part of this Section and the Contract for this work and apply to this Section as fully as if repeated herein.

1.2 SUMMARY

A. Furnish and install complete wet-pipe fire sprinkler system as specified in Contract Documents and Material Submittal Data. The fire sprinkler system shall be a wet pipe type sprinkler system. The system shall be installed in conformance with the current Edition of NFPA 13, Standard for Installation of Sprinkler Systems. All materials utilized shall be UL Listed and Factory Mutual Approved. All materials installed shall adhere to the manufacturer's installation guidelines.

B. Scope includes all design, labor, equipment, materials, tools, transportation, excavation and backfill, supervision, and services required to furnish and install a complete and properly operating engineered wet-pipe fire protection system. Wet-pipe fire protection system shall be installed in all areas of the buildings.

C. Wet-pipe system shall be served by a storage tank system and fire pump on-site, as indicated by the civil drawings and specifications.

D. Should any work or materials be not included in the Drawings or Specifications, but is nevertheless necessary for the proper execution of the stated scope thereof or for full compliance with governing authorities, the Contractor shall understand such work and/or materials is required, and shall perform all such work and furnish such material as fully as if it were particularly delineated or described.

1.3 REFERENCES

A. American Society For Testing and Materials
   1. ASTM A-53, "Standard Specification for Pipe, Steel, and Hot-Dipped, Zinc-Coated, Welded and Seamless"
   2. ASTM A-234, "Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service"
   3. ASTM A-536, "Standard Specification for Ductile Iron Castings"
   4. ASTM A-795, "Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use"

B. American Water Works Association
   1. AWWA C900-16 Polyvinyl Chloride (PVC) pressure pipe and fabricated fittings, 4 in. Through 60 in. (100 mm through 1,500 mm)

C. American National Standards Institute/American Society of Mechanical Engineers
   1. ANSI/ASME B16.1, “Cast Iron Pipe Flanges and Pipe Flanged Fittings”
   2. ANSI/ASME B16.3, “Malleable Iron Threaded Fittings: Classes 150 and 300”
   3. ANSI/ASME B16.4, “Cast Iron Threaded Fittings, Class 125 and Class 250”

D. American National Standards Institute/National Fire Protection Association
   1. ANSI/NFPA 13, 2022, “Standard for the Installation of Sprinkler Systems”
   2. ANSI/NFPA 24, 2019, “Standard for the Installation of Private Fire Service Mains and Their Appurtenances”

1.4 LICENSING REQUIREMENTS

A. All fire sprinkler systems shall be installed by a C-16 Fire Sprinkler Contractor. Fire sprinkler systems include: waste removal and connection of on-site waste disposal systems; fire sprinkler piping, fire sprinkler heads, supports, bracing, and restraints, and all required testing, maintenance and replacement of the items described above, including health and safety devices.

1.5 SUBMITTALS

A. The contractor shall install the fire sprinkler system in accordance with the approved drawings, hydraulic calculations, and material submittal data. Where deviations are made from the approved drawings that would necessitate revisions to the drawings or hydraulic calculations, the contractor shall include the cost to make such revisions in their bid, at no additional cost to the owner.

B. All submittals shall be submitted under the provisions of Section 013300 – Submittal Procedures and as described below.
   1. Submittal No. 21 00 00A (#) – Product Data
      a. Submit manufacturer’s product data for all fire sprinkler system components, in compliance with specifications.
   2. Submittal No. 21 00 00B (#) – Operation and Maintenance Data
      a. Provide master index showing items included.
      b. Provide name, address, and phone number of Owner’s Representative, Fire Sprinkler Consultant, General Contractor, and Fire Protection subcontractor.
      c. Provide operating instructions to include general description of fire protection system and step-by-step procedure to follow in putting system into operation.
      d. Maintenance instructions shall include a list of system components used indicating name and model of each item and manufacturer’s maintenance instructions for each component installed in Project. Instructions shall include installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
      e. Include copies of approved shop drawings and copies of required warranties.

1.6 QUALITY CONTROL

A. Qualifications:
   1. A State of California Licensed C-16 Contractor shall design and install all fire sprinkler system components, including underground lines and overhead lines. Furnish verified list of similar projects installed during past 5 years.

B. Requirements of Regulatory Agencies
   1. Unless noted otherwise, system shall conform to:
      a. ANSI/NFPA 13, 2022 – "Light & Ordinary Hazard Occupancies"
      b. ANSI/NFPA 24, 2019 – "Service Mains and their Appurtenances, Private"
      c. Requirements of local water department and local authority having jurisdiction over fire protection.
      d. Applicable rules, regulations, laws, and ordinances.
      e. Underwriter's Laboratories Publication, "Fire Protection Equipment Directory," February 2008.
   2. Comply with backflow prevention requirements and if required, include device in hydraulic calculations.

1.7 COOPERATION WITH OTHER TRADES

A. Cooperate fully with other trades doing work on the project as may be necessary for the proper completion of the project. Refer to the Structural, Mechanical, and Electrical Drawings for details of the building structure and equipment installation that will tend to overlap, conflict with or require coordination with the work of this Section, and schedule this work accordingly.

B. Any work done without regard for other trades shall be moved, replaced, or redone as required, without extra charges to Owner.

1.8 AS-BUILT DRAWINGS

A. A complete set of Contract Drawings shall be maintained at the work site, and all changes in the work shall be recorded on this set, on a daily basis. The final as-built drawings shall be submitted to the Owner's Representative for approval.

1.9 DRAWINGS

A. The drawings indicate diagrammatically the general layout of the fire sprinkler systems and other related work. Field verification of scaled dimensions taken from the Drawings is required.

B. The Contractor shall review and compare the Architectural, Structural, Plumbing, Mechanical, and Electrical Drawings and all Owner supplied equipment Drawings, and adjust their work to be in conformity with the conditions indicated thereon. Discrepancies between drawings, between drawings and actual field conditions, or between Drawings

and Specifications, shall be brought to the attention of the Architect prior to the production of the shop drawings for a determination of the modifications to be affected.

1.10 DAMAGE BY LEAKS

A. Contractor shall be responsible for any damage to work of other Contractors that is caused by leaks in any temporary or permanent piping systems due to pipe rupture, disconnected pipes or fittings, or by overflow of equipment.

PART 2 – PRODUCTS

2.1 GENERAL

A. Only specified materials shall be utilized in the work of this Section unless substitutions have been approved by the State Fire Marshall and the Architect.

2.2 COMPONENTS

A. Piping
   1. Above Grade: Schedule 40 fire sprinkler pipe for metal piping 1-1/2” and smaller, and for sway braces.
      a. Schedule 40 pipes shall meet the requirements of ASTM A-795.
      b. Schedule 40 pipes shall be Wheatland Schedule 40 Fire Sprinkler pipes, or approved equal.
      c. Fittings shall be either malleable iron threaded fittings meeting the requirements of ANSI/ASME B16.3, cast iron threaded fittings meeting the requirements of ANSI/ASME B16.4, or grooved fittings meeting the requirements of ASTM A-536.
      d. Fittings shall be Victaulic, Anvil, or approved equal.
   2. Above Grade: Schedule 10 fire sprinkler pipe for metal piping 2” and larger
      a. Schedule 10 pipes shall meet the requirements of ASTM A-795.
      b. Schedule 10 pipes shall be Wheatland Schedule 10 Fire Sprinkler pipes, or approved equal.
      c. Fittings shall be either cast iron flanges meeting the requirements of ANSI/ASME B16.1, welded fittings meeting the requirements of ASTM A-234, or grooved fittings meeting the requirements of ASTM A-536.
      d. Fittings shall be Victaulic, Anvil, or approved equal.
   3. Below Grade: Polyvinyl Chloride (PVC) Pipe AWWA C900, Class 305.
      a. Piping and fittings used for the installation of underground water mains shall be listed for such service.
      b. Fittings: Integral wall (thickened bell end), integral sleeve reinforced bell end or elastomeric gasket couplings meeting the requirements of AWWA C900.

B. Fire Sprinkler Heads: Sprinklers shall be of all brass body construction with a metal Belleville spring seal, coated on both sides with Teflon film. Sprinklers utilizing non-metal

parts in the sealing portion of the sprinkler are strictly prohibited. Sprinklers to be installed in areas with no ceilings shall be of a brass finish and shall be of adequate temperature for the hazard. Exposed sprinklers subject to corrosive atmosphere shall have a factory applied corrosion resistant coating. Sprinklers shall not be painted, except by the sprinkler manufacturer.

1. Victaulic “FL-QR” SIN V2708 pendent sprinklers, or approved equal, shall be used in locations shown on plans of Light Hazard and Ordinary Hazard occupancies. Sprinklers shall be Quick Response, Standard Coverage, and Intermediate Temperature Rating. Sprinklers shall have a nominal K factor of 5.6. Sprinklers shall be UL Listed.
2. Victaulic “FL-QR” SIN V2704 upright sprinklers, or approved equal, shall be used in locations shown on plans of Light Hazard and Ordinary Hazard occupancies. Sprinklers shall be Quick Response, Standard Coverage, and Intermediate Temperature Rating. Sprinklers shall have a nominal K factor of 5.6. Sprinklers shall be UL Listed.
3. Victaulic “FL-RES” SIN V2740 residential pendent sprinklers, or approved equal, shall be used in locations shown on plans of Residential occupancies. Sprinklers shall be Quick Response, and Ordinary Temperature Rating. Sprinklers shall have a nominal K factor of 4.9. Sprinklers shall be UL Listed.

C. Locating Wire and Warning Tape
1. Wire shall be blue coated #10 AWG solid copper, soft drawn wire, taped at 10 ft minimum intervals.
2. Tape shall be a detectable minimum 2” wide warning tape, blue color coded, imprinted with “Caution-Buried Water Line Below”, installed 12” above piping. Tape shall be Lineguard detectable marking tape, Type III or approved equal.

D. In-Building Riser
1. UL Listed, FM Approved, Certified to NSF/ANSI 372.
2. 304 Stainless Steel ASTM A 312 construction with ductile iron grooved coupling and EPDM coupling gasket.
3. Grooved outlet connection for riser connection.
4. Ames IBR or approved equal.
5. In-Building Riser shall not extend above the slab more than 24 in.

E. System Control Valve
1. The wet system control valve shall be a listed indicating type valve. Control valve shall be UL Listed and Factory Mutual Approved for fire protection installations. System control valve shall be rated for normal system pressure but in no case less than 175 PSI. Control valve shall be Victaulic Series 705 with grooved ends or approved equal.

F. Check Valve
1. Check Valves installed in system risers shall be Victaulic Series UMC Universal Check Assembly or approved equal. The check valve shall be UL Listed and Factory Mutual Approved. The check valve shall be equipped with a removable cover assembly. The check valve shall be listed for installation in the vertical position. The check

valve shall be equipped with gauge connections on the system side and supply side of the valve clapper. The check valve shall be equipped with an external bypass to eliminate false water flow alarms. The check valve trim piping shall be externally galvanized. Maximum water working pressure to 250 PSI.

2. Check Valves installed in above ground piping, except on the system riser, shall be Victaulic Series 717 Check Valve or approved equal. The check valve shall be UL Listed and Factory Mutual Approved. The check valve shall be equipped with a removable cover assembly. The check valve shall be listed for installation in the vertical or horizontal position. The check valve shall be equipped with gauge connections on the system side and supply side of the valve clapper. The check valve shall be equipped with an external bypass to eliminate false water flow alarms. The check valve trim piping shall be externally galvanized. Maximum water working pressure to 250 PSI.

G. Water Flow Indicating Pressure Switch
1. Water flow will activate an alarm by way of an alarm pressure switch. The alarm pressure switch shall be compatible with system devices. The alarm pressure enclosure shall be UL Listed and Factory Mutual Approved for the application in which it is used. The alarm pressure switch shall have the ability to be wired for Class A or Class B service. The alarm pressure switch manufacturer shall be Potter VSR Series.

H. Hangers and Supports
1. System piping shall be substantially supported to be building structure. The installation of hangers and supports shall adhere to the requirements set forth in NFPA 13, Standard for Installation of Sprinkler Systems. Materials used in the installation or construction of hangers and supports shall be listed and approved for such application. Hangers or supports not specifically listed for service shall be designed and bear the seal of a professional engineer.

I. Fire Department Connection
1. A system fire department connection shall be provided on the system riser in accordance with NFPA 13, Standard for Installation of Sprinkler Systems. Fire department connection shall be constructed of a brass body with an integral clapper assembly to separate flow between inlets. Fire department connection shall be installed in an area accessible for the first response unit according to the authority having jurisdiction requirements. Fire department connection shall be UL Listed and Factory Mutual Approved for fire protection use.

L. Air Venting Valves
1. Product: M7900AAV Automatically Vent Air from the System. Automatic Air Venting Valve is a 1 inch (25 mm) ball valve, strainer, air vent, and purge assembly.
   a. Standard: ULs "Product iQ" listing or "Approval Guide," published by FM Global, listing. NFPA 13, 13R, 13D (as applicable).
   b. Pressure Rating: 300 psig (2070 kPa), 175 psi (1205 kPa) for air vent.
   c. Body Material: Forged brass body.

d. Components: Integrated ball valve, stainless steel strainer, purge valve with hose connection (Field adjustable), thread cap with lanyard, automatic air vent.
e. Inlet Size: 1 inch NPT.
f. Outlet Size: 3/4 inch (19 mm) NPT.
g. Water Collection Accessories: Product: Model 7925VI. Water Collection Assembly with Visual Indicator.

2.3 MISCELLANEOUS

A. Provide all necessary escutcheons, drains, test valves and accessories, hose connections for flow test, spare parts, tools, and signs that are required for the work of this Section.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Drawings
1. Fire Protection Drawings show general arrangement of piping. Follow as closely as actual building construction and work of other trades will permit.
2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. Plumbing drainage piping and ductwork shall have the right of way over fire protection piping except for fire protection drainage piping wherever conflicts.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

3.2 INSTALLATION

A. General piping installation requirements shall be in accordance with NFPA 13.

B. Install system to drain. Drain piping in accordance with NFPA 13.
1. Install main drain from riser.
2. Install auxiliary drains in low points of piping system and inspector's test valve drain to mechanical pad located outside building unless otherwise directed by Architect.

C. Install piping system so it will not be exposed to freezing temperature.

D. Do not use dropped, damaged, or used sprinkler heads.

E. Install sprinkler lines above ceiling and within walls so that no piping is visible within the building. Where possible, pipes shall be concealed and run parallel to buildings lines.

F. Install tamper switches and pressure flow detectors where located for building site.

G. Brace and support system to meet seismic zone requirements for building site.

H. All concealed spaces shall be protected by sprinklers except areas not required by NFPA 13.

3.3 FIELD QUALITY CONTROL

A. This Contractor shall not allow or cause any work of this Section to be covered or enclosed until it has been inspected, tested, and approved by the Architect and the authorities having jurisdiction over the work. Certificates of approval shall be furnished to the Owner. Should any of this work be enclosed or covered up before such inspection, testing, and approval, this Contractor shall uncover the work, have the necessary inspections, test, and approvals made and, at no expense to the Owner, make all repairs necessary to restore both his work and that of other contractors which may have been damaged to be in conformity with the Contract Documents.

B. Site Tests
1. Test system according to 'Contractor's Material and Testing Certificate for Above Ground Piping' NFPA 13.
2. Tests shall be witnessed by Architect and representative of local jurisdiction over fire prevention.
3. When using Test Blanks is required for testing isolated sections of the sprinkler system, the Test Blanks shall have red painted lugs protruding beyond flange to clearly indicate their presence and be numbered to assure their removal when testing is completed.

C. This Contractor shall make all tests required by all local, state, and federal laws, codes, ordinances, and regulations having jurisdiction over this work.

D. Furnish all necessary labor, materials, and equipment for conducting tests, and pay all expenses in connection therewith. Should leaks develop while testing, repairs shall be made, and tests shall be repeated until a satisfactory test result is obtained.

3.4 SUPPLEMENTARY FIRE PROTECTION REQUIREMENTS

A. Before bidding, be familiar with rulings of governing authorities and comply with such requirements.

B. Protect unattended openings in piping from dirt and vandalism during construction.

C. Ensure that joints do not occur in piping installed in pipe sleeves.

D. Where construction is not inherently accessible, provide adequately sized and conveniently located access doors in ceilings, walls, and furring for servicing valves, equipment, etc. Doors shall be delivered to the General Contractor for installation. Doors shall be Milcor, Zurn, or as specified under Division 8 Sections.

1. Plaster surfaces: Style K.
2. Acoustic tile, gypsum board and tack board surfaces: Style A.
3. Masonry surfaces: Style M.
4. Rated ceiling and walls: Style “Fire Rated.”

E. Pipe penetrations at finished surfaces shall be covered with chrome plated escutcheon plates with set screws.

F. Install materials and equipment to allow convenient servicing (e.g., no piping in front of manholes, heaters, controls, electrical equipment, pumps, etc.)

G. Where pipes, etc., pass through roofs or outside wall above grade, provide flashings with weather-tight installation. Where not otherwise specified or shown, flashings shall be 24-gauge minimum thickness galvanized steel, with 8” minimum flange all around and 8” minimum height.

H. Sprinkler heads shall be located in center of ceiling tile.

I. Exposed sprinkler pipe in stairways shall be bent to suit overhead contours (no offset fittings shall be used for this purpose).

J. Connections from branches or mains to sprinkler heads shall be off of the top of branch or main pipe with return bend or piping for adjustment of location.

K. All exterior walkways between and adjacent to the buildings shall be sprinkled.

3.5 OWNER’S INSTRUCTIONS

A. Instruct building maintenance personnel in operation and maintenance of system, utilizing Operation and Maintenance Manual when so doing. Minimum instruction period shall be 4 hours.

B. Instruction periods shall occur after Substantial Completion inspection, when system is properly working, and before final payment is made.

3.6 MAINTENANCE

A. Furnish valve wrenches and operating and maintenance instructions to Owner upon completion of work.

B. Furnish spare heads of each type and temperature rating used, properly boxed with sprinkler head wrench.
1. A total of no fewer than six spare sprinklers is required for buildings with less than three hundred sprinklers in total.
2. A total of no fewer than twelve spare sprinklers is required for buildings with three hundred or more sprinklers, and less than one thousand sprinklers in total.

3. A total of no fewer than twenty-four spare sprinklers is required for buildings with more than one thousand sprinklers in total.
4. If there are dry sprinklers of different lengths installed, then having spare dry sprinklers is not required, but a means to return the system to service shall be required.

3.7 MICROBIOLOGICALLY INFLUENCED CORROSION (MIC)

A. All water used to charge or test the fire sprinkler system shall be treated to prevent MIC in accordance with NFPA 13, 2022.

B. Alternately, piping coated with ABF (Allied Tube) may be used in lieu of treatment if acceptable to the local and state Fire Marshall.

END OF SECTION

SECTION 22 00 00 – PLUMBING

PART 1 – GENERAL

1.1 INCLUDED

A. This Specification establishes the required standards for all labor, materials, equipment, and workmanship in connection with the furnishing, fabrication, and installation of "Plumbing." Plumbing work includes, but is not limited to, the following items of work:
   1. A complete system of soil, waste, vent, and sanitary sewer piping and structures, including provisions for mechanical equipment drainage; and connection of same to public sanitary sewers, located as indicated on the Drawings.
   2. Cold water distribution system, complete, from points of contact with site domestic water systems (located approximately as indicated on the Drawings) to all plumbing fixtures, mechanical equipment, building specialties, and Owner supplied equipment scheduled for service on the Drawings.
   3. Hot water distribution system, complete, from serving water heaters and/or points of contact with site domestic hot water, to all plumbing fixtures, mechanical equipment, building specialties, and Owner supplied equipment schedule for service on the Drawings.
   4. All plumbing fixtures and trim as scheduled on the Drawings, inclusive of setting of Fixtures and connections to drainage and water supply systems.
   5. Flashing of all plumbing pipe penetrations through exterior walls, roofs, and foundations. Sheet metal and lead flashings for pipe penetrations through roofs shall be furnished by the Plumbing Contractor and installed by the appropriate Roofing Contractor.
   6. Excavation and backfill as required for the work of this Section in conformity with Earthwork Section of the Specifications.
   7. Rough in and connection of all fixtures and equipment furnished by the Owner and/or Tenant.
   8. Final connection of water and natural gas to equipment furnished under other Sections.
   9. Protection of all piping specified herein and/or shown on the Drawings, from freezing. Buried piping shall be a minimum 12" below the local frost line. Piping above grade in unconditioned areas shall be insulated.
   10. Testing and adjusting of all piping systems and equipment herein specified.
   11. Sterilization of domestic water systems.
   12. Pipe wrapping and insulation.

B. The bidding requirements and contract forms, including General Conditions and Supplemental General Conditions, all Division 01 Sections apply to all work herein.

C. Should any work or material not be included in the Drawings or Specifications but it nevertheless necessary for the proper execution of the stated scope therefore for full compliance with codes, laws, rules, and regulations, the Contractor shall understand such work and material is required, and shall perform all such work.

1.2 LICENSES, PERMITS, AND FEES

A. The Contractor shall provide, procure, and pay for all licenses, permits, fees, etc. as required to carry on and complete their work.

1.3 CODES AND STANDARDS

A. All work shall be done in code with all applicable local, state, and federal building safety codes, ordinances, and regulations. Additionally, all work shall conform to the latest editions of the following standards:
1. National Fire Protection Association.
2. California Mechanical Code.
3. California Plumbing Code.
4. Underwriters Laboratories.
5. Titles 8, 17, 19, 21, 24 of the California Code of Regulations.
6. California Electric Code.

B. When the Contract Documents call for materials or construction of a higher standard than is required by the above, the Contract Document requirements shall take precedence over the requirements of the applicable laws, ordinances, rules, or regulations. Nothing in the Contract Documents shall be interpreted as permitting work in violation of said laws, rules, and/or regulations.

C. The Contractor for this work shall furnish, without extra charge, any additional materials and/or labor as may be required for compliance with these laws, rules, and/or regulations though such materials and/or labor are not specially set forth in the Contract Documents.

1.4 LICENSING REQUIREMENTS

A. All plumbing systems shall be installed by a C-36 Plumbing Contractor. Plumbing systems include: waste removal and connection of on-site waste disposal systems; piping, storage tanks, and venting for supply of gases and liquids for any purpose; all gas appliances, flues, and gas connections; water and gas piping from the Owner’s side of utility meter to the structure or fixed works, installation of any type of equipment to heat water or fluids to a suitable temperature; and maintenance and replacement of the items described above, including health and safety devices.

B. All plumbing insulation shall be performed by a C-2 – Insulation and Acoustical Contractor.

1.5 SUBMITTALS

A. All fixtures, materials, and equipment equal in quality and utility to these herein mentioned will be accepted. When specific names are used in describing fixtures, materials, and equipment they are mentioned as standards only, but this implies no right

on the part of the Contractor to use other fixtures, material, and equipment or methods, unless approved as equal in quality and utility by the Architect.

B. Before any fixtures, materials, or equipment are purchased, the Contractor shall submit to the Architect for approval, a complete list of materials, fixtures, and equipment, giving the manufacturer's names, model numbers, and catalog sheets.

C. The Contractor shall submit for the approval of the Architect, shop drawings of proposed material and equipment that differ from the specified materials and equipment, and of any specified materials and equipment with special conditions and/or arrangements. These drawings shall show necessary modifications of owner, plumbing, electrical, and mechanical work required by the proposed materials and equipment.

D. Submittal lists and drawings shall include identifying marks assigned by the Drawings and Specifications.

E. Review of drawings and other material submitted shall not be construed as complete check or constitute a waiver of the requirements of the Drawings and Specifications, but will indicate that the material submitted is acceptable in quality and utility. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangements or construction of other work.

F. Coordination/Layout Shop Drawings
1. Prepare complete consolidated layout drawings for all new systems, and for existing systems that are in the same areas. All drawings shall be fully coordinated with HVAC, Plumbing, Fire Protection, Electrical, Structural, and Architectural work.
2. Clearly identify and dimension the proposed locations of the principal items of equipment and adequate clearance for all equipment, piping, pumps, valves, and other items. Provide detailed layout of all piping systems showing the proposed routes.
3. Show the access means for all items requiring access for operations and maintenance.
4. Submit shop drawings to Architect for approval, prior to fabrication or installation of any work. Do not install equipment or piping until layout drawings have been approved. Any work installed without prior shop drawing approval shall be removed at the Contractor's expense.

1.6 COOPERATION WITH OTHER TRADES

A. Cooperate fully with other trades doing work on the project as may be necessary for the proper completion of the project. Refer to the Structural, Mechanical, and Electrical Drawings for details of the building structure and equipment installation that will tend to overlap, conflict with or require coordination with the work of this Section, and schedule this work accordingly.

B. Any work done without regard for other trades shall be moved, replaced, or redone as required, without extra charges to Owner.

1.7 AS-BUILT DRAWINGS

A. A complete set of Contract Drawings shall be maintained at the work site, and all changes in the work shall be recorded on this set, on a daily basis. The final as-built drawings shall be submitted to the Owner's Representative for approval.

1.8 DRAWINGS

A. The drawings indicate diagrammatically the general layout of the plumbing systems and other related work. Field verification of scaled dimensions taken from the Drawings is required.

B. The Contractor shall review and compare the Architectural, Structural, Plumbing, Mechanical, and Electrical Drawings and all Owner supplied equipment Drawings, and adjust their work to be in conformity with the conditions indicated thereon. Discrepancies between drawings, between drawings and actual field conditions, or between Drawings and Specifications, shall promptly be brought to the attention of the Architect for a determination of the modifications to be effected. In the event that a major modification is required, a Change Order will be prepared.

1.9 VERIFICATION OF EXISTING CONDITIONS AND DEMOLITION

A. Before installation of any new work, verify the location, size, and other conditions at all points of connection to services or other existing piping, and at all locations where new work will cross or pass near existing piping, electrical, or other facilities.

B. Patch, cap, or repair existing works affected by this demolition in concealed spaces within six (6) inches of a live main or branch.

C. Deliver removed material to the Owner as directed by the Architect. Dispose of all other removed material offsite.

D. Information shown relative to existing services is based upon available records and data during preparation of the Drawings, but shall be verified. Make reasonable deviations found necessary to conform to actual locations and conditions, without extra charge.

E. The data given herein and on the Drawings are as exact as could be reasonably secured, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc. will be governed by shop drawings, the building itself, and actual field conditions.

1.10 DAMAGE BY LEAKS

A. Contractor shall be responsible for any damage to work of other Contractors that is caused by leaks in any temporary or permanent piping systems due to pipe rupture, disconnected pipes or fittings, or by overflow of equipment.

1.11 SEISMIC FORCE RESISTANCE: MECHANICAL, PLUMBING, FIRE PROTECTION SYSTEMS

A. All mechanical systems and plumbing piping systems shall adhere to the SMACNA "Seismic Restraint Manual: Guidelines for Mechanical Systems," Third Edition, dated March 2008.

B. Equipment:
1. Each piece of equipment installed shall be constructed and anchored to structural supports to resist a seismic force of 150% of the equipment's operating weight in any direction. Supports, anchors, and braces shown shall be minimum.
2. Equipment manufacturer shall design, construct, and certify that his equipment satisfies the special minimum seismic resistance requirements and shall submit calculations or test results supporting his certification.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection, and placing of all equipment and materials.
1. Contractor shall protect the work and materials from damage during construction. Equipment stored at the job site shall be protected from dust, water, or other damage, and be covered if equipment is exposed to weather. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
2. Any items damaged shall be repaired or replaced, at no additional cost to the Owner.

B. Cleanliness of Piping and Equipment Systems
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading, and welding of piping.
2. Piping systems shall be flushed, blown, or pigged as necessary to deliver clean systems.
3. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.13 WARRANTIES

A. Equipment warranties shall be provided for all equipment, with all necessary information filled in, except purchase date, in favor of the Owner.

B. The contractor shall guarantee that all work under this Section is free from defects in material and workmanship for a period of one year from the date of filing the Notice of Completion. Replacement of defective work and damage caused to work of other trades as a result of such defective work shall be the responsibility of the Contractor, and shall be made at no cost to the Owner.

1.14 ALTERNATIVE MATERIALS AND METHODS

A. These plans and specifications describe the general scope of the mechanical systems. These plans and specifications do not preclude the submittal of alternative methods or materials. Manufacturer’s names and catalog numbers are stated to identify the type and quality of the equipment or materials required for the project.

B. The contractor may submit shop drawings and/or technical information on alternative equipment, materials or installation details to accomplish the intent of the plans and specifications. Approval of the alternative equipment, materials or installation details shall not relieve the contractor of any responsibility for complying with the intent of the plans and specifications. Submit the manufacturers' technical information, shop drawings, and/or written description of alternative methods for each item described by manufacturer's name and catalog number and for each component, equipment, material, or installation detail required.

1.15 SITE EXAMINATION

A. Thoroughly examine the site and verify the actual work conditions. No extra compensation will be allowed for expenses due to failure to discover site conditions which affect the work.

PART 2 – PRODUCTS

2.1 GENERAL

A. Only specified material shall be utilized in the work of this Section unless substitutions have been approved in accordance with the General Conditions and Division 1 Sections of the Specifications.

B. All materials shall be new and unused, of the best quality for the intended use, and shall be listed by the ASA, AGA, and UL as meeting their requirements and bearing their label wherever standards have been established and label services are regularly furnished by them.

2.2 PIPE AND FITTINGS

A. Sanitary Soil, Waste, and Vent Piping:
   1. Below Ground

a. Lines 2” and larger shall be service weight, hub-less cast iron soil pipe and fittings, and shall conform to the requirements of ASTM A 888 and CISPI Standard 301. Approved manufacturers: Charlotte, Tyler, or AB&I.
b. Joints: Couplings shall conform to the requirements of ASTM C1540 and shall be heavy duty type 304 stainless steel shielded, having 4 sealing clamps for pipe sizes 1 ½” thru 4”, and 6 sealing clamps for pipe sizes 5” thru 10”. Gaskets shall comply with ASTM C-564. Anaco, Tyler, or equal.

2. Above Ground
a. Lines 2” and larger shall be standard weight, hub-less cast iron soil pipe and fittings, and shall conform to the requirements of ASTM A 888 and CISPI Standard 301. Approved manufacturers: Charlotte, Tyler, or AB&I.
b. Joints: Couplings shall conform to the requirements of ASTM C1540 and shall be heavy duty type 304 stainless steel shielded, having 4 sealing clamps for pipe sizes 1 ½” thru 4:, and 6 sealing clamps for pipe sizes 5” thru 10”. Gaskets shall comply with ASTM C-564. Anaco, Tyler, or equal.

B. Condensate Piping
1. From cooling coil: Type M, hard temper, copper with wrought copper or cast brass fittings. Joints shall be made up with “Stay-Safe 50” lead free solder.

D. Cold and Hot Water Piping
1. All domestic cold water piping 3” and smaller shall be Type L, hard temper, copper pipe with wrought copper or cast brass solder joint fittings. All joints shall be made up with “Stay-Safe 50” lead free solder. A suitable non-corrosive flux shall be used at all joints.
2. Pipes below grade inside buildings shall be soft drawn, Type L or K copper with no joints below slabs. Pipes shall be installed in a PVC conduit not less than Schedule 40. The interior diameter of the conduit shall not be less than 1/2 inch larger than the outside diameter of the water piping.

2.3 UNIONS

A. Steel pipe unions shall be malleable iron, 150lb., ground joint, Grinnell Fig. 463.

B. Copper pipe unions shall be soldered joint, Nibco series 633 or 733, Mueller, or equal.

C. Dielectric unions shall be EPCO or equal.

2.4 VALVES, SPECIALTIES

A. Ball Valves, Potable Water up to 2”: Nibco T-585-80-LF or T-585HP-LF, lead-free silicon bronze body, “Ring Ball,” full port, two piece, lever handle, 125 lb. Below ground installation shall have stainless steel lever handle.

B. Ball Valves, Potable Water over 2”: Nibco T-580-80-LF, lead-free silicon bronze body, “Ring Ball,” conventional port, two piece, lever handle, 125 lb. Below ground installation shall have stainless steel lever handle.

C. Check Valves, Potable Water:
1. Nibco T-480-LF, lead-free silicon bronze body, inline lift type, Teflon seat, and discs, spring actuated, 125 lb.
2. Nibco T-413-Y-LF, lead-free silicon bronze body, Y-pattern lift type, Class 200.

D. Gate Valves: 3" and smaller shall be NIBCO T134 or Stockham B-120 or B-124, bronze body, union bonnet, rising stem, solid wedge, 150 lb. with wheel handle.

E. Relief Valves: Water heater temperature/pressure relief valve, Watts, M&M, or equal with ASME rating, and AGA certified design. Set at 125 psi and 210°F.

F. Backflow Preventers (where shown on the Drawings or required by local code):
1. Atmospheric type; Wilkins #35 series.
2. Pressure type: Wilkins #720A series.
3. Reduced pressure type:
a. ¼" to 2" – Wilkins #975-XLMS series.
b. 2 ½" to 10" – Wilkins #375 series.

G. Water Pressure Regulating Valves: Wilkins 500 YSBR series. Install where pressure to building exceeds 70 psi.

2.5 HANGERS, SUPPORTS

A. Installation of piping shall be such that damage cannot result through loading, expansion, or contraction of piping. Anchors shall be installed to obtain uniformity of pipe movement.

B. Pipe supports shall be spaced sufficiently close to support pipes properly without formation of pockets. Supports and hangers shall be installed at ends of mains and branches and maximum intermediate spacing shall be as follows:

	MAXIMUM SPACING, (FT.) Pipe Diameter, Inches		MINIMUM ROD DIAMETER Pipe Dia.	
	1" &Less	1-1/4"& More	Inches	Rod Dia. Inches
Steel	8	10	2 & Less	3/8
Copper	6	8	2-1/2 to 3	½
Cast Iron	5 (One min. per length & fitting)		4 & Larger	5/8

C. Pipe hangers shall be Superstrut, B-Line, or equivalent Grinnell. All hangers shall be electro-chromate finished. Hanger rods shall have electro-galvanized finish.

D. Steel pipe, cast iron soil pipe: C-711 pipe hangers.

E. Copper tubing: C-711 pipe hanger complete with C-716 isolator.

F. Insulated pipe: C-711 pipe hanger fitted to outside of insulation with C-790 galvanized shields.

G. Trapeze Hangers
1. Grouped pipes may be supported by A-1200 channel bolted to rods.
2. Copper and steel pipe shall be attached to channels with A-716 “Cush-A-Clamp.”

H. Cast iron soil pipe shall be supported with C-711 pipe hangers with rods attached to the bottom of channels.

I. Point of Support Connectors
1. Wood Construction
a. 540 side beam hanger for stationary pipes.
b. S-541 for pipes subject to movement.
2. Vertical Pipe Risers: Vertical pipes risers shall be securely supported with C-720 pipe clamps (C-720P for bare cold water pipe) anchored to construction.

J. Provide resilient mounting for domestic water piping. Thermal insulation may serve as resilient mounting for insulated piping.

K. Suspended water piping shall be anchored with steel struts installed at midpoint of each run.

L. No valve or piece of equipment shall be used to support piping.

2.6 CLEANOUTS

A. Cleanouts in membrane damp-proofed floors shall have flashing flange and membrane clamps. Plugs shall be bronze, with cast iron body ferrule for cast iron pipe.

B. Floor Cleanouts (FCO): Zurn ZN 1400-HD, “Level-trol” adjustable cleanouts, dura-coated cast iron with gas and water-tight ABS tapered thread plug, and round scoriated top, adjustable to finished floor .

C. Grade Cleanouts (GCO): Zurn Z-1474-IN or equal JR Smith. Housing to be dura-coated cast iron body with integral anchor flange and scoriated cover with lifting device. Cleanouts in un-paved areas shall be set in 18” x 18” x 4” concrete pads.

D. Wall Cleanouts (WCO):
1. Copper tubing: Nibco Figure 816 or 817, with Zurn Z-1462, 6” x 6” polished chrome-plated bronze wall plate and frame.
2. Cast iron pipe: Zurn Z-1441, dura-coated with gas and water-tight bronze, taper thread plug and round smooth stainless steel access cover with securing screw.
3. Steel pipe: Zurn Z-1468, round stainless steel wall access cover, complete with securing screw and bronze raised hex head plug for steel pipe.

E. Acid Resistant Floor Cleanouts (AFCO): ORION FCO corrosion resistant finished floor cleanout. Manufactured from fire retardant polypropylene material conforming to ASTM D4101, ferrule supplied with countersunk plug and adjustable top with square nickel bronze cover, with AWCO (Acid Waste Cleanout) cast in cover.

F. Acid Resistant Wall Cleanouts (AWCO): ORION Blueline FRPP SF corrosion resistant Cleanout Tee. Manufactured from fire retardant polypropylene material conforming to ASTM D4101. Fitting layouts to conform to ASTM D3311 and ASTM F1412.

2.7 SLEEVES, WALL PLATES

A. Service pipe through exterior wall, roofs: Crane Style BC wall and ceiling plates; chrome plated at finished rooms.

B. Pipes through, under footings: 18 gauge iron sleeves two diameters larger than pipe, cast in concrete, annular space filled with mastic or plastic bituminous cement.

C. Pipes through fire rated walls shall be protected with fire retardant mastic as detailed on the Drawings. Installation shall be in full accordance with the requirements of the UL system number. Hilti or approved equal.

D. Wall and ceiling plates: Crane Style BC or equal; chrome plated at finished rooms.

E. Pipes through floors, interior concrete walls, and through fire rated wall and smoke stop partitions: 18 gauge iron sleeves, two diameters large than pipe, annular space filled with 3M Brand Fire Barrier CP-25 caulk.

F. Pipes through 1-hour walls shall be protected with fire retardant mastic as detailed on the Drawings. Installation shall be in full accordance with the requirements of the UL system number. Hilti or approved equal.

2.8 ACCESS DOORS

A. Where construction is not inherently accessible, provide adequately sized and conveniently located access doors in ceiling, walls, and furring for servicing valves, equipment, and appurtenances etc.

B. Access doors shall be Karp, Milcor, or equal, prime coated steel for all surfaces except ceramic tile, 12” x12” minimum size as required. Locks shall be flush, screwdriver operated.
1. Style KDW for gypsum board surfaces.
2. Style PL for plaster surfaces.
3. Style 210 for acoustic tile surfaces.
4. Style DSC 214-M satin finish stainless steel at ceramic tile surfaces.
5. Style “Fire Rated” at rated ceilings and walls.
6.

2.9 PIPE INSULATION

A. Insulate all hot water supply piping, all hot water return piping, all cold water supply piping in exterior walls or unconditioned spaces, and all primary roof drain piping in conditioned spaces with John Manville “Micro-Lok” 650, Fiberglass, Certainteed, or equal, rigid fiberglass one-piece pipe insulation with and all purpose jacket. Jackets shall be constructed of high density, white kraft bonded to aluminum foil with fiberglass yarn, with a pressure sensitive closure system.

B. All insulation shall have composite (insulation, jacket, and adhesive used to adhere the jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 or UL 723, not exceeding: Flame Spread – 25, Smoke Developed – 50.

C. All piping exposed to the weather shall be finished with aluminum jacketing with a laminated moisture retarder. Aluminum jacketing shall be overlapped 2 to 3 inches and held in place with stainless steel bands to form a weather tight system. Elbows and tees shall be fitted with matching aluminum fitting covers.

D. Inserts shall be installed at outside hangers. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of thickness equal to the adjoining insulation. Inserts shall not be less than 10” long for pipe sizes through 2 ½” and not less than 12” long for pipes larger than 2 ½”.

E. Metal shields shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and shall extend up to the centerline of the pipe and the length specified for hanger inserts.

F. Insulation thickness shall be as follows:

1.	All cold water piping:	1”
2.	All hot water piping 3/4” and smaller:	1”
3.	All hot water piping 1” and larger:	1 ½”
4.	All primary roof drain piping:	1”

2.10 PIPE LABELS

A. All new domestic cold water, hot water, and hot water recirculation piping shall be clearly labelled.

B. Industrial safety solutions piping labels shall be rated for indoor and outdoor use and be attached with permanent adhesive.

C. Labels shall show the direction of flow and indicate the process media. Pipe labeling color and text size shall conform to ANSI/ASME A13.1-2007. Process piping shall be labeled a minimum of twice per room in locations designated by the Engineer.

2.11 FIXTURES

A. The quantity and location of fixtures shall be taken from the Architectural and Plumbing Drawings. Provide adequate supports and all standard trim normally furnished for fixtures. All enamel shall be acid resisting. Traps, unless otherwise noted shall be 17 gauge brass tubing, chrome plated when exposed.

B. Except as otherwise shown, provide ¼" steel backing plates, 36" wide by 12" high minimum size, secured to a minimum of three studs by welding, or with ¼" x 2 ½" lag screws for all wall hung fixtures for which no other means of support is specified.

C. Stops and supplies: Provide stops for all fixtures. Unless otherwise specified, stops exposed at lavatories and similar fixtures shall be Chicago #1016-ABCP, chrome plated, loose key. Concealed stops shall be Chicago #1771.

D. All fixtures shall meet or exceed the requirements of the California Administrative Code, Title 24, Part 5.

2.12 TRAP PRIMERS

A. Trap primers shall be installed for all floor drains as follows:
1. Precision Plumbing Products model P2-500 automatic trap primer, corrosion resistant brass, piston operated.

2.13 SHOCK ABSORBERS

A. Zurn, "Shoktrol," or equal JR Smith, stainless steel bellows. Install with gate valve shut-off and access door at all flush valves or other automatic valves. A single unit sized in accordance with the manufacturer's recommendations may serve batteries of valves.

2.14 VALVE BOXES

A. Christy #F-08, complete with concrete cover and required extensions. Index all covers "GAS" or "WATER" as required for service use.

2.15 HOSE BIBBS

A. Non-freeze wall hydrants where subject to freezing.

B. Approved vacuum breaker per CPC 603.5.7.

C. Brass or bronze construction, heavy duty commercial type, lead free components per CPC 604.2.

D. Mount 12"-18" above finished grade for exterior use, unless otherwise noted.

E. Mount 18"-30" AFF for interior or service areas, unless otherwise noted.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. This Contractor shall be held to have examined the site and compared it with the Contract Documents, and to adequately understand the conditions under which the work is to be performed. In the event of discrepancy, this Contractor shall notify the Architect and proceed as directed. This Contractor shall be held responsible for all existing conditions, whether or not accurately described, and no allowance shall subsequently be made on his behalf for any error, omission, or extra expense due to failure or neglect to make such examination and notification.

B. Prior to commencing the work of this Section, this Contractor shall inspect the installed work of other trades and verify that their work is sufficiently complete to permit the start of work under this Section and that the completed work will be in complete accordance with the original design. In the event of discrepancy immediately notify the Architect and proceed as directed.

3.2 ACCESSIBILITY

A. Equipment shall be placed and piping connections made in such a manner that all routine adjustments and maintenance operations may be carried out without inconvenience and so that all code requirements for clearances are maintained.

3.3 VIBRATION AND SOUND CONTROL

A. Make all necessary provisions to prevent the transmission of vibration to the building structure, including flexible pipe connections to motor driven equipment, resilient mounting for piping, and sealing off pipe and duct penetrations of walls and roof.

3.4 INSULATION

A. Insulation shall be applied in complete accordance with the manufacturer's published installation instructions. All insulation shall be applied on clean, dry surfaces and shall be continuous through wall and ceiling opening and sleeves. All joints shall be firmly butted together and longitudinal jacket laps and butt strips shall be smoothly secured. Specified adhesives, mastics, and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.

3.5 PIPING INSTALLATION – GENERAL

A. Rough in shall proceed as rapidly as general construction will permit. All rough-in shall be complete, at locations verified by Architect and Owner, and tested and inspected prior to installation of concrete, lath, plaster, gypsum wallboard, or other finishes.

B. All piping shall be concealed in finished rooms, installed in furred walls and partitions. Where furred or suspended ceilings occur, piping shall be installed in the concealed space at points adjacent to beams and/or other structural members, and coordinated with ductwork and equipment. Where exposed piping occurs, it shall be installed parallel to or at right angles to building walls, unless specifically shown otherwise on the Drawings.

C. Installation of piping shall be such that damage cannot result, through thermal expansion or contraction, to piping, building, or pipe hangers and supports. Anchors shall be installed at midpoints of all runs in main piping for the purpose of localizing pipe expansion or prevention of creepage.

D. All pipe lines shall be installed free from traps and air pockets, true to line and grade, with suitable supports properly space. All piping shall be installed without undue stresses and with provision for expansion and contraction.

E. All piping shall be new and free from foreign substances. American standard pipe threads shall be used for IPS threaded work. Joints in threaded piping shall be made up with Teflon tape applied to the male threads only. No screwed pipe joints shall be caulked or packed with rope or other packing materials. Pipe shall be free from tool marks, threads cut accurately with not more than two (2) threads showing beyond fitting. Friction wrenches shall not be used with plated, polished, or soft metal piping. All changes in pipe size shall be made with reducing fitting. Bushings will not be permitted.

F. Protect unattended openings in piping during construction.

G. No water or drainage piping shall pass over electrical equipment unless adequate protection is provided to prevent damage by leaks or condensation.

H. All copper tubing shall be formed in a workmanlike manner, in accordance with the Pipe and Tube Bending Handbook of the Copper and Brass Research Association. A tube bender giving support to the periphery of the tube shall be used. The tubing shall be protected against flatting or other injury.

I. All copper connections and joints shall be made in accordance with the Copper Tube Handbook, Copper and Brass Research Association. No swaged connections will be permitted. All valves, pumps, and similar equipment shall be connected to copper piping through union or flange adapter fittings.

J. Valves, cocks, etc., shall be installed to allow convenient accessibility and operation.

K. Unions and flanges shall be installed to allow convenient replacement of all equipment and clearing tubes.

L. A union connection shall be installed downstream from all valves, at equipment connections and at other locations as required or directed.

M. Shut off valves shall be provided in all main services, and where required to permit proper servicing of equipment. Valves of one type shall be of one manufacturer.

N. All valves shall be of the same size as the pipelines in which they are installed, unless specifically sized on the Drawings. All hand controlled line valves shall be ball valves, except where throttling control or frequent operation is required, in which case globe or angle valves shall be used. Globe valves in horizontal lines shall be installed with stem in horizontal to permit line draining. All globe and angle valves shall be installed to close against pressure. Disc valves shall have discs suitable for the services for which they are to be used.

O. All valves shall be accessible and shall not be installed with the stems below the horizontal plane. Provide access panels at walls, ceilings, or floors.

P. Provide prime coated escutcheon plates at all points where exposed piping penetrates finished wall ceilings or floors.

Q. Cutting or boring of joists or other structural members shall be done only when alternative routing is impossible and only upon written approval of the Architect or Owner.

3.6 INSTALLATION, PIPING

A. Condensate Piping
1. Indirect waste piping shall be installed to a uniform minimum grade of ¼" per foot unless otherwise noted.
2. Changes in direction of indirect waste piping shall be accomplished by the use of appropriate drainage fittings.
3. Drilling and tapping of indirect waste pipes and the use of saddle hubs and bands are prohibited.

B. Flashing
1. All roof and wall penetrations shall be flashed and counterflashed water tight with 26 gauge sheet metal, except as noted.
2. Vents through roof shall be flashed with Semco #1100-4 lead flashing assemblies. Flashing shall extend over top of pipe and shall be turned down inside top of pipe.

C. Soil, Waste, Vent, Drain Piping
1. Soil, waste, and vent piping occurring within the building shall be installed to a uniform minimum grade of ¼" per foot unless otherwise noted. Vent piping shall be graded so that all condensation shall flow directly to a soil or waste line.
2. Changes in direction of drainage piping shall be accomplished by the use of appropriate drainage and sanitary fittings.
3. Protection against breakage of piping passing under or through walls shall be provided using specified sleeves and caulking.
4. Adapters shall be installed between threaded iron and soil pipe.
5. Test tees shall be installed at the foot of all soil, waste, and storm water stacks.

6. Cleanouts shall be located where indicated on the Drawings; at all horizontal offsets; at ends of waste or sewer branches more the 5’ in length; at intervals of 100’ in straight runs of piping, or at closer intervals if directed or required by local code. A cleanout shall be installed above the fixture connection fitting, serving each urinal, regardless of the location of the urinal in the building. Location of cleanouts in finished spaces shall be approved by the Architect prior to installation.

E. Hot and Cold Water Systems
1. Di-electric unions shall be installed where copper pipe is connected to galvanized steel piping or stub outs.
2. Connections from copper pipe to fixture supply fittings shall be made with copper or brass nipples.
3. All domestic water piping shall be kept clear of the building structure. Where it is within 1” of the building structure, it shall be wrapped with felt (3/16” minimum thickness).
4. To the greatest extent possible, domestic cold water piping shall be kept separated from hot piping and where there is a choice shall be run in the coolest portion of the available space.

F. Plumbing Fixtures
1. Space between wall mounted fixtures and wall surface shall be neatly pointed up with silicone rubber compound of color matching fixture.
2. All exposed bolt heads and nuts used to secure fixtures shall be concealed with vitreous china caps.

G. Excavation and Backfill
1. Provide all excavation, trenching, and backfill in connection with the work of this Section.
2. Excavation shall be carried to 4” below the bottom of pipes. Provide a sand bedding for all sloped drainage piping, and provide smooth uniformly graded bedding of firm but yielding material for all other piping, catch basins, and similar structures.
3. Backfill material shall be non-corrosive and free from all foreign material that could damage pipes. Backfill shall be placed in 6” layers, each layer tamped, and compacted to 95% of maximum dry density (ASTM D-1557-64T (c) compaction test procedure).

H. Storm Drainage Piping
1. Roof drains shall be installed where indicated on the Drawings, in conjunction with work specified in “Membrane Waterproofing” Section. This Contractor shall be responsible for a watertight installation.
2. Rain water leaders connected to roof drains and gutter systems shall be standard weight galvanized steel pipe and fittings, except where otherwise noted, and shall be continuous from drain to connection with underground storm water drainage facilities. Provide a cleanout at the base of all vertical to horizontal transitions.
3. Downspouts inside building, if shown, shall be continuous from drain to curb or connection with underground storm water drainage facilities. Provide a cleanout at the base of all vertical to horizontal transitions.

4. Insulate storm drain piping where it is located above a ceiling or within a concealed space. Overflow piping is not required to be insulated.

3.7 INSTALLATION, HANGERS & SUPPORTS

A. Installation of piping shall be such that damage cannot result through loading, expansion, or contraction of piping. Anchors shall be installed to obtain uniformity of pipe movement.

B. Hanger rod sizes shall be no smaller than 3/8-inch for pipe and tube sizes ½ to 4 inches and ½ inch for sizes 5-8 inches.

C. Pipe supports shall be spaced sufficiently close to support pipes properly without formation of pockets. Hangers shall be installed at ends of mains and branches. Maximum horizontal support spacing shall be as follows:
1. Steel Pipe for Water or DWV: 10 feet for pipe sizes ¾ inch and smaller and 12 feet for sizes 1 inch and larger.
2. Steel and Tinned Copper Pipe for Gas: 6 feet for ½ inch pipe; 8 feet for sizes ¾ to 1 inch, and 10 feet for sizes 1 ¼ inch and larger.
3. Copper Tube and Pipe, soldered or brazed: 6 feet for pipe sizes 1 ½ inches and smaller and 10 feet for sizes 2 inches and larger.
4. Hubless Cast-Iron shall be supported at every other joint, unless over 4 feet, then support each joint. Support adjacent to joint, not to exceed 18 inches, brace at not more than 40 foot intervals to prevent horizontal movement. Support at each horizontal branch connection. Hangers shall not be placed on the coupling.

D. Provide resilient mounting for domestic water piping. Thermal insulation may serve as resilient mounting for insulated piping.

E. Suspended water piping shall be anchored with steel struts installed at midpoint of each run.

F. No valve or piece of equipment shall be used to support piping.

G. Pipes through studs or joists shall be isolated from structure with properly sized Hubbard “Hole-Rite” suspension clamps.

3.8 TESTING, INSPECTIONS

A. General
1. This Contractor shall not allow or cause any work of this Section to be covered or enclosed until it has been inspected, tested, and approved by the Architect and the authorities having jurisdictions over the work. Should any of this work by enclosed or covered up before such inspection, testing, and approval, this Contractor shall uncover the work, have the necessary inspections, tests, and approvals made and, at no expense to the Owner, make all repairs necessary to restore both his work

and that of other contractors that may have been damaged, to be in conformity with the Contract Documents.

B. Tests
1. This Contractor shall make all tests required by all local, state, and federal laws, codes, ordinances, and regulations having jurisdiction over this work.
2. Furnish all necessary labor, materials, and equipment for conducting tests, and pay all expenses in connection therewith. Should leaks develop while testing, repairs shall be made, and tests shall be repeated until a satisfactory test is obtained.
3. Water Piping shall by hydrostatically tested for 6 hours at 150 psi. All equipment shall be tested water tight at utility pressure.
4. Drainage and Vent Piping shall be tested for 1 hour by plugging all outlets and filling the pipes with water to the top of vertical sections of pipes. No loss of water shall be permitted.

3.9 DOMESTIC WATER SYSTEM STERILIZATION

A. Upon completion of this work, the domestic water system shall be thoroughly flushed, sterilized, and reflushed. Sterilization and reflushing shall be performed using the following procedure.
1. All work shall be performed in the presence of the inspector.
2. Introduce chlorine or a solution of sodium hypochlorite, filling the lines slowly and supplying the sterilization agent at a rate of 50 parts of chlorine per million, as determined by residual chlorine tests at the ends of all branches. Open and close all valves while the system is being chlorinated to insure uniform distribution.
3. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the branches. If less than 5 ppm is indicated, repeat the sterilization procedure.
4. When tests show at least 5 ppm of residual chlorine, flush out the system until all traces of the chemical are removed.

B. After a period of 48 hours minimum, bacteriological tests, using samples from at least 3 representative points shall be made by recognized testing agency, who shall certify to the Architect that the system is bacteriologically safe and at least equal in safety to that of the principal water supply. The laboratory report and certification shall be transmitted to the Architect and Owner.

3.10 ADJUSTING

A. Properly adjust all stops, and controls, and demonstrate safe and satisfactory operation of all equipment.

3.11 CLEANING

A. Flush all water piping systems. Remove, clean, and replace all strainer baskets prior to final inspection.

B. Blow out all compressible fluid piping with compressed air before connecting with regulators or equipment.

3.12 CLEANUP

A. Upon completion of the work of this Section, remove all surplus material, debris, and equipment associated with or used in the performance of this work.

END OF SECTION

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SECTION 22 11 23 - PUMPS

PART 1 GENERAL

1.1SECTION INCLUDES

A. This section includes supply and installation of domestic water pumps and fire suppression pumps to be used on this project.

1.2MEASUREMENT

A. Domestic Water Booster Pumps: Item is paid per bid schedule listed in section 004100. Installation of new pumps include connections, piping, anchorage, and all appurtenances not otherwise specified in the bid schedule.

B. Fire Sprinkler Pump: Item is paid per bid schedule listed in section 004100. Installation of new pumps include connections, piping, anchorage, and all appurtenances not otherwise specified in the bid schedule.

C. Instrumentation for Pumps: Cost is incidental to the construction of the plant building. Includes supply and installation of new pumps, connections, piping, anchorage, and all appurtenances not otherwise specified in the bid schedule. Control Panels for monitoring of pumps shall be installed per manufacturer recommendations for the specific pump system.

1.3RELATED SECTIONS

A. Section 033000 Concrete

B. Section 331100 Water utility Distribution

1.4QUALITY ASSURANCE

A. Perform work in accordance with manufacturer’s recommended procedures.

1.5DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site.

1.6SUBMITTALS

A. The contractor shall provide submittals to the Engineer for all pumps to be used for this project. The submittals shall include pump rating curves, technical figures, and any other information as required by the Engineer.

PART 2 PRODUCTS

2.1DOMESTIC WATER BOOSTER PUMPS

A. Manufacturer: Goulds or equivalent

B. Domestic water booster pumps shall be (2) Goulds e-SV Vertical Multistage pumps with Variable Frequency Drive capable of each providing 85 gpm. Two pumps are to be installed in parallel with isolation valves, check valve, pressure gauge, and other elements as shown in plans.

C. Pump system shall be connected to drawdown tank 30 gallons to provide stability to system when low demand is experienced.

D. Pump system will provide a bypass to ensure water supply to buildings in the event of no electrical power.

2.2 FIRE SUPPRESSION PUMP

A. Manufacturer: Talco or equivalent

B. Fire Suppression pump shall be according to Fire Sprinkler Designer specification.

C. Pumps shall be housed in an enclosed CMU building that will also house all accessories and related electrical, mechanical, and plumbing components necessary for the adequate performance of the pumps.

D. Fire Suppression system shall use a dedicated diesel pump. Diesel tank will be double walled and located in near proximity to pump system.

2.3 EXECUTION

A. Verify that pumps selected are suitable for their intended use.

2.4 PREPARATION

A. Submit all technical information as required by this section to the Engineer prior the installation of the pumps.

2.5 INSTALLATION

A. Install pumps per manufacturers' recommendations.

B. After installation all connections shown on the project drawing shall be made.

C. Operation of the pumps shall be tested to the satisfaction of the Engineer.

PART 3 EXECUTION

3.1 INSTALLATION AND WORKMANSHIP, GENERAL

A. Members shall be accurately cut to required dimensions and shall be firmly secured with metal connectors true to the lines, levels, and dimensions indicated, all in accordance with applicable codes.

3.2 REPAIRS AND PROTECTION DURING CONSTRUCTION

A. Protect all materials, equipment, and systems from weather, damage, and theft until substantial completion. Damaged or compromised products must be replaced by the contractor at no additional cost to the project.

3.3 MATERIAL AND EQUIPMENT INSTALLATION

A. Follow the manufacturer's installation recommendations unless otherwise indicated. Follow the Engineer's decision, wherever any conflict arises between the manufacturer's instructions, State or other codes and regulations, and these Contract Documents. Keep copy of the manufacturer's installation instructions available on the jobsite for review at all times.

3.4 CUTTING AND PATCHING

A. Do not cut or notch any structural member or building surface without specific approval of the Engineer. Carefully carry out any cutting, channeling, chasing, or drilling of floors, walls partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such work, restore surfaces neatly to new condition using skilled craftsmen of the trades involved.

3.5 CLEANING AND TOUCH-UP PAINTING

A. Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from the premises and from the interior and exterior of all devices and equipment. Refinish damaged surfaces to new condition using skilled craftsmen of the trades involved.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT

A Measurement and payment for all work shall be in accordance with the contract BID SCHEDULE, refer to Section 004100 and actual work as field measured and verified. No payments will be made for materials on hand. All payments to be made following field verification of work.

END OF SECTION 22 11 23

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SECTION 22 12 00 - WATER TANKS

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes all work for furnishing of all materials and equipment and erection of (2) 60,000-gallon bolted steel storage tank as shown on the drawings and specified herein. Includes design and shop drawings, fabrication, foundation design and installation, installation of tank structure, connections, and all appurtenances not otherwise specified in the bid schedule.

1.2 MEASUREMENT

A. Measurement and payment is per bid schedule Section 004100.

1.3 GENERAL DESIGN

A. The contractor shall be completely responsible for the design and construction, and for the integrity and satisfactory performance of the tanks during the guarantee period. The tanks shall conform to AWWA standard D103-97, to the latest edition Uniform Building Code, and to the requirements of the plans and these specifications. The supplier shall submit for approval complete and detailed plans for the tanks, foundation, and appurtenances for approval by the Engineer.

PART 2 PRODUCTS

2.1 DESIGN DATA

A. The following data and information are supplied as a basis for design and erection of the tank and appurtenances:

1. Tanks shall be bolted steel design in accordance with AWWA D103-97.

2. Allowable soil bearing: 2,000 psf

3. Lightning protection: ground tank.

4. Roof type: roof shall be of the column support type with a roof pitch not to exceed 2 inches per foot.

5. Wind load: base on 110 mph wind.

6. Snow Load: 25 lb/sf

7. Seismic design data shall be as follows:
   i. Site Class: D

ii. Ss=2.03
iii. S1=0.78
iv. SMs=2.41
v. SM1=1.62
vi. SDs=1.61
vii. SD1=1.1
viii. Vertical acceleration: no
ix. Design basis: AWWA D100-05
x. Hoop stress combination: direct sum
xi. Pressure stability shall be considered.
xii. Importance Factor: I = 1.5

8. Tank steel floor system shall be (at a minimum) the same thickness as the walls.

2.2 ACCESSORIES

A. Accessories such as ladders, fall prevention system (Saf-T-Climb, or equal), platforms, safety cages, access hatches and manways, vents, overflows, inlets, and outlets, and connections for level controls shall be furnished and installed as shown on the drawings, all in accordance with AWWA D103-97.

PART 3 EXECUTION

3.1 INSPECTION OF BOLTED STEEL TANK

A. Mill or shop inspection is not required.

B. All materials shall be inspected in the field by the Engineer prior to erection.

C. A written report as set forth in Section 11.2.1 of AWWA D100-05 is required.

3.2 PAINTING OF BOLTED STEEL TANK

A. In accordance with Section 099600 plus requirements set forth herein. In the event of a conflict, the more stringent requirement shall govern.

B. Surface preparation for painting:

1. Interior of tank shall be SSPC-SP10 “Near White Blast Cleaning”.

2. Exterior of tank shall be SSPC-SP10 “Commercial Blast Cleaning”.

3. The tank is located in a residential area, and blasting procedures may have to be modified or delayed during windy periods if grit and dust adversely impact the surrounding area.

C. Inside paint system:

1. System shall conform to AWWA D102-06, inside paint system no. 1. Only paint systems approved by the NSF shall be used. Contractor shall submit the material Safety Data Sheet (MSDS) for the type of coating proposed.

2. A minimum of seven-day curing time shall be used with a continuous exhaust fan or blower of sufficient capacity to insure removal of solvent vapors during the curing process. Curing time shall be extended as necessary until coating is completely cured as determined by the coating manufacturer.

3. Following a five-day soaking period, the water in the tank, only, will be analyzed by the District using EPA Test method 502.2. If the concentration of any organic chemical contaminant exceeds State Standards as a result of the coating, the Contractor shall take corrective action at his sole expense, including replacing the coating if necessary. The cost of additional analytical tests shall also be paid for by the Contractor.

4. During soaking period, tanks shall be checked for leaks. Any that are found shall be repaired and the paint systems touched up and disinfected.

D. Outside paint system: system shall conform to AWWA D102-06, outside paint system no. 2. Paint color shall be a dark forest green as approved by the Owner.

E. Underside of bottom to be painted coated rubber.

F. All surfaces that are concealed after installation shall be coated prior to installation.

G. An 11 month inspection as specified in AWWA D102-06 shall be conducted and all necessary repairs made by the Contractor. An inspection report by an independent paint specialist selected by the Engineer shall also be provided and paid for by the Contractor.

3.3 DISINFECTION

A. Tanks shall be disinfected in accordance with AWWA Standard C652-02 after the final inside coat has cured. Disinfection solution shall be sprayed or brushed on the inside of the tank per Chlorination method 2.

END OF SECTION 22 12 00

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SECTION 23 00 00 – HVAC

PART 1 – GENERAL

1.1 INCLUDED

A. This section covers mechanical work, complete. Work includes furnishing, installing, calibrating, adjusting, testing, documenting, and starting up equipment in accordance with these Specifications, the accompanying Plans, and the directions of the Engineer.

1.2 LICENSES, PERMITS, AND FEES

A. The Contractor shall provide, procure, and pay for all licenses, permits, fees, etc. as required to carry on and complete their work.

1.3 CODES AND STANDARDS

A. All work shall be done in code with all applicable local, state, and federal building safety codes, ordinances, and regulations. Additionally, all work shall conform to the 2022 editions of the following standards:
1. National Fire Protection Association.
2. California Mechanical Code.
3. California Plumbing Code.
4. Underwriters Laboratories.
5. Titles 8, 17, 19, 21, 24 of the California Code of Regulations.
6. California Electric Code.
7. SMACNA Standards.
8. ASHRAE Standards 55 and 62.1.

B. When the Contract Documents call for materials or construction of a higher standard than is required by the above, the Contract Document requirements shall take precedence over the requirements of the applicable laws, ordinances, rules, or regulations. Nothing in the Contract Documents shall be interpreted as permitting work in violation of said laws, rules, and/or regulations.

C. The Contractor for this work shall furnish, without extra charge, any additional materials and/or labor as may be required for compliance with these laws, rules, and/or regulations though such materials and/or labor are not specially set forth in the Contract Documents.

1.4 LICENSING REQUIREMENTS

A. All work of Division 22 and 23 shall be performed by an appropriately licensed contractor. The licenses shall be current, valid through the term of the contract and in the name of the contractor.
1. All HVAC work, which includes warm air heating systems and water heating pumps, ventilating systems, air conditioning systems, and ductwork, registers, flues, humidity, and thermostatic controls in connection with these systems, shall be

performed by a C-20 – Warm-Air Heating, Ventilating and Air-Conditioning Contractor.

2. All ductwork insulation shall be performed by a C-2 – Insulation and Acoustical Contractor.

1.5 SUBMITTALS

A. General Requirements

1. Submittal lists and drawings shall include identifying marks assigned by the Drawings and Specifications.
2. Review of drawings and other material submitted shall not be construed as complete check or constitute a waiver of the requirements of the Drawings and Specifications, but will indicate that the material submitted is acceptable in quality and utility. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangements or construction of other work.
3. All fixtures, materials, and equipment equal in quality and utility to these herein mentioned will be accepted. When specific names are used in describing fixtures, materials, and equipment they are mentioned as standards only, but this implies no right on the part of the Contractor to use other fixtures, material, and equipment or methods, unless approved as equal in quality and utility by the Architect.
4. Before any fixtures, materials, or equipment are purchased, the Contractor shall submit to the Architect for approval, a complete list of materials, fixtures, and equipment, giving the manufacturer's names, catalog number, capacity, size, power requirements, etc.
5. The Contractor shall submit for the approval of the Architect, shop drawings of proposed material and equipment that differ from the specified materials and equipment, and of any specified materials and equipment with special conditions and/or arrangements. These drawings shall show necessary modifications of owner, plumbing, electrical, and mechanical work required by the proposed materials and equipment.

B. Submittal – Product Data

1. Submit manufacturer's product data for all HVAC equipment, in compliance with specifications.

C. Coordination/Layout Shop Drawings

1. Prepare complete consolidated layout drawings for all new systems, and for existing systems that are in the same areas. All drawings shall be fully coordinated with HVAC, Plumbing, Fire Protection, Electrical, Structural, and Architectural work.
2. Clearly identify and dimension the proposed locations of the principal items of equipment and adequate clearance for all equipment, piping, pumps, valves, and other items. Provide detailed layout of all piping systems showing the proposed routes.
3. Show the access means for all items requiring access for operations and maintenance.

4. Submit shop drawings to Architect for approval, prior to fabrication or installation of any work. Do not install equipment or piping until layout drawings have been approved. Any work installed without prior shop drawing approval shall be removed at the Contractor's expense.

1.6 COOPERATION WITH OTHER TRADES

A. Cooperate fully with other trades doing work on the project as may be necessary for the proper completion of the project. Refer to the Structural, Plumbing, and Electrical Drawings for details of the building structure and equipment installation that will tend to overlap, conflict with or require coordination with the work of this Section, and schedule this work accordingly.

B. Any work done without regard for other trades shall be moved, replaced, or redone as required, without extra charges to Owner.

1.7 DIVISION OF WORK BETWEEN DIVISIONS 23 AND 26

A. Close coordination between the electrical and mechanical trades is a part of the work that is required by this contract. No allowance will be made for omissions based on incorrectly assuming another trade will be performing your work. Confirm your scope of work with the general contractor.

B. The division of responsibilities between trades supplying equipment in other Divisions may be different. For instance, Division 26 contractor may be required to supply disconnect switches and starters for non-HVAC mechanical equipment supplied under other Divisions.

C. Division 23 Responsibilities
1. Assume responsibility for the proper functioning of the HVAC systems in their entirety.
2. Furnish and install all conductors and conduit required for control of HVAC equipment.
3. Make all terminations with the exception of power conductors.
4. Furnish and install all control panels and devices to provide a complete and functional controls system, including all controls transformers.
5. Furnish and install motor starters for all equipment specified in Division 23.
6. Install duct smoke detectors furnished by fire alarm contractor in buildings with fire alarm systems.
7. Furnish and install duct smoke detectors in buildings without fire alarm systems.
8. Furnish and install all control conductors and conduit connecting duct smoke detectors to smoke dampers and fan start controls.
9. All electrical work performed under Division 23 shall conform to the requirements of Division 26.

D. Division 26 Responsibilities

1. Furnish and install all raceways, conduit, disconnect switches, and conductors necessary for electrical power supply.
2. Make all power supply terminations to motors, starters, disconnect switches, control transformers, and other mechanical devices.
3. Fire alarm contractor to furnish duct smoke detectors in buildings with fire alarm systems.
4. Provide power to all duct fire/smoke detectors, smoke dampers, and two position outside air motorized dampers.
5. Coordinate all work with mechanical contractors.

1.8 AS-BUILT DRAWINGS

A. A complete set of Contract Drawings shall be maintained at the work site, and all changes in the work shall be recorded on this set, on a daily basis. The final as-built drawings shall be submitted to the Architect for approval.

1.9 DESIGN DRAWINGS

A. The drawings indicate diagrammatically the general layout of the mechanical systems and other related work. Field verification of scaled dimensions taken from the Drawings is required.

B. The Contractor shall review and compare the Architectural, Structural, Plumbing, Mechanical, and Electrical Drawings and all Owner supplied equipment Drawings, and adjust their work to be in conformity with the conditions indicated thereon. Discrepancies between drawings, between drawings and actual field conditions, or between Drawings and Specifications, shall promptly be brought to the attention of the Architect for a determination of the modifications to be effected. In the event that a major modification is required, a Change Order will be prepared.

1.10 VERIFICATION OF EXISTING CONDITIONS AND DEMOLITION

A. Before installation of any new work, verify the location, size, and other conditions at all points of connection to services or other existing piping, and at all locations where new work will cross or pass near existing piping, electrical, or other facilities.

B. Remove ductwork, piping, controls, fixtures, and equipment that is not to remain in service as shown on the Drawings or as required. This included the removal of associated appurtenances and supports.

C. Patch, cap, or repair existing works affected by this demolition in concealed spaces within six (6) inches of a live main or branch.

D. Deliver removed material to the Owner as directed by the Architect. Dispose of all other removed material offsite.

E. Information shown relative to existing services is based upon available records and data during preparation of the Drawings, but shall be verified. Make reasonable deviations found necessary to conform to actual locations and conditions, without extra charge.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish three sets of typewritten instructions covering maintenance, adjustment, and operation of each piece of apparatus, bound in a hard cover loose-leaf binder. Neatly obscure or cross out inapplicable data from manufacturer's literature. Submit data to the Architect.

B. Operating instructions shall show sequence of operations, lubrication, care, and maintenance requirements of all equipment. Final acceptance of the work will not be made until a satisfactory submission of this material is received and approved by the Architect.

C. The Owner's authorized representative shall be instructed in the operation and servicing of all HVAC & plumbing systems.

1.12 ACCURACY OF DATA

A. The data given herein and on the Drawings are as exact as could be reasonably secured, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc. will be governed by shop drawings, the building itself, and actual field conditions.

1.13 DAMAGE BY LEAKS

A. Contractor shall be responsible for any damage to work of other Contractors that is caused by leaks in any temporary or permanent piping systems due to pipe rupture, disconnected pipes or fittings, or by overflow of equipment.

1.14 SEISMIC FORCE RESISTANCE: MECHANICAL, PLUMBING, FIRE PROTECTION SYSTEMS

A. All mechanical systems and plumbing piping systems shall adhere to the SMACNA "Seismic Restraint Manual: Guidelines for Mechanical Systems," Third Edition dated March 2008.

1.15 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection, and placing of all equipment and materials.
   1. Contractor shall protect the work and materials from damage during construction. Equipment stored at the job site shall be protected from dust, water, or other damage, and be covered if equipment is exposed to weather. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.

2. Any items damaged shall be repaired or replaced, at no additional cost to the Owner.

B. Cleanliness of Piping and Equipment Systems
1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading, and welding of piping.
2. Piping systems shall be flushed, blown, or pigged as necessary to deliver clean systems.
3. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.16 WARRANTIES

A. Equipment warranties shall be provided for all equipment, with all necessary information filled in, except purchase date, in favor of the Owner.

B. The contractor shall guarantee that all work under this Section is free from defects in material and workmanship for a period of one year from the date of filing the Notice of Completion. Replacement of defective work and damage caused to work of other trades as a result of such defective work shall be the responsibility of the Contractor, and shall be made at no cost to the Owner.

1.17 ALTERNATIVE MATERIALS AND METHODS

A. These plans and specifications describe the general scope of the mechanical systems. These plans and specifications do not preclude the submittal of alternative methods or materials. Manufacturer’s names and catalog numbers are stated to identify the type and quality of the equipment or materials required for the project.

B. The contractor may submit shop drawings and/or technical information on alternative equipment, materials or installation details to accomplish the intent of the plans and specifications. Approval of the alternative equipment, materials or installation details shall not relieve the contractor of any responsibility for complying with the intent of the plans and specifications. Submit the manufacturers' technical information, shop drawings, and/or written description of alternative methods for each item described by manufacturer's name and catalog number and for each component, equipment, material, or installation detail required.

1.18 SITE EXAMINATION

A. Thoroughly examine the site and verify the actual work conditions. No extra compensation will be allowed for expenses due to failure to discover site conditions which affect the work.

PART 2 – PRODUCTS

2.1 GENERAL

A. All materials, appliances, and equipment shall be new and best of their respective kinds, free from defects, and of the make, brand, or quality specified or as accepted by the Architect.

B. When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.

C. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between manufacturer's instructions and the contract drawings and specifications to the Architect for resolution.

2.2 THERMOSTATS

A. Electric, solid-state, microcomputer-based room thermostat with the following features.
   1. Automatic switching from heating to cooling.
   2. Preferential rate control to minimize overshoot and deviation from set point.
   3. Set up for four separate temperatures per day.
   4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
   5. Short-cycle protection.
   6. Programming based on every day of week.
   7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
   8. Battery replacement without program loss.
   9. Thermostat display features include the following:
      a. Time of day.
      b. Actual room temperature.
      c. Programmed temperature.
      d. Programmed time.
      e. Duration of timed override.
      f. Day of week.
      g. System mode indications include "heating," "off," "fan auto," and "fan on."

B. Thermostat Cover Construction: Heavy-duty, locking thermostat guard, of solid metal tamperproof construction.

C. Accuracy: Plus or minus 0.5 deg. F at calibration point.

D. Wire: Twisted, shielded-pair cable.

E. Contractor shall field verify dimensions prior to ordering fan and curb adaptor.

2.3 DUCTWORK

A. Sheet Metal Ductwork - Rectangular
   1. Ducts and plenums shall be fabricated and installed in conformance with the latest editions of: NFPA Pamphlet No. 90A; California Building Code; California Mechanical Code and the SMACNA HVAC Duct Construction Standards (Metal and Flexible). Ducts and plenums shall be constructed of hot dipped galvanized mild steel and shall have airtight Class “B” seals at all transverse joints and longitudinal seams. Tables and figures hereinafter referenced are from the 2020 edition of the SMACNA HVAC Duct Construction Standards (Metal and Flexible).
   2. Rectangular duct construction shall conform to Table 2-3. All transverse joints shall be flanged per Table 2-32, with corner closures or “Duct Mate” flanged connections with corner closures per Figure 2-17. Elbows shall be standard radius (Type RE 1) or square throat with vanes (Type RE 2) per Figure 4-2, with double thickness turning vanes per Figures 4-3 and 4-4. Offsets and transitions shall be per Figure 4-7. Supply, return, and exhaust branch connections shall be per Figure 4-5 or 4-6. Splitters shall not be used.
   3. Lined ducts shall be fabricated such that the net inside dimensions equals the duct sizes shown on the Drawings.

B. Sheet Metal Ductwork - Spiral
   1. Round ducts shall be spiral, United McGill or equal. All transverse joints and longitudinal seams shall have Class “B” seals. All branches in round duct systems shall be made with factory fabricated reducing wye branches. Duct turns shall be made with standard, factory fabricated, three-piece elbows.

C. Flexible Ductwork
   1. Flexible ducts shall be Flexmaster “8M” or approved equal. Flexible ducts shall be used only where shown on the Drawings, and maximum length of any given flexible duct shall not exceed 5 ft. Galvanized sheet metal elbows shall be used for turns greater the 45° on flexible ducts 10” and larger. Connections to rectangular ducts shall be made with “spin-in” fittings with air scoops. The installation of flexible ducts shall conform to Figure 3-10, with the exceptions noted herein.

D. Supports
   1. Supports for horizontal ducts and plenums shall be fabricated per Figures 5-5 and 5-6 and Tables 5-1, 5-2, and 5-3. The maximum distance between hangers shall be eight feet for rectangular ducts and twelve feet for round ducts. Attachments to the structure shall be made with adequately sized lag bolts for straphangers and adequately sized machine bolts and side beam brackets for rod hangers. Supports for vertical ducts shall be band iron strap or angle bracket type per Figure 5-8 and 5-9.

E. Specialties:
   1. Duct Access Doors: Including those for removing filters, duct access doors shall be as detailed in Figure 7-2 with sash locks, piano hinges, and gaskets. Access doors shall have an unobstructed full swing.

2.4 IDENTIFICATION FOR MECHANICAL SYSTEMS

A. Labels
   1. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
   2. Snap-around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
   3. Self-adhesive Wraparound Labels: 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.
      a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
      b. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
   4. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
      a. Minimum Nominal Size:
         1) 3-1/2 by 5 inches for equipment.
         2) As required by authorities having jurisdiction.

2.5 DUCTWORK ACCESSORIES

A. Flexible Duct Connections
   1. Duro-Dyne “Metal-Fab” with Duroion, Ventfabrics “Ventglass,” or approved equal.
   2. Install at each point where a blower unit is connected to a duct. A minimum clearance of three inches between the duct and the source of vibration shall be maintained. Install per Figure 2-17.

B. Screens
   1. Install removable bird screens at all outside intakes and exhaust air discharges. Screens shall be fabricated from ½” x 14 gauge mesh secured in full frames. Screens and frames shall be constructed of the same material as the duct, hood, or equipment to which attached.

C. Joints
   1. Tape all joints airtight using Hardcast type “DT” pressureless tape and “CCWI-181” duct mastic, per manufacturer’s directions.

D. Dampers
   1. Provide butterfly or multi-blade dampers where indicated on the Drawings or as required for balancing air quantities to values shown without generating excessive noise. Provide Duro-Dyne “KS-385,” or approved equal, locking quadrants on each

manual damper. Locate dampers in furred ceilings near access panels where possible.

a. Butterfly dampers shall be constructed as per Figure 7-4, Figure A, B, and C in the duct manual.
b. Multi-blade dampers shall conform to Figure 7-5.
c. Back-draft dampers shall be Air Balance "Air Dynamic" model DY-1002-V, or equal.

2.6 INSULATION

A. Exterior of Ductwork:
1. Unless specified to be lined, all sheet metal supply and return ducts in indirectly conditioned spaces shall be insulated on the outside with Johns Manville "Microlite XG" flexible fiberglass blanket-type duct wrap, with factory applied FSK aluminum foil facing, with a composite UL rating of 25/50, minimum R-6 installed.
2. Unless specified to be lined, all sheet metal supply and return ducts in unconditioned spaces shall be insulated on the outside with Johns Manville "Microlite XG" flexible fiberglass blanket-type duct wrap, with factory applied FSK aluminum foil facing, with a composite UL rating of 25/50, minimum R-8 installed.
3. All outside air ductwork between building outside air inlet and HVAC unit or heat/energy recovery ventilator shall be insulated on the outside with Johns Manville "Microlite XG" flexible fiberglass blanket-type duct wrap, with factory applied FSK aluminum foil facing, with a composite UL rating of 25/50, minimum R-4 installed.
4. Exhaust ductwork within 10 feet of termination point and between any heat/energy recovery ventilator and exhaust termination shall be insulated on the outside with Johns Manville "Microlite XG" flexible fiberglass blanket-type duct wrap, with factory applied FSK aluminum foil facing, with a composite UL rating of 25/50, minimum R-4 installed.

B. Interior of Ductwork:
1. Duct lining shall be installed in supply and return ducts and plenums where noted on the Drawings. Lining shall be Johns Manville "PermacoteLinacoustic R" rigid fiberglass board for plenums and "PermacoteLinacoustic HP" fiberglass duct liner for ducts, 1" thick, unless otherwise noted, with fire resistant coating. Duct liner shall meet ASTM C 1071, with air surface coated with acrylic coating treated with EPA registered anti-microbial agent prove to resist microbial growth as determined by ASTM G 21 and G 22. Insulation with torn or broken coating shall be removed and replaced. Loose corners, edges, and butt joints will not be accepted.
2. All exposed exterior supply and return ductwork shall have minimum 2" interior insulation, as specified in this section.
3. Maximum velocity: 5,000 ft/min.
4. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.
5. Developed smoke density shall not exceed 50. Flame spread rating shall not exceed 25.

2.7 REFRIGERATION PIPING AND APPURTENANCES

A. Refrigerant piping shall be Type “ACR” de-oxidized hard temper copper tube, ASTM B280.

B. Mechanical joints on refrigerant piping systems are prohibited. All refrigerant piping joints shall be brazed. Use lead-free, silver solder, minimum 15% silver content.

C. Pipe fittings shall be wrought-copper with soldered joints, ASME B16.22.

D. Flexible connections shall be bronze, double braided, sweat solder ends.

E. Moisture/liquid indicators (sight glasses) shall be color change moisture indication type, replaceable element, filter screen and pad, sweat solder ends; Sporlan “See-All”, Henry, or equal.

F. Charging and purge valves shall be forged brass, diaphragm packless, globe type, angle or straight through, one end solder, one end flare; Henry 623 and 643 series, Sporlan or equal.

G. Solenoid valves shall be forged brass, extended end connections, solder ends, molded coil; Sporlan “E” series or equal. Comply with ARI 760 & UL 429.

H. Filter driers shall be replaceable media, angle type; Henry “Dri-Cor” or equal; ARI 730.

I. Thermsotatic expansion valves shall have forged brass body, stainless steel seats and pins, ODF solder connections, external equalizer,; ARI 750.

J. Outdoor condensing units shall have a flexible piping section at the outdoor unit.

2.8 REGISTERS, GRILLES, AND DIFFUSERS

A. Air terminals shall be Titus, equivalent Nailor, or approved equal, as scheduled on the Drawings.

B. All terminals shall be steel and shall be factory painted “off-white,” unless otherwise noted. Air terminals for installation in gypsum board shall have a 1” border for surface mounting.

2.9 ACCESS PANELS

A. Where construction is not inherently accessible, provide adequately sized and conveniently located access doors in ceilings, walls, and furring for servicing valves, equipment, etc. Doors shall be delivered to the General Contractor for installation.

B. Fire Rated: Inryco/Milcor, U.L. listed, “B” label, 1 ½ hour rating. Minimum size shall be 12” x 12”. Provide larger sizes where required. Locks shall be flush screwdriver operated.

C. Drywalled Surfaces: Inryco/Milcor, Style DW, prime coated steel. Minimum size shall be 12” x 12”. Provide larger sizes where required. Locks shall be flush screwdriver operated.

D. Concrete and Tiled Surfaces: Inryco/Milcor, Style M, prime coated steel, except access panels installed in tiled surfaces shall be stain finish stainless steel. Minimum size shall be 12” x 12”. Provide larger sizes where required. Locks shall be flush screwdriver operated.

E. Plastered Surfaces: Inryco/Milcor, Style K, prime coated steel. Minimum size shall be 12” x 12”. Provide larger sizes where required. Locks shall be flush screwdriver operated.

2.10 FIRE/SMOKE DAMPERS

A. All fire/smoke dampers shall be Ruskin FSD60 series combination fire smoke dampers or approved equal. Rated for 1-1/2 hour fire resistance in accordance with UL555, Leakage Class I Smoke Damper in accordance with UL555S.

B. Frame: 5 inches x minimum 16 gage (127 x minimum 1.6 mm) roll formed, galvanized steel hat-shaped channel, reinforced at corners.

C. Blades: True airfoil-shaped, single piece, double skin. Material: Minimum 14 gage (2.0 mm) equivalent thickness, galvanized steel.

D. Blade Seals: Inflatable silicone fiberglass material to maintain smoke leakage rating to a minimum of 450°F (232°C) and galvanized steel for flame seal to 1,900°F (1,038°C). Mechanically attached to blade edge (glue-on or grip type seals are not acceptable).

E. Jamb Seals: Stainless steel, flexible metal compression type.

F. Axles: Minimum ½ inch (13) diameter plated steel, hex-shaped, mechanically attached to blade.

G. Provide TS 150EZ Fire Stat, UL classified dual temperature device that allows the damper to be re-opened after initial closure from heat.

H. Where a total coverage fire alarm system is not provided in the building, provide factory duct smoke detector kit, Ruskin DSDF, with “single-point” electrical connections.

I. Minimum 20 gauge factory sleeve.

J. Factory mounting angles with pre-punched screw holes.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide all necessary cutting in connection with the work of the Section. No cutting shall be done without the approval of the Architect. Comply with requirements specified in Cutting and Patching Section.

B. No structural members shall be drilled, bored, or notched in a manner that will impair their structural capacity.

C. All penetrations of concrete or masonry shall be made with core drills.

3.2 EQUIPMENT STARTUP

A. Notify the Owner's representative a minimum of two weeks prior to equipment startup date to allow for Owner's personnel to be present during startup.

B. Manufacturer must provide a service technician to supervise rigging of the units to ensure proper fit.

C. Unit must be checked out, tested and placed into operation by the installing contractor under the supervision of an authorized representative of the factory.

D. Controls contractor must be present during startup to ensure that factory-installed controls have been adequately installed, wired, and integrated into the building managements system.

E. Provide minimum eight (8) hours of training time with Owner's maintenance personnel to thoroughly review new equipment, maintenance requirements, and equipment controls. Provide documentation of training materials to Owner for future reference in hard copy and electronic format. Provide a summary sheet indicating time of training, participants, and subject matter with signatures from Owner's maintenance personnel.

F. During startup, the full functionality of the equipment shall be demonstrated to the satisfaction of the Owner's representative, including heating, mechanical cooling, economizer cooling, zone modulation, and all emergency shutdown features.

3.3 EQUIPMENT, GENERAL REQUIREMENTS

A. Equipment shall operate quietly and without objectionable vibration. Such problems, other than from equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated at the direction of the Architect.

B. Install equipment to provide good appearance, easy access, and adequate space to allow replacement and maintenance. Provide bases, supports, anchor bolts, and other items required to achieve this. Installation shall be level, above moisture level, and adequately braced.

C. Thoroughly lubricate equipment before operating. Repair of damage resulting from failure to comply with this requirement shall be the Contractor's responsibility.

D. Connections to piping shall be secured and properly aligned and all utility and control connections shall be properly isolated from the building structure by means of vibration isolators and flexible connections. Any equipment not meeting this requirement will be modified and reinstalled at no expense to the Owner.

E. Move equipment into building through available openings. Dismantle equipment where necessary to accomplish this. After reassembly, test equipment to verify its satisfactory operating condition.

3.4 DUCTWORK

A. All ductwork shall be installed within spaces provided where possible. Ducts shall be installed true to line and grade, fully secured to structural faming with specified hangers and supports, insulated, and vibration isolated, where required.

B. Each section of supply air ductwork shall be cleaned at the shop, dust and oil free, using a degreasing agent and detergent and sealed airtight at both ends with visqueen and tape. Supply ducts shall be additionally cleaned with a disinfecting solution. Ends of all supply and internally insulated exhaust dusts shall be kept sealed until the time they are jointed. When duct sections are joined, wipe down all interior surfaces with a clean tack cloth. If tack cloth shows any dust, then re-clean duct as described above. The intent is that no foreign matter be allowed to enter the ductwork at any time after factory cleaning and during construction.

3.5 CONTROLS

A. This Contractor shall provide all required control components, including but not limited to thermostats, temperature sensors, static pressure sensors, humidity sensors, damper actuators, valve actuators, unitary controllers, relays, and low-voltage wiring, such that the Owner is provided with a fully functional control system.

B. Where work is performed in an existing building, this Contractor shall integrate all control modifications into the existing building control system, if applicable. Specific requirements shall be coordinated with Owner and approved by Architect prior to installation.

C. Installation of the system shall be made under the supervision of the manufacturer of the equipment, or his factory authorized representative.

D. In addition to the submittals required above, and those set forth in “Submittals,” the following items shall be furnished.
   1. In an existing building, this Contractor shall furnish a document that describes the proposed materials methods for integration into the existing building management system, if applicable.

2. Prior to final inspection, the system contractor shall furnish a letter stating that the entire control system and all interlock wiring is installed and operating in a satisfactory manner.

3.6 THERMOSTAT

A. Room thermostats shall be installed in the locations indicated on the Contract Drawings. Final locations shall be coordinated with Owner's maintenance personnel and shall be installed in locations which shall provide representative temperatures for the adjacent areas.

B. Low voltage control wiring and conduit shall be installed in accordance with requirements of Division 26.

3.7 INSULATION

A. Exterior Ductwork:
1. The insulation shall be cut longer than the perimeter of the duct to provide 2" staple lap and minimum compression at the corners. All joints shall be lapped 2' and stapled with outward clinching staples 2" on center. The insulation shall be mechanically fastened to the underside of all ducts 24" wide or more using cup-head pins, weld pins, or stick pins with speed clips 18" on center. All joints and penetrations of the vapor barrier jacket shall be sealed with a minimum 3" wide matching pressure sensitive tape. Pressure-sensitive tape shall be firmly rubbed in place immediately after application using a "squeegee" type tool.
2. When a vapor seal is required, two coats of vapor retarder mastic reinforced with one layer of 4" wide, open weave glass fabric may be used in lieu of pressure-sensitive tape. Mastic shall be brushed onto joint and glass fabric until the fabric is filled. Mastics shall be applied in accordance with application instructions on the container.

B. Interior Duct Liner
1. Apply to the inside face of ducts, coated side facing air stream, fasten using fire retardant adhesive meeting ASTM C 9169, and secure with mechanical liner fasteners at 24" maximum o.c., both directions. Pin length should be such as to limit compression of liner.
2. Exposed edges must be factory or field coated. For systems operating at 4000 fpm or higher, a metal nosing must be installed on all liner leading edges. Insulation with torn or broken coatings shall be removed or replaced. Loose corners, edges, and butt joints will not be accepted.

C. Refrigerant Piping
1. The insulation shall be installed in accordance with the manufacturer's instructions. All joints and seams shall be sealed with waterproof vapor retardant adhesive. All pipes exposed to the weather shall be coated with aluminum jacketing to protect the insulation from ultra-violet radiation in accordance with the manufacturer's published instructions.

3.8 REFRIGERANT PIPING

A. Piping shall be continuously purged with dry nitrogen while soldering. Care shall be taken when soldering near valves or other equipment that may be damaged by extreme heat.

B. Refrigerant piping shall be tested for leaks under 500 psig pressure using an inert gas such as dry nitrogen. Joints shall be tested for leaks using soapsuds. (WARNING! OXYGEN OR ACETYLENE SHALL NOT BE USED IN PLACE OF DRY NITROGEN. A VIOLENT EXPLOSION MAY RESULT!). Be sure that all controls, relief valves, or rupture discs that could be damaged by test pressure are removed before beginning pressure test.

C. Pressure and leak tests on refrigerant piping and equipment shall be done in accordance with local code requirements and the American Standard Safety Code for Mechanical Refrigeration (ASA B9.1).

D. Pressure Testing Requirements:
   1. A three-step pressure test shall be performed per the following:
      a. Step 1 – Leak check at 149 psi for a minimum of 3 minutes.
      b. Step 2 - Leak check at 312 psi for a minimum of 5 minutes.
      c. Step 3 – Leak check at 550 psi for a minimum of 24 hours.

E. Evacuation Requirements:
   1. The contractor shall notify the Architect 48 hours prior to the time and date of the evacuation.
   2. A vacuum pump specifically designed for use with the manufacturer's specified refrigerant shall be used to triple-evacuate the system per the following procedure:
      a. Step 1 – Evacuate the system to 29" mercury and maintain for 20 minutes.
      b. Step 2 – Break vacuum with dry nitrogen to a pressure of 2-3 psi and maintain for 15 minutes.
      c. Step 3 – Evacuate the system to 29" mercury and maintain for 20 minutes.
      d. Step 4 – Break vacuum with dry nitrogen to a pressure of 2-3 psi and maintain for 15 minutes.
      e. Step 5 - Evacuate the system to 29" mercury and maintain for 20 minutes.

F. The refrigerant charge shall be calculated and weighed into the system.

G. After charging with refrigerant, all joints shall be tested with an electric halide leak detector. Precautions should be taken to keep moisture out of the system, and a drier shall be used.

H. Service technicians shall be certified in the use of CFC and HCFC refrigerant recovery and recycling equipment and he/she shall use UL listed and labeled recovery equipment when discharging refrigerant.

3.9 FIRE/SMOKE DAMPERS

A. Inspect areas to receive dampers. Notify the Engineer of conditions that would adversely affect the installation or subsequent utilization of the dampers. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Install dampers at locations indicated on the drawings and in accordance with the manufacturer's UL approved installation instructions. Install dampers square and free from racking with blades running horizontally. Do not compress or stretch damper frame into duct or opening. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jackshaft.

C. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.10 SUPPORTS AND HANGERS

A. All hangers, supports, and attachments to the structure must be capable of withstanding three times the anticipated load.

3.11 TEST, INSPECTIONS

A. Make all necessary control adjustments and balancing of air and water flows. Operate the entire system for a period of time not less than three (3) working days for the purpose of proving satisfactory performance. During this period, instruct such persons as the Owner and/or Architect may designate in the proper operation of the systems. Should further adjustment prove necessary, operating tests shall be repeated until a satisfactory test is obtained.

B. This Contractor shall not allow or cause any work of this Section to be covered or enclosed until it has been inspected, tested, and approved by the Architect and the authorities having jurisdiction over the work. Should any of this work be enclosed or covered up before such inspection, testing, and approval, this Contractor shall uncover the work, have the necessary inspections, tests, and approvals made and, at no expense to the Owner, make all repairs necessary to restore both his work and that of other contractors which may have been damaged to be in conformity with the Contract Documents.

3.12 CLEANUP

A. Upon completion of the work of this Section, remove all material, debris, and equipment associated with or used in the performance of this work.

END OF SECTION

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SECTION 23 05 93 – TESTING ADJUSTING BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. Provide all supervision, personnel, instruments, calibration, equipment, and all other materials necessary to perform balancing and testing, and compile test data including calculations and services necessary for the heating, ventilating, and air conditioning systems for this project, all in accordance with the project Drawings and Specifications and as specified herein.

1.2 GENERAL

A. Mechanical Contractor will employ a Testing, Adjusting, and Balancing (TAB) Agency that is certified by Associated Air Balancing Council (AABC), National Environmental Balancing Bureau (NEBB), or Testing, Adjusting, and Balancing Bureau (TABB).

B. The TAB agency must also be an approved Acceptance Test Employer with Acceptance Test Technicians (ATT). The ATT will be responsible for performing all required acceptance testing and associated forms.

C. The TAB Agency shall be responsible for inspecting, balancing, adjusting, testing, and logging the data of the performance of fans, all dampers in the duct systems, all air distribution devices, and the flows of water through all coils.

D. Existing equipment, unless specifically mentioned otherwise, shall not in the scope of the TAB work.

E. A completely operable system shall be placed into operation each day during testing and balancing.

F. The TAB Agency shall utilize instrumentation which meets the requirements of ASHRAE 111, Section 5, “Instrumentation”.

G. The Mechanical Contractor shall be responsible for certifying in writing that the system, as scheduled for balancing, is operational and complete. Completeness shall include not only the physical installation, but the Mechanical Contractor’s certification that the prime movers are installed in good working order, and that full load performance has been preliminary tested under the certification of the Mechanical Contractor. Before any testing and balancing is started, a complete report shall be sent to the TAB Agency by the Mechanical Contractor.

H. The Mechanical Contractor shall be responsible for making all modifications to recertify discrepancies reported by the TAB Contractor as indicating non-compliance with the Contract Documents. By completing the work on time, the Mechanical Contractor shall

provide sufficient time before the completion date so that balancing can be accomplished.

I. If construction deficiencies are encountered which preclude obtaining optimum conditions, the deficiencies will be recorded and given to the Owner's representative. The TAB Agency is advised that deficiencies in the HVAC construction are often encountered during final TAB services, and should include in the bid an amount deemed advisable to compensate for time in identifying the deficiencies.

1.3 SERVICES

A. The TAB Agency will balance, test, and adjust the systemic components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered which preclude obtaining optimum conditions, the deficiencies will be recorded and given to the Owner's representative. The TAB Agency is advised that deficiencies in the HVAC construction are often encountered during final TAB services, and should include in the bid an amount deemed advisable to compensate for time in identifying the deficiencies.

B. The report shall be complete with logs, data, and records as required herein and all logs, data, and records shall be typed, produced, on white bond paper, and bound. Transmit four copies directly to the Owner's Representative to be distributed to the Mechanical Contractor, Controls Contractor, Engineer, and record file.

C. The report shall contain the following general data in a format selected by the TAB Agency for clarity and ease of reference.
1. Project Title.
2. Project Location.
3. Project Architect (Firm name and address).
4. Project Mechanical Engineer (Name).
5. TAB Field Test Engineer (Name).
6. TAB Agency (Firm name and address).
7. Inclusive dates tests were performed and date of report.
8. Calibration Certificates of each instrument used along with specific ID numbers (i.e., serial numbers).

1.4 SUBMITTALS

A. Submittal No. 23 05 93 (1) – TAB Agenda
1. The TAB Contractor shall submit a complete agenda, which shall outline in full the testing methods and locations for each HVAC system and/or device that is within the scope of the TAB work. The agenda shall represent the total system balance report, less field test data. Areas of intended field test inputs shall be represented by fully labeled blank spaces.
2. The TAB Agenda shall also indicate the proposed test methods, instrumentation devices and all applicable calibration certificates.

B. Submittal No 23 05 93 (2) – TAB Report
   1. Provide Test and Balance Report as indicated herein.

1.5 AIR SYSTEMS REQUIREMENTS

A. In addition to the above data in its appropriate format, the Test and Balance Report shall include the following data:
   1. Fan Coil Units and Energy Recovery Ventilators
      a. Manufacturer and model.
      b. Size.
      c. Motor hp, voltage, phase, cycles, full load amps.
      d. Location and local identification data.
      e. Identification tag listed in schedules on drawings and specifications.
      f. Supply airflow (cfm) and exhaust airflow (cfm), where applicable.
      g. Fan RPM.
      h. Motor current readings at each fan.
      i. Inlet and outlet static pressure from supply fan and exhaust fan (if applicable). These readings shall be related to the fan curve.
      j. Static pressure differential across each coil and filter section.
      k. Entering air and leaving air temperatures (DB/WB) in 100% cooling mode.
      l. Entering air and leaving air temperatures (DB) in 100% heating mode.
      m. Outdoor air percentage setting.
   2. Exhaust Fans
      a. Manufacturer and model.
      b. Size.
      c. Motor hp, voltage, phase, cycles, full load amps.
      d. Location and local identification data.
      e. Identification tag listed in schedules on drawings and specifications.
      f. Exhaust airflow (cfm).
      g. Fan RPM.
      h. Motor current readings at each fan.

PART 2 – PRODUCTS (not used)

PART 3 – EXECUTION

3.1 GENERAL PROCEDURES

A. During the balancing, the temperature regulation shall be adjusted for proper relationship between controlling instruments and calibrated. The correctness of the final setting shall be proved by taking hourly readings for a period of one successive 8-hour day, in a typical room on each separately controlled zone, after tenant moves in. The total variation shall not exceed 2 degrees from the preset medium temperature during the temperature survey period. (This will be done only on systems that are totally operational).

3.2 AIR SYSTEMS PROCEDURES

A. The TAB Agency shall perform the following tests and balance the air systems in accordance with the following requirements:
   1. Test and adjust blower and motor rpm to design requirements.
   2. Test and record motor full load amperes and corresponding voltage.
   3. Make pitot tube traverse of main supply ducts and obtain design cfm at fans.
   4. Test and record system static pressures, suction and discharge.
   5. Test and adjust system for design cfm of outside air.
   6. Test and record entering and leaving air dry bulb temperatures of all heating and cooling coils.
   7. Test and record entering and leaving wet bulb temperatures of all cooling coils.
   8. Adjust all main supply and return air ducts to proper design cfm. System supply airflow, system return airflow, and system outdoor airflow shall be balanced to within 5% of the design requirement.
   9. Adjust all zones to proper design cfm, supply and return.
   10. Test and adjust each diffuser, grille, and register to within 10% of design requirement.
   11. Each grille, diffuser, and register shall be identified as to location and area.
   12. Size, type, and manufacturer of diffusers, grilles, registers, and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.
   13. Readings and test of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments.
   14. TAB Agency shall check all controls to ensure they are operating as specified. Provide the control contractor with specific set points.

3.3 TEMPERATURE CONTROL SYSTEM

A. In the progress of performing the TAB work, the TAB Agency shall:
   1. Work with the Controls Contractor to ensure the most effective total system operation within the design limitations, and to obtain mutual understanding of intended control performance.
   2. Verify that all control devices are properly connected.
   3. Verify that all dampers, valves, and other controlled devices are operated by the intended controller.
   4. Verify that all dampers and valves are in the position indicated by the controller (open, closed, or modulating).
   5. Verify that the integrity of valves and dampers in terms of tightness of close-off and full-open position. This includes dampers in multi-zone units.
   6. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
   7. Verify the calibration of all controllers.
   8. Verify the proper application of all normally open and normally closed valves.
   9. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

10. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Controls Contractor will relocate as deemed necessary by the TAB Agency.
11. Check the sequence of operation for any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs. Observe that heating cannot take place until the cooling zone of valve is completely closed.
12. Verify that all controller set points meet the design intent.
13. Check all dampers for free travel.
14. Verify the operation of all interlock systems.
15. Perform all system verification to assure the safety of the system and its components.

B. A systematic check of the above requirements shall be included in the final TAB report.

3.4 DUCT LEAKAGE TEST

A. All supply, return, exhaust, and outside air ductwork shall be tested for leaks, using necessary instruments before insulating any ductwork.

B. Ductwork shall be leak-tested in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Representative sections totaling not less than 10 percent of the total installed duct area shall be tested. Where the tested 10 percent fails to comply with the requirements of this section, then 40 percent of the total installed duct area shall be tested. Where the tested 40 percent fails to comply with the requirements of this section, then 100 percent of the total installed duct area shall be tested.

C. The maximum permitted leakage shall be determined in accordance with CMC 603.9.2.

D. The test and balance report shall include the results of the duct leakage test for the engineer's review.

3.5 TEST AND BALANCE REPORT

A. The report shall contain the following data:
1. A listing of the measured air quantities at each outlet corresponding to the temperature tabulation specified above.
2. Air quantities at each return and exhaust air handling device (only if ducted return systems).
3. Static pressure readings entering and leaving each supply, return and exhaust fan, filter, and coil of the system. These readings shall be related to fan curves in terms of cfm handled.
4. Water pressure readings at gauge connections. Pressure readings at coils and pumps shall be related to coils and pump curves in terms of gpm handled.
5. Motor current readings at each fan and pump. The voltages at the time of the readings shall be listed.

3.6 FINAL ACCEPTANCE

A. At the time of final inspection, the Balancing Agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data, i.e., water and air quantities, recorded in the Certified Report.

B. Points and areas for recheck shall be selected by the Owner's Representative.

C. Measurement and test procedures shall be the same as approved for work forming basis of Certified Report.

D. Selections for recheck, specific plus random, will not normally exceed 25% of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

E. If random tests elicit a measured flow deviation of 10% or more from that recorded in the Certified Report on 10% or more of the selected recheck stations, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to the Owner.

F. Following final acceptance of the Certified Report by the Owner's Representative, the settings of all valves, splitter, dampers, and other adjustment devices shall be permanently marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after final acceptance.

END OF SECTION

SECTION 26 00 00 – ELECTRICAL

PART 1 - GENERAL

1.1 INCLUDED

A. This section covers electrical work, complete. Work includes furnishing, installing, calibrating, adjusting, testing, documenting, and starting up equipment in accordance with these Specifications, the accompanying Plans, and the directions of the Engineer.

1.2 LICENSES, PERMITS, AND FEES

A. The Contractor shall provide, procure, and pay for all licenses, permits, fees, etc. as required to carry on and complete their work.

1.3 CODES AND STANDARDS

A. All work shall be done in code with all applicable local, state, and federal building safety codes, ordinances, and regulations. Additionally, all work shall conform to the latest editions of the following standards:
   1. National Fire Protection Association.
   2. Underwriters Laboratories.
   3. Titles 8, 17, 19, 21, 24 of the California Code of Regulations.
   4. California Electric Code.

B. When the Contract Documents call for materials or construction of a higher standard than is required by the above, the Contract Document requirements shall take precedence over the requirements of the applicable laws, ordinances, rules, or regulations. Nothing in the Contract Documents shall be interpreted as permitting work in violation of said laws, rules, and/or regulations.

C. The Contractor for this work shall furnish, without extra charge, any additional materials and/or labor as may be required for compliance with these laws, rules, and/or regulations though such materials and/or labor are not specially set forth in the Contract Documents.

1.4 LICENSING REQUIREMENTS

A. All work of Division 26 shall be performed by an appropriately licensed contractor. The licenses shall be current, valid through the term of the contract and in the name of the contractor.

B. The contractor must also be an or hire an approved Acceptance Test Employer with Acceptance Test Technicians (ATT). The ATT will be responsible for performing all required acceptance testing and associated forms.

1.5 SUBMITTALS

A. General Requirements
   1. Submittal lists and drawings shall include identifying marks assigned by the Drawings and Specifications.
   2. Review of drawings and other material submitted shall not be construed as complete check or constitute a waiver of the requirements of the Drawings and Specifications, but will indicate that the material submitted is acceptable in quality and utility. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangements or construction of other work.
   3. All fixtures, materials, and equipment equal in quality and utility to these herein mentioned will be accepted. When specific names are used in describing fixtures, materials, and equipment they are mentioned as standards only, but this implies no right on the part of the Contractor to use other fixtures, material, and equipment or methods, unless approved as equal in quality and utility by the Architect.
   4. Before any fixtures, materials, or equipment are purchased, the Contractor shall submit to the Architect for approval, a complete list of materials, fixtures, and equipment, giving the manufacturer's names, catalog number, capacity, size, power requirements, etc.
   5. The Contractor shall submit for the approval of the Architect, shop drawings of proposed material and equipment that differ from the specified materials and equipment, and of any specified materials and equipment with special conditions and/or arrangements. These drawings shall show necessary modifications of owner, plumbing, electrical, and mechanical work required by the proposed materials and equipment.

B. Submittal - Product Data
   1. Submit manufacturer's product data for all electrical equipment, in compliance with specifications.

1.6 COOPERATION WITH OTHER TRADES

A. Cooperate fully with other trades doing work on the project as may be necessary for the proper completion of the project. Refer to the Structural, Plumbing, and Electrical Drawings for details of the building structure and equipment installation that will tend to overlap, conflict with or require coordination with the work of this Section, and schedule this work accordingly.

B. Any work done without regard for other trades shall be moved, replaced, or redone as required, without extra charges to Owner.

1.7 DIVISION OF WORK BETWEEN DIVISIONS 23 AND 26

A. Close coordination between the electrical and mechanical trades is a part of the work that is required by this contract. No allowance will be made for omissions based on incorrectly

assuming another trade will be performing your work. Confirm your scope of work with the general contractor.

B. The division of responsibilities between trades supplying equipment in other Divisions may be different. For instance, Division 26 contractor may be required to supply disconnect switches and starters for non-HVAC mechanical equipment supplied under other Divisions.

C. Division 23 Responsibilities
1. Assume responsibility for the proper functioning of the HVAC systems in their entirety.
2. Furnish and install all conductors and conduit required for control of HVAC equipment.
3. Make all terminations with the exception of power conductors.
4. Furnish and install all control panels and devices to provide a complete and functional controls system, including all controls transformers.
5. Furnish and install motor starters for all equipment specified in Division 23.
6. Install duct smoke detectors furnished by fire alarm contractor in buildings with fire alarm systems.
7. Furnish and install duct smoke detectors in buildings without fire alarm systems.
8. Furnish and install all control conductors and conduit connecting duct smoke detectors to smoke dampers and fan start controls.
9. All electrical work performed under Division 23 shall conform to the requirements of Division 26.

D. Division 26 Responsibilities
1. Furnish and install all raceways, conduit, disconnect switches, and conductors necessary for electrical power supply.
2. Make all power supply terminations to motors, starters, disconnect switches, control transformers, and other mechanical devices.
3. Fire alarm contractor to furnish duct smoke detectors in buildings with fire alarm systems.
4. Provide power to all duct smoke detectors and smoke dampers.
5. Coordinate all work with mechanical contractors.

1.8 AS-BUILT DRAWINGS

A. A complete set of Contract Drawings shall be maintained at the work site, and all changes in the work shall be recorded on this set, on a daily basis. The final as-built drawings shall be submitted to the Architect for approval.

1.9 DESIGN DRAWINGS

A. The drawings indicate diagrammatically the general layout of the electrical systems and other related work. Field verification of scaled dimensions taken from the Drawings is required.

B. The Contractor shall review and compare the Architectural, Structural, Plumbing, Mechanical, and Electrical Drawings and all Owner supplied equipment Drawings, and adjust their work to be in conformity with the conditions indicated thereon. Discrepancies between drawings, between drawings and actual field conditions, or between Drawings and Specifications, shall promptly be brought to the attention of the Architect for a determination of the modifications to be affected. In the event that a major modification is required, a Change Order will be prepared.

1.10 VERIFICATION OF EXISTING CONDITIONS AND DEMOLITION

A. Before installation of any new work, verify the location, size, and other conditions at all points of connection to services or other existing piping, and at all locations where new work will cross or pass near existing piping, electrical, or other facilities.

B. Remove conduit, conductors, wiring devices, disconnect switches, and other equipment that is not to remain in service as shown on the Drawings or as required. This includes the removal of associated appurtenances and supports.

C. Patch, cap, or repair existing works affected by this demolition in concealed spaces within six (6) inches of a live main or branch.

D. Deliver removed material to the Owner as directed by the Architect. Dispose of all other removed material offsite.

E. Information shown relative to existing services is based upon available records and data during preparation of the Drawings, but shall be verified. Make reasonable deviations found necessary to conform to actual locations and conditions, without extra charge.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Furnish three sets of typewritten instructions covering maintenance, adjustment, and operation of each piece of apparatus, bound in a hard cover loose-leaf binder. Neatly obscure or cross out inapplicable data from manufacturer's literature. Submit data to the Architect.

B. Operating instructions shall show sequence of operations, lubrication, care, and maintenance requirements of all equipment. Final acceptance of the work will not be made until a satisfactory submission of this material is received and approved by the Architect.

C. The Owner's authorized representative shall be instructed in the operation and servicing of all power & lighting systems.

1.12 ACCURACY OF DATA

A. The data given herein and on the Drawings are as exact as could be reasonably secured, but absolute accuracy is not guaranteed. Exact locations, distances, elevations, etc. will be governed by shop drawings, the building itself, and actual field conditions.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage, protection, and placing of all equipment and materials.
   1. Contractor shall protect the work and materials from damage during construction. Equipment stored at the job site shall be protected from dust, water, or other damage, and be covered if equipment is exposed to weather. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
   2. Any items damaged shall be repaired or replaced, at no additional cost to the Owner.

1.14 WARRANTIES

A. Equipment warranties shall be provided for all equipment, with all necessary information filled in, except purchase date, in favor of the Owner.

B. The contractor shall guarantee that all work under this Section is free from defects in material and workmanship for a period of one year from the date of filing the Notice of Completion. Replacement of defective work and damage caused to work of other trades as a result of such defective work shall be the responsibility of the Contractor, and shall be made at no cost to the Owner.

1.15 ALTERNATIVE MATERIALS AND METHODS

A. These plans and specifications describe the general scope of the electrical systems. These plans and specifications do not preclude the submittal of alternative methods or materials. Manufacturer's names and catalog numbers are stated to identify the type and quality of the equipment or materials required for the project.

B. The contractor may submit shop drawings and/or technical information on alternative equipment, materials or installation details to accomplish the intent of the plans and specifications. Approval of the alternative equipment, materials or installation details shall not relieve the contractor of any responsibility for complying with the intent of the plans and specifications. Submit the manufacturers' technical information, shop drawings, and/or written description of alternative methods for each item described by manufacturer's name and catalog number and for each component, equipment, material, or installation detail required.

1.16 SITE EXAMINATION

A. Thoroughly examine the site and verify the actual work conditions. No extra compensation will be allowed for expenses due to failure to discover site conditions which affect the work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise indicated, provide all first-quality new materials, free from any defects, and suitable for the intended use and the space provided. Provide materials approved by UL wherever standards have items not specifically shown or specified which are required to provide the complete systems specified herein. Where two or more units of the same class of material pr equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.

B. Equipment Finish: Unless otherwise indicated, finish for electrical equipment and enclosures shall be manufacturer's standard gray or ANSI 61 gray over a primer and rust inhibitor.

2.2 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

A. Metal Conduits and Fittings
   1. Metal Conduit:
      a. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
      b. GRC: Comply with ANSI C80.1 and UL 6.
      c. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
         1) Comply with NEMA RN 1.
         2) Coating Thickness: 0.040 inch, minimum.
      d. EMT: Comply with ANSI C80.3 and UL 797.
      e. FMC: Comply with UL 1; zinc-coated steel.
      f. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
   2. Metal Fittings:
      a. Comply with NEMA FB 1 and UL 514B.
      b. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
      c. Fittings, General: Listed and labeled for type of conduit, location, and use.
      d. Fittings for EMT:
         1) Material: Steel.
         2) Type: Setscrew.
      e. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.

f. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

3. Joint Compound for GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

B. Non-metallic Conduits and Fittings

1. Nonmetallic Conduit:
   a. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   b. ENT: Comply with NEMA TC 13 and UL 1653.
   c. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
   d. LFNC: Comply with UL 1660.
2. Nonmetallic Fittings:
   a. Fittings, General: Listed and labeled for type of conduit, location, and use.
   b. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
      1) Fittings for LFNC: Comply with UL 514B.
   c. Solvents and Adhesives: As recommended by conduit manufacturer.

C. Boxes, Enclosures and Cabinets

1. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
2. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
3. Metal Floor Boxes:
   a. Material: Cast metal or sheet metal.
   b. Type: Fully adjustable.
   c. Shape: Rectangular.
   d. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
5. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
6. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

D. Handholes and boxes for exterior underground wiring

1. General Requirements for Handholes and Boxes:
   a. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
   b. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of

sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

a. Standard: Comply with SCTE 77.
b. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
c. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
d. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
e. Cover Legend: Molded lettering, "ELECTRIC.".
f. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
g. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.3 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Copper Building Wire
1. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
2. Standards:
   a. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
   b. RoHS compliant.
   c. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
3. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
4. Conductor Insulation: Type THHN and Type THWN-2: Comply with UL 83, 90ºC dry or 75ºC wet.

B. Photovoltaic Cable, Type PV
1. Description: Flexible, insulated, drawn copper current-carrying conductor with an overall insulation layer resistant to heat, moisture, and sunlight, rated 2000 V or less.
2. Standards:
   a. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
3. RoHS compliant.
   Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
4. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
5. Conductor Insulation: Type RHH and Type RHW-2: Comply with UL 44 AND UL 4703.

C. Connectors and Splices

1. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and use.
2. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
3. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
    a. Material: Copper.
    b. Type: Two hole with standard barrels.
    c. Termination: Compression.

2.4 IDENTIFICATION FOR ELECTRICAL SYSTEMS

A. Labels
1. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.
2. Snap-around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.
3. Self-adhesive Wraparound Labels: 3-mil-thick, polyester flexible label with acrylic pressure-sensitive adhesive.
    a. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
    b. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
4. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
    a. Minimum Nominal Size:
        1) 1-1/2 by 6 inches for raceway and conductors.
        2) 3-1/2 by 5 inches for equipment.
        3) As required by authorities having jurisdiction.

B. Tape
1. General purpose, flame retardant: 7 mil, vinyl plastic, rated for 90ºC minimum; complies with requirements of UL 510.
2. Flame retardant, cold and weather resistant: 8.5 mil, vinyl plastic.

C. Tags
1. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.
2. Write-on Tags:
    a. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable

tie for attachment.

b. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

D. Signs

1. Baked-Enamel Signs:
   a. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
   b. 1/4-inch grommets in corners for mounting.
   c. Nominal Size: 7 by 10 inches.
2. Metal-Backed Butyrate Signs:
   a. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396- inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
   b. 1/4-inch grommets in corners for mounting.
   c. Nominal Size: 10 by 14 inches.
3. Laminated Acrylic or Melamine Plastic Signs:
   a. Engraved legend.
   b. Thickness:
      1) For signs up to 20 sq. in., minimum 1/16 inch thick.
      2) For signs larger than 20 sq. in., 1/8 inch thick.
      3) Engraved legend with black letters on white face.
      4) Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

E. Cable Ties

1. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
   a. Minimum Width: 3/16 inch.
   b. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
   c. UL 94 Flame Rating: 94V-0.
   d. Temperature Range: Minus 50 to plus 284 deg F.
   e. Color: Black.

2.5 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. Description

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
2. Comply with UL 467 for grounding and bonding materials and equipment.

B. Conductors

1. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
2. Bare Copper Conductors:
   a. Solid Conductors: ASTM B 3.

b. Stranded Conductors: ASTM B 8.
c. Tinned Conductors: ASTM B 33.
d. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
e. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
f. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
g. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Connectors
1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
2. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
3. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to the ground bus bar.
4. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated, or silicon bronze bolts.
5. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
6. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
7. Conduit Hubs: Mechanical type, terminal with threaded hub.
8. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
9. Lay-in Lug Connector: Mechanical type, aluminum terminal with set screw.
10. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
11. Straps: Solid copper, cast-bronze clamp. Rated for 600 A.
12. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
13. Water Pipe Clamps:
    a. Mechanical type, two pieces with stainless-steel bolts.
    b. Material: Tin-plated aluminum.
    c. Listed for direct burial.

D. Grounding Electrodes
1. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet.
2. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
    a. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches long.
    b. Backfill Material: Electrode manufacturer's recommended material.
3. Ground Plates: 1/4 inch thick, hot-dip galvanized.

2.6 WIRING DEVICES

A. General Requirements
1. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with NFPA 70.
3. RoHS compliant.
4. Comply with NEMA WD 1.
5. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   a. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   b. Devices shall comply with requirements in this Section.
6. Devices for Owner-Furnished Equipment:
   a. Receptacles: Match plug configurations.
   b. Cord and Plug Sets: Match equipment requirements.
7. Device Color: White.
8. Wall Plate Color: For plastic covers, match device color.

B. Duplex Receptacles, 125 V, 20 A:
1. Description: Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Standards: Comply with UL 498 and FS W-C-596.
4. Tamper-resistant: Provide device listed and labeled as complying with NFPA “Tamper Resistant Receptacles” in locations specified by NFPA 70 406.12.
5. Weather-resistant: Provide device listed and labeled as complying with NFPA 70 “Receptacles in Damp or Wet Locations” in locations as shown on the plans.

C. GFCI Receptacles, 125V, 20A
1. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
2. Configuration: NEMA WD 6, Configuration 5-20R.
3. Type: Feed through.
4. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
5. Tamper-resistant: Provide device listed and labeled as complying with NFPA “Tamper Resistant Receptacles” in locations specified by NFPA 70 406.12.
6. Weather-resistant: Provide device listed and labeled as complying with NFPA 70 “Receptacles in Damp or Wet Locations” in locations as shown on the plans.

D. Toggle Switches, 120/277V, 20A
1. Standards: Comply with UL 20 and FS W-S-896.

E. Occupancy Sensors
1. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (microphonic and passive infrared) technology.
2. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac

for fluorescent or LED lighting, and 1/4 HP at 120 V ac.
3. Adjustable time delay of 20 minutes.
4. Able to be locked to Automatic-On mode.
5. Connections: Provisions for connection to BAS.

F. Dimmers
1. Switchbox-mounted, combination dimming and conventional switch lighting control unit.
2. Compatibility: Suitable for the luminaire(s) to be controlled.
3. Connections: Provisions for connection to BAS.

G. Wall Plates
1. Single and combination types shall match corresponding wiring devices.
a. Plate-Securing Screws: Metal with head color to match plate finish.
b. Material for Finished Spaces: Smooth, high-impact thermoplastic.
c. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
d. Material for Damp Locations: Thermoplastic with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
2. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.

H. Floor Service Fittings
1. Flush-Type Floor Service Fittings:
a. Description: Type: Modular, flush-type, dual-service units suitable for wiring method used, with cover flush with finished floor.
b. Compartments: Barrier separates power from voice and data communication cabling.
c. Service Plate and Cover: Rectangular, with satin finish.
d. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
2. Flap-Type Service Fittings:
a. Description: Type: Modular, flap-type, dual-service units suitable for wiring method used, with flaps flush with finished floor.
b. Compartments: Barrier separates power from voice and data communication cabling.
c. Flaps: Rectangular, with satin finish.
d. Service Plate: Same finish as flaps.
e. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
f. Data Communication Outlet: Blank cover with bushed cable opening.

2.7 SWITCHBOARDS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standards: Comply with NEMA PB 2, NFPA 70, and UL 891.

D. Front-Connected, Front-Accessible Switchboards:
   1. Main Devices: Panel mounted.
   2. Branch Devices: Panel mounted.
   3. Sections front and rear aligned.

E. Nominal System Voltage: 480Y/277 V.

F. Main-Bus Continuous: As shown on Drawings.

G. Indoor Enclosures: Steel, NEMA 250, Type 1.

H. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

I. Barriers: Between adjacent switchboard sections.

J. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.

K. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

L. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

M. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

N. Removable, Hinged Rear Doors and Compartment Covers: Secured by captive thumb screws, for access to rear interior of switchboard.

O. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

P. Buses and Connections: Three phase, four wire unless otherwise indicated.
   1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.

2. Phase- and Neutral-Bus Material: Tin-plated copper feeder circuit-breaker line connections.
3. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
4. Ground Bus: 1/4-by-2-inch tin-plated copper, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
5. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
6. Disconnect Links:
   a. Isolate neutral bus from incoming neutral conductors.
   b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.
7. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
8. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

Q. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.8 PANELBOARDS

A. General Requirements
1. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   a. Rated for environmental conditions at installed location.
      1) Indoor Dry and Clean Locations: NEMA 250, Type 1.
      2) Outdoor Locations: NEMA 250, Type 3R.
      3) Kitchen Areas: NEMA 250, Type 4X, stainless steel.
      4) Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
2. Height: 84 inches maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
4. Finishes:
   a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Galvanized steel.
5. Incoming Mains:
   a. Location: Convertible between top and bottom.
   b. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
6. Phase, Neutral, and Ground Buses:
   a. Material: Tin-plated copper.

1) Plating shall run entire length of bus.
2) Bus shall be fully rated the entire length.

b. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
c. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
d. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

7. Conductor Connectors: Suitable for use with conductor material and sizes.
   a. Material: Tin-plated copper.
   b. Terminations shall allow use of 75 deg C rated conductors without derating.
   c. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
   d. Main and Neutral Lugs: Compression type, with a lug on the neutral bar for each pole in the panelboard.
   e. Ground Lugs and Bus-Configured Terminators: Compression type, with a lug on the bar for each pole in the panelboard.
   f. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   g. Sub-feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
   a. Panelboards and overcurrent protective devices rated 240 V or less shall have short- circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
   b. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

B. Distribution Panelboards
1. Panelboards: NEMA PB 1, distribution type.
2. Mains: Circuit breaker or Lugs only.
3. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger than 125 A: Bolt-on circuit breakers.

C. Branch Circuit Panelboards
1. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
2. Mains: Circuit breaker or lugs only.
3. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
4. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling,

but current carrying terminals and bus shall remain concealed.

2.9 LOW-VOLTAGE TRANSFORMERS

A. General Requirements:
1. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Transformers Rated 15 kVA and Larger: Comply with NEMA TP 1 energy-efficiency levels as verified by testing according to NEMA TP 2.
4. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
5. Coils: Continuous windings without splices except for taps.
   a. Internal Coil Connections: Brazed or pressure type.
   b. Coil Material: Copper.
6. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

B. Distribution Transformers
1. Comply with NFPA 70, and list and label as complying with UL 1561.
2. Cores: One leg per phase.
3. Enclosure: Ventilated.
4. Transformer Enclosure Finish: Comply with NEMA 250.
5. Finish Color: Gray.
6. Taps for Transformers 3 kVA and Smaller: One 5 percent tap above normal full capacity.
7. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
8. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
9. Insulation Class, Smaller than 30 kVA: 185 deg C, UL-component-recognized insulation system with a maximum of 115-deg C rise above 40-deg C ambient temperature.
10. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150-deg C rise above 40-deg C ambient temperature.
11. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.
    a. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
    b. Indicate value of K-factor on transformer nameplate.
    c. Unit shall meet requirements of NEMA TP 1 when tested according to NEMA TP 2 with a K-factor equal to one.
12. Wall Brackets: Manufacturer's standard brackets.

2.10 CIRCUIT BREAKER

A. Comply with UL 489, with interrupting capacity to meet available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

D. Electronic trip circuit breakers with RMS sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long and short time adjustments.
   4. Ground-fault pickup level, time delay, and I squared t response.

E. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

F. MCCB Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Appropriate for application.
   4. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.11 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

A. Fusible Switches
   1. Type HD, Heavy Duty, Single throw, Three pole, 600-V ac, 1200 A and smaller, UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
   2. Accessories:
      a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
      b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
      c. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
      d. Hook stick Handle: Allows use of a hook stick to operate the handle.
      e. Lugs: Mechanical type, suitable for number, size, and conductor material.

B. Non-fusible Switches
   1. Type HD, Heavy Duty, Three Pole, Single Throw, 600-V ac, 1200 A and Smaller: UL

98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2. Accessories:
   a. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   b. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   c. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   d. Hook stick Handle: Allows use of a hook stick to operate the handle.
   e. Lugs: Mechanical type, suitable for number, size, and conductor material.
   f. Service-Rated Switches: Labeled for use as service equipment.

C. Shunt Trip Switches
1. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with Class J fuse block and 200-kA interrupting and short-circuit current rating.
2. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 600-V ac, 100 A; UL 98 and NEMA KS 1; integral shunt trip mechanism; horsepower rated, with clips or bolt pads to accommodate fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
3. Accessories:
   a. Oil-tight key switch for key-to-test function.
   b. Oil-tight red ON pilot light.
   c. Isolated neutral lug; 100 percent rating.
   d. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
   e. Form C alarm contacts that change state when switch is tripped.
   f. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   g. Hook stick Handle: Allows use of a hook stick to operate the handle.
   h. Lugs: Mechanical type, suitable for number, size, and conductor material.

D. Enclosures
1. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
2. Enclosure Finish: The enclosure shall be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (NEMA 250) Type 1.
3. Operating Mechanism: The circuit-breaker operating handle shall be externally operable with the operating mechanism being an integral part of the box, not the cover. The cover interlock mechanism shall have an externally operated override. The override shall not permanently disable the interlock mechanism, which shall return to the locked position once the override is released. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.12 SURGE PROTECTIVE DEVICES (SPDs)

A. SPDs: Comply with UL 1449, Type 1.

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.

C. Features and Accessories:
1. Integral disconnect switch.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
5. Surge counter.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Line to Line: 1000 V for 208Y/120 V.

F. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits shall not exceed the following:
1. Line to Neutral: 700 V.
2. Line to Ground: 700 V.
3. Line to Line: 1000 V.

G. SCCR: Equal or exceed 100 kA.

H. Nominal Rating: 20 kA.

2.13 LUMINAIRES

A. General Requirements:
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Recessed luminaires shall comply with NEMA LE 4.
3. California Title 24 compliant.

B. Fixtures: As shown on the plans.

2.14 LIGHTING CONTROLS

A. Wall-mounted Switches
1. Switch shall include on/off buttons and raise/lower buttons where dimming is indicated.
2. Lowercase letters may be used to indicate switching configuration.
3. Multi-zone dimming control shall include master on and off buttons in addition to individual zone control.
4. Where indicated, provide a locking single-pole switch connected to room controller for on/off control of indicated luminaires. Provide owner with three (3) keys.

B. Wall-Mounted Occupancy Sensors
1. Occupancy Sensor shall have durable lens, utilize both passive infrared (PIR) and ultrasonic/microphonic technology, and include on/off buttons and raise/lower buttons where dimming is indicated.

C. Ceiling-Mounted Occupancy Sensors
1. Occupancy Sensor shall have durable lens, utilize both passive infrared (PIR) and ultrasonic/microphonic technology.

D. Daylight Sensors
1. Daylight sensor shall have durable lens, utilize an integral photodiode to measure ambient light levels and be provided with an adjustable time delay and deadband.
2. Sensor shall be connected to control unit to continuously dim selected luminaires up and down based on the measured light level in the controlled space.

E. Control Units
1. Unit with integrated transformers shall be used to provide power to occupancy sensors and other control devices.
2. Unit shall be located within or connected to junction boxes.
3. Unit shall be 120-277V rated with no minimum load.
4. Continuous dimming:
    a. System or wall-based occupancy sensors shall be provided with control units to perform the luminaire dimming requirements as indicated.
5. Plug-loads control
    a. Where additional 120-277V loads are to be controlled by the room controller, a designated control unit shall be provided as required.
    b. The occupancy sensor-controlled loads shall be powered on rega5rdless of the lighting control state.
6. In some cases, multiple relays may be required to control the indicated switch legs or other loads.
7. Where connection to a remote emergency power source is indicated, provide a UL924 listed interface equipment to allow the override of local controls during and outage.
8. Where connection to an AV system is indicated, provide two-way capable RS-232

communications interface for AV system control of addressable lighting / room scenes. Communications system shall provide light levels status feedback to the AV control system.

9. Where networked lighting control relay panel(s) are indicated, provide all components, wiring, and programming required to integrated the control panels into the lighting controls system.

PART 3 – EXECUTION

3.1 WORKMANSHIP

A. General: The installation of materials and equipment shall be performed in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a quality level of workmanship. Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks.

B. Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function, conforming to applicable standards of building system construction, and exhibiting a high degree of quality and proficiency which is judged by the Architect as equivalent as or better than that ordinarily produced by qualified industry tradesmen.

1. Comply with NECA 1 and NFPA 70.

C. Performance: Personnel shall not be used in the performance of the installation of material and equipment who, in the opinion of the Architect, are deemed to be careless or unqualified to perform the assigned tasks. Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship and not acceptable to the Architect, shall be removed and reinstalled by qualified craftsmen, at no change in the contract price.

3.2 PROTECTION AND CLEAN UP

A. Protection and Restoration: Suitably protect equipment provided under this Division during construction. Restore damaged surfaces and items to "like new" condition before a request for substantial completion inspection.

B. Handling: Materials shall be properly protected and Raceway openings shall be temporarily closed by the Contractor to prevent obstruction and damage. Post notice prohibiting the use of systems provided under this Contract, prior to completion of work and acceptance of systems by the Owner's representative. The Contractor shall take precautions to protect his materials from damage and theft.

C. Safeguards: The Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment

or systems provided under this contract.

D. Cleanup: Keep the job site free from debris and rubbish. Remove debris and rubbish from the site and leave premises in clean condition on a daily basis.

3.3 SYSTEMS GUARANTEE

A. General: Provide a one-year guarantee. This guarantee shall be by the Contractor to the Owner for any defective workmanship or material, which has been provided under this Contract at no cost to the Owner for a period of one year from the date of substantial completion of the System. The guarantee shall include lamps, for ninety days after date of Substantial Completion of the System. Explain the provisions of guarantee to the Owner at the "Demonstration of Completed System".

3.4 FINAL OBSERVATION

A. General: Work shall be completed, and forms and other information shall be submitted for acceptance one week prior to the request for final observation of the installation.

3.5 SPECIAL CONSIDERATIONS

A. Comply with special requirements imposed at site by Owner. This may include badging of employees, prohibition of smoking, special working hours, or special working conditions.

3.6 METHODS FOR RACEWAY INSTALLATION

A. Raceway Application
   1. Outdoors: Apply raceway products as specified below unless otherwise indicated:
      a. Exposed Conduit: GRC, RNC, or Type EPC-40-PVC.
      b. Concealed Conduit, Aboveground: GRC.
      c. Underground Conduit: RNC, Type EPC-40-PVC.
      d. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
      e. Boxes and Enclosures, Aboveground: NEMA 250, Type 4.
   2. Indoors: Apply raceway products as specified below unless otherwise indicated:
      a. Exposed, Not Subject to Physical Damage: EMT.
      b. Exposed, Not Subject to Severe Physical Damage: EMT.
      c. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
         1) Loading dock.
         2) Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
         3) Mechanical rooms.
         4) Gymnasiums.
      d. Concealed in Ceilings and Interior Walls and Partitions: EMT.

e. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
f. Damp or Wet Locations: GRC.
g. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

3. Minimum Raceway Size: 1/2-inch trade size.
4. Raceway Fittings: Compatible with raceways and suitable for use and location.
   a. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   b. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   c. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
   d. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
5. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
6. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

B. Raceway Installation
1. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
2. Do not fasten conduits onto the bottom side of a metal deck roof.
3. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
4. Complete raceway installation before starting conductor installation.
5. Arrange stub-ups so curved portions of bends are not visible above finished slab.
6. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
7. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
8. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
9. Support conduit within 12 inches of enclosures to which attached.
10. Raceways Embedded in Slabs:
    a. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.

b. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
c. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
d. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

11. Stub-ups to Above Recessed Ceilings:
    a. Use EMT or RMC for raceways.
    b. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
12. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
13. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
14. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
15. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
16. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
17. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
18. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
19. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
    a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    b. Where an underground service raceway enters a building or structure.
    c. Conduit extending from interior to exterior of building.
    d. Conduit extending into pressurized duct and equipment.
    e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    f. Where otherwise required by NFPA 70.
20. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
21. Expansion-Joint Fittings:

a. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has a straight-run length that exceeds 100 feet.
b. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
   4) Attics: 135 deg F temperature change.
c. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
d. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
e. Provide expansion/deflection fitting per NEC 300.4 (H) where raceway crosses structural joint intended for expansion/contraction/deflection to accommodate horizontal and vertical movement.

22. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
    a. Use LFMC in damp or wet locations subject to severe physical damage.
    b. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
23. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
24. Locate boxes so that cover or plate will not span different building finishes.
25. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
26. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
27. Set metal floor boxes level and flush with finished floor surface.
28. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

C. Installation of Underground Conduit
   1. Direct-Buried Conduit
      a. Excavate trench bottom to provide firm and uniform support for conduit.
      b. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process.

Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

c. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

d. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

1) Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.

2) For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

e. Warning Planks: Bury warning planks approximately 12 inches above direct-buried conduits but a minimum of 6 inches below grade. Align planks along centerline of conduit.

D. Installation of Underground Handholes and Boxes

1. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
3. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
4. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
5. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 METHODS FOR CONDUCTOR INSTALLATION

A. Materials Applications

1. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3. VFC Output Circuits Cable: Extra-flexible stranded for all sizes.
4. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

B. Conductor Insulation and Wiring Methods
1. Service Entrance: Type THHN/THWN-2, single conductors in raceway.
2. Feeders; exposed or concealed: Type THHN/THWN-2, single conductors in raceway.
3. Branch Circuits; exposed or concealed: Type THHN/THWN-2, single conductors in raceway.
4. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless- steel, wire-mesh, strain relief device at terminations to suit application.
5. VFC Output Circuits: Type XHHW-2 in metal conduit.

C. Installation of Conductors and Cables
1. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
2. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
4. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Connections
1. Tighten electrical connectors and terminals according to manufacturer's published torque- tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
2. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
3. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
4. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

E. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
2. Colors for 208/120-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
3. Colors for 240-V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
4. Colors for 480/277-V Circuits:
   a. Phase A: Brown.
   b. Phase B: Orange.

c. Phase C: Yellow.
5. Color for Neutral: White.
6. Color for Equipment Grounds: Bare copper.
7. Colors for Isolated Grounds: Green with white stripe.

3.8 METHODS FOR ELECTRICAL SYSTEM IDENTIFICATION

A. Installation of Identification Products
1. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
2. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
3. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
   a. "EMERGENCY POWER."
   b. "POWER."
   c. "UPS."
4. Vinyl Wraparound Labels:
   a. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
   b. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
5. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.
6. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
7. Self-Adhesive Labels:
   a. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
   b. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1- 1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
8. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.
9. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.
10. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
11. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
12. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
13. Underground Line Warning Tape:

a. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
b. Install underground-line warning tape for direct-buried cables and cables in raceways.

14. Metal, Nonmetallic Preprinted, and Write-on Tags:
    a. Place in a location with high visibility and accessibility.
    b. Secure using UV-stabilized and plenum-rated cable ties.
15. Baked-Enamel, Metal-backed Butyrate, and Laminated Acrylic Signs:
    a. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
    b. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.
16. Cable Ties: General purpose, for attaching tags, except as listed below:
    a. Outdoors: UV-stabilized nylon.
    b. In Spaces Handling Environmental Air: Plenum rated.

B. Identification Schedule
1. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
2. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
3. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
4. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
5. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
    a. "EMERGENCY POWER."
    b. "POWER."
    c. "UPS."
6. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels to identify the phase.
    a. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

7. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.
8. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with the conductor designation.
9. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
10. Equipment Identification Labels:
    a. Indoor Equipment: Laminated acrylic or melamine sign.
    b. Outdoor Equipment: Laminated acrylic or melamine sign.
    c. Equipment to Be Labeled:
        1) Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self- adhesive, engraved, laminated acrylic or melamine label.
        2) Enclosures and electrical cabinets.
        3) Access doors and panels for concealed electrical items.
        4) Switchboards.
        5) Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
        6) Enclosed switches.
        7) Enclosed circuit breakers.
        8) Enclosed controllers.
        9) Variable-speed controllers.
        10) Power-generating units.
11. For equipment labels, follow the convention examples below:

PANEL A
FED FROM MSB
400A, 277/480V, 3Ø 22KAIC

XFMR A
FED FROM PANEL A
480:120/208V, 3Ø, 75KVA

HEAT PUMP HP-1
FED FROM PANEL M

MOTOR CONTACT ENCLOSURE
FED FROM PANEL A

3.9 METHODS FOR GROUNDING AND BONDING

A. Applications
1. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
2. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
3. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
    a. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

b. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

4. Conductor Terminations and Connections:
   a. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   b. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   c. Connections to Structural Steel: Welded connectors.

B. Grounding at the Service
1. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

C. Grounding Separately Derived Systems
1. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

D. Grounding Underground Distribution System Components
1. Comply with IEEE C2 grounding requirements.
2. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.
3. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
4. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned- copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation. Installation of pad shall be in compliance with utility company's grounding standard.

E. Equipment Grounding
1. Install insulated equipment grounding conductors with all feeders and branch circuits.

2. Install insulated equipment grounding conductors with the following items, in addition to those required by CEC:
    a. Feeders and branch circuits.
    b. Lighting circuits.
    c. Receptacle circuits.
    d. Single-phase motor and appliance branch circuits.
    e. Three-phase motor and appliance branch circuits.
    f. Flexible raceway runs.
    g. Armored and metal-clad cable runs.
    h. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
3. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
4. Water Heater, Heat-Tracing, and Anti-frost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
5. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

F. Installation
1. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
2. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
    a. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
    b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
3. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
    a. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
    b. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
    c. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
4. Grounding and Bonding for Piping:

a. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
b. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
c. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

5. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
6. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
7. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to CEC; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
   a. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
   b. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.10 METHODS FOR WIRING DEVICE INSTALLATION

A. Installation
1. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
2. Coordination with Other Trades:
   a. Protect installed devices and their boxes. Do not place wall finish materials over device boxes, and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   b. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   c. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   d. Install wiring devices after all wall preparation, including painting, is complete.
3. Conductors:
   a. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

b. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
c. The length of free conductors at outlets for devices shall comply with NFPA 70, Article 300, without pigtails.
d. Existing Conductors:
    1) Cut back and pigtail, or replace all damaged conductors.
    2) Straighten conductors that remain and remove corrosion and foreign matter.
    3) Pig-tailing existing conductors is permitted, provided the outlet box is large enough.

4. Device Installation:
    a. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
    b. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
    c. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
    d. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
    e. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
    f. Use a torque screwdriver when a torque is recommended or required by manufacturer.
    g. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
    h. Tighten unused terminal screws on the device.
    i. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
5. Receptacle Orientation:
    a. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
6. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
7. Dimmers:
    a. Install dimmers within terms of their listing.
    b. Verify that dimmers used for fan-speed control are listed for that application.
    c. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.
8. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on bottom. Group adjacent switches under single, multi-gang wall plates.
9. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

B. Identification
   1. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.11 METHODS FOR SWITCHBOARD AND PANELBOARD INSTALLATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

C. Equipment Mounting: Attach panelboard to the vertical finished or structural surface behind the panelboard.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

E. Mount top of trim 90 inches above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box.

G. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

H. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

I. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

J. Install filler plates in unused spaces.

K. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

3.12 METHODS FOR LOW-VOLTAGE TRANSFORMER INSTALLATION

A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.
   1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

B. Install transformers level and plumb on a concrete base with vibration-dampening supports. Locate transformers away from corners and not parallel to adjacent wall surface.

C. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Secure transformer to concrete base according to manufacturer's written instructions.

E. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

F. Remove shipping bolts, blocking, and wedges.

3.13 METHODS FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS INSTALLATION

A. Enclosure Environmental Rating Applications
   1. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
      a. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
      d. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

B. Installation
   1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
   2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
   3. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
   4. Install fuses in fusible devices.

3.14 METHODS FOR INTERIOR LIGHTING INSTALLATION

A. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

B. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and relamping.
   3. Provide support for luminaire without causing deflection of ceiling or wall.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

C. Flush-Mounted Luminaires:
   1. Secured to outlet box.
   2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
   3. Trim ring flush with finished surface.

D. Wall-Mounted Luminaires:
   1. Attached to structural members in walls.
   2. Do not attach luminaires directly to gypsum board.

E. Suspended Luminaires:
   1. Ceiling Mount:
      a. Two 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
      b. Pendant mount with 5/32-inch- diameter aircraft cable supports adjustable to 10 feet in length.
      c. Hook mount.
   2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
   4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
   5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Ceiling-Grid-Mounted Luminaires:
   1. Secure to any required outlet box.
   2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.

3.15 METHODS FOR EXTERIOR LIGHTING INSTALLATION

A. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

B. Install lamps in each luminaire.

C. Fasten luminaire to structural support.

D. Supports:
1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Wiring Method: Install cables in raceways. Conceal raceways and cables.

F. Coordinate layout and installation of luminaires with other construction.

G. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

H. Bollard Luminaire Installation:
1. Align units for optimum directional alignment of light distribution.
a. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

I. Individual Ground-Mounted Luminaire Installation
1. Aim as indicated on Drawings.
2. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth.

3.16 METHODS FOR LIGHTING CONTROLS INSTALLATION

A. Sensor Installation
1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
2. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Contactor Installation
1. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

C. Wiring Installation
   1. Wiring within Enclosures: Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
   2. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
   3. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.17 SUPPORTS AND HANGERS

A. All hangers, supports, and attachments to the structure must be capable of withstanding three times the anticipated load.

3.18 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Perform the following visual and electrical tests:
   1. Conductors and Cables:
      a. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors and all conductors #6 AWG and larger.
         1) Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
         2) Test bolted connections for high resistance using a low-resistance ohmmeter.
         3) Inspect for correct identification.
         4) Inspect cable jacket and condition.
         5) Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
         6) Continuity test on each conductor and cable.
         7) Uniform resistance of parallel conductors.
   2. Grounding and Bonding
      a. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
      b. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
      c. Report measured ground resistances that exceeds 25 ohms.
      d. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
   3. Wiring Devices
      a. Line Voltage: Acceptable range is 105 to 132 V.

b. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
c. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
d. Using the test plug, verify that the device and its outlet box are securely mounted.
e. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault-current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new and retest as specified above.

4. Switches
   a. Visual and Mechanical Inspection
      1) Inspect physical and mechanical condition.
      2) Inspect anchorage, alignment, grounding, and clearances.
      3) Verify that the unit is clean.
      4) Verify blade alignment, blade penetration, travel stops, and mechanical operation.
      5) Verify that fuse sizes and types match the Specifications and Drawings.
      6) Verify that each fuse has adequate mechanical support and contact integrity.
      7) Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on the Drawings.
      8) Verify correct phase barrier installation.
      9) Verify lubrication of moving current-carrying parts and moving and sliding surfaces.
   b. Electrical Tests
      1) Perform resistance measurements through bolted connections with a low- resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
      2) Measure contact resistance across each switchblade fuse holder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
      3) Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
      4) Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
      5) Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."

5. Molded Case Circuit Breakers

a. Visual and Mechanical Inspection
   1) Perform resistance measurements through bolted connections with a low- resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
   2) Measure contact resistance across each switchblade fuse holder. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
   3) Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
   4) Perform ground fault test according to NETA ATS 7.14 "Ground Fault Protection Systems, Low-Voltage."
   5) Inspect operating mechanism, contacts, and chutes in unsealed units.
   6) Perform adjustments for final protective device settings in accordance with the coordination study.

b. Electrical Tests
   1) Perform resistance measurements through bolted connections with a low- resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
   2) Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
   3) Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
   4) Perform insulation resistance tests on all control wiring with respect to ground. Applied potential shall be 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable. Test duration shall be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values shall be no less than two meg-ohms.

5) Determine the following by primary current injection:
   a) Long-time pickup and delay. Pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
   b) Short-time pickup and delay. Short-time pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
   c) Ground-fault pickup and time delay. Ground-fault pickup values shall be as specified. Trip characteristics shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
   d) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
6) Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
7) Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset all trip logs and indicators. Investigate units that do not function as designed.
8) Verify operation of charging mechanism. Investigate units that do not function as designed.

6. Interior Lighting
   a. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   b. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
7. Exterior Lighting
   a. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
   b. Verify operation of photoelectric controls.
   c. Illumination Tests:
      1) Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):
      2) IES LM-5.
      3) IES LM-50.
      4) IES LM-52.
      5) IES LM-64.
      6) IES LM-72.
8. Lighting Control Devices

a. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Devices will be considered defective if they do not pass tests and inspections.

3.19 CLEANUP

A. Upon completion of the work of this Section, remove all material, debris, and equipment associated with or used in the performance of this work.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the following items from a single supplier:
   1. Engine Generator Set.
   2. Enclosure
   3. Related Accessories as specified

B. Related Requirements
   1. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
   2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line-by-line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
   3. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
   4. All equipment shall be new and of current production by an international power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 SUBMITTALS

A. Action Submittals
   1. Product Data
      a. The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
   2. Shop Drawings
   3. Samples

B. Informational Submittals
   1. Certificates

a. The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.

2. Test and Evaluation Reports
3. Manufacturer's Instruction
4. Source Quality Control Submittals
5. Field or Site Quality Control
6. Manufacturer's Report
7. Special Procedure Submittal
8. Qualification Statement

C. Closeout Submittal
1. Maintenance Contracts
2. Operation And Maintenance Data
3. Bonds
4. Warranty Documentation
5. Record Documentation
6. Software

D. Maintenance Material Submittal
1. Provide two (2) copies of the following documents and manuals for the engine, the alternator, and the generator set:
a. Operation Manuals
b. Parts Catalogs
c. Service Manuals
d. Installation Manuals
e. Wiring Diagrams
f. NFPA-110 Startup and Test Procedure.
2. Provide one (1) copies of the following documents and manuals for the engine, the alternator, and the generator set:
a. Operation Manuals
b. Parts Catalogs
c. Service Manuals
d. Installation Manuals
e. Wiring Diagrams.

1.3 QUALITY ASSURANCE

A. Regulatory Agency
1. The generator set shall conform to the requirements of the following codes and standards:
a. CSA C22.2, No. 14-M91 Industrial Control Equipment.
b. EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
c. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
d. IEC8528 part 4, Control Systems for Generator Sets.
e. IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and

conducted electromagnetic emissions.

f. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

g. NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

h. NFPA 99, Essential Electrical Systems for Health Care Facilities.

i. NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.

B. Qualifications

1. The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.

C. Manufacturers

1. The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.

1.4 FIELD OR SITE CONDITIONS

A. Ambient Conditions

1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
   a. Ambient Temperature: 90ºF
   b. Altitude: 1333 ft
   c. Relative Humidity: 95%

1.5 WARRANTY OR BOND

A. Manufacturer’s Warranty

1. The generator set shall include a standard warranty covering one (1) year or 2000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear

controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Equipment
1. The basis of design product shall be a Rehlko model GMKD700 with a KH02970TO4D alternator. It shall provide 875 kVA and 700.00 kW when operating at 277/480 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby @50C rating while operating in an ambient condition of less than or equal to 90°F and a maximum elevation of 4374 feet above sea level. The standby rating shall be available for the duration of the outage.
2. A comparable product by one of the following manufacturers may be considered, subject to compliance with requirements.
   a. Caterpillar, Inc.; Electric Power Division
   b. Cummins Power Generation
   c. Generac Power Systems

B. Engine
1. The minimum 18 liter displacement engine shall deliver a minimum of 1053 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
   a. Electronic isochronous governor capable of 0.25% steady-state frequency regulation
   b. 12-volt positive-engagement solenoid shift-starting motor
   c. 65-ampere automatic battery charging alternator with a solid-state voltage regulation
   d. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
   e. Dry-type replaceable air cleaner elements for normal applications
   f. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel
   g. The turbocharged engine shall be fueled by diesel
   h. The engine shall have a minimum of 4 cylinders and be liquid-cooled
2. The engine shall be EPA certified from the factory
3. The generator must accept rated load in one-step.

C. Cooling System
1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

D. Heavy Duty Air Cleaner
1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

E. Battery
1. Each genset requires a maintenance free BCI group 24 battery which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. This battery shall be rated according to SAE Standards J-537 with

a minimum cold cranking amp of 650 amps and a minimum reserve capacity of 120 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life.

2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F. Housing

1. Level 2 Sound Attenuated Enclosure
   a The generator set shall be supplied with a Level 2 Sound Attenuated Enclosure that is UL2200 listed, providing a sound level of 69.8 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) using acoustic insulation and acoustic-lined inlet hoods, and constructed from high strength, low alloy 14-gauge galvanized steel. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use a vertically louvered air inlet and outlet hood with 90-degree angle to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps. The snow load rating shall be 70 lbs./ sq. ft. or greater.
   b The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion. All enclosure parts shall receive an 100% epoxy primer electrocoat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power ArmorTM industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
   c The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.
   d Enclosures will be finished in the manufacturer's standard color.
   e The enclosures shall allow the generator set to operate at full load based on the cooling capability of the genset. The enclosure will account for no more than a 5°C derating of the ambient cooling capability of the generator.
   f Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.
   g The enclosure shall be furnished with stainless steel latches, hinges and hardware on the external panels of the enclosure. Access doors shall be rubber sealed to prevent water intrusion and to minimize noise.
   h Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
   i A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.
   j The complete exhaust system shall be internal to the enclosure.
   k The critical silencer shall be fitted with a tailpipe and rain cap.

G. Fuel oil storage

1. Double Wall Secondary Containment Sub-base Fuel Tank

a The generator set shall be supplied with a sub-base fuel tank of sufficient capacity to hold 5025 gallons of diesel fuel.
b The sub-base fuel system shall be listed under UL 142, subsection entitled Special Purpose Tanks EFVT category, and will bear their mark of UL Approval according to their particular classification.
c The above ground steel secondary containment rectangular tank for use as a sub base for diesel generators is manufactured and intended to be installed in accordance with the Flammable and Combustible Liquids Code—NFPA 30, the Standard for Installation and Use of Stationary Combustible Engine and Gas Turbines—NFPA 37, and Emergency and Standby Power Systems—NFPA 110.
d The primary tank shall be rectangular in shape and constructed in clam shell fashion to ensure maximum structural integrity and allow the use of a full throat fillet weld.
e Steel Channel Support System. Reinforced steel box channel for generator support, with a load rating of 5,000 lbs. per generator mounting hole location. Full height gussets at either end of channel and at generator mounting holes shall be utilized.
f Exterior Finish. The sub-base tank exterior finish shall be Power Armor Plus™, a polyurea-textured rubberized coating.
g Normal venting shall be sized in accordance with the American Petroleum Institute Standard No 2000, Venting Atmospheric and Low Pressure Storage Tanks not less than 1-1/4" (3 cm.) nominal inside diameter.
h The emergency vent opening shall be sized to accommodate the total capacity of both normal and emergency venting and shall be not less than that derived from NFPA 30, table 2-8, and based on the wetted surface area of the tank. The wetted area of the tank shall be calculated on the basis of 100 percent of the primary tank. The vent is to be spring-pressure operated: opening pressure is 0.5/psig and full opening pressure is 2.5 psig. The emergency relief vent is to be sized to accommodate the total venting capacity of both normal and emergency vents.
i There shall be a 2" NPT opening within the primary tank and lockable manual fill cap.
j A direct reading, UL listed, magnetic fuel level gauge with a hermetically sealed, vacuum tested dial, to eliminate fogging, shall be provided.
k A float switch for remote or local annunciation of a (50% standard) low fuel level condition shall be supplied.

H. Controller
1. Advanced Power Management 603 (APM603) Generator Set Controller
   a. The generator set controller shall be a microprocessor-based control system that will provide automatic starting, system monitoring, and protection.
   b. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.
2. Codes and Standards
   a. The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
   b. The controller shall meet NFPA 99 and NEC requirements.
   c. The controller shall be UL 6200 recognized.
   d. The controller shall meet ASTM B117 (salt spray test).
3. Applicability

a. The controller shall be a standard offering in the manufacturer's controller product line.
b. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
c. The controller front face shall meet an environmental rating of IP65 when mounted properly on the generator.

4. Controller Buttons, Display, and Components
   a. The generator set controller shall include the following features and functions:
      1) Master Control Push Buttons – the buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
         i. Run Mode – when in Run mode the generator set shall start.
         ii. Off/Reset Mode – when in Off/Reset mode, the generator set shall not accept any remote start commands and shall be capable of resetting all faults, allowing for the restarting of the generator set after a shutdown.
         iii. Auto Mode – when in Auto mode, the generator set shall be ready to accept a signal from a remote device.
      2) Control Panel shall include:
         i. Emergency Stop Switch – the latch type stop switch shall be red in color with a “mushroom” type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
         ii. Alarm Horn – the horn sounds when any faults or warnings are present. The horn shall also sound when the controller in not in the Auto mode.
      3) Display – the display shall be a 7” TFT color touchscreen.
      4) Fault Light – the controller shall have an annunciator fault light that glows red for faults and yellow for warnings. The warning light will also illuminate when not in Auto.
      5) Alarm Silence/Lamp Test Button – when this button is held, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not Auto or has a fault.
      6) USB Connection – the controller shall have a USB connection port for a storage device that is accessible on the front of the control panel without having to open any electrical enclosure panels on the generator. This connection shall allow for updating of all software and firmware. This connection shall allow for downloading of controller parameter settings and the event log. This connection shall allow for data logging storage. This connection shall allow the ability to capture screenshots.
      7) Mini-USB Connection – the controller shall have a mini-USB connection port for a PC connection that is accessible on the front of the control panel without having to open any electrical enclosure panels on the generator. This connection shall allow a certified technician to service the generator controller using a dedicated PC program. The program shall allow for servicing of generator set parameters, faults diagnostics and viewing of controller information. The program shall allow for uploading of software and firmware as well as downloading of parameter settings and the event log.

5. The controller shall have three user level access
    a. User Level – no password required, and user can view all metered values and settings
    b. Operator Level – password required to adjust settings that do not impact the generator
    c. Technician Level – password required to adjust all settings
6. Overview and Favorites
    a. Overview – User shall be able to customize up to 16 gauges for a personalized Home screen that will allow for immediate access to site specific critical data.
    b. Favorites – User shall be able to create their own menu set up with parameters for easy viewing.
7. Load Management
    a. Programmable outputs included to command the connect and disconnect of loads based on generator or paralleling system state:
        1) Loads connected based on available capacity
        2) Loads disconnected at system startup
        3) Loads disconnected based on a maximum kW setting or under frequency setting
    b. Supports up to 16 prioritize load steps per system
        1) Can be used on a single generator system
        2) Can be combined in a paralleling system for a total system load control capability
    c. Simplified load management system view from any generator controller in the system
8. Controller Engine Control Features and Functions
    a. User-programmable time delay for engine start.
    b. User-programmable time delay engine cool down.
    c. Capability to start and run at user-adjustable idle speed during warm-up for a selectable time-period until engine reaches preprogrammed temperature.
    d. The idle function including engine cooldown at idle speed.
    e. Real-time clock and calendar for time stamping of events.
    f. Output with adjustable timer for an ether injection starting system.
    g. Programmable cyclic cranking that can adjust on time, off time, and number of cycles.
9. Controller Alternator Control Features and Functions
    a. Patented High-speed RMS Digital Voltage Regulation – the system shall have integral microprocessor-based voltage regulator system that provides + 0.25% voltage regulation no-load to full load with three phase sensing. A separate voltage regulator is not acceptable. The digital voltage regulator shall be applicable to single- or three-phase systems. The system shall be prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum + 10% adjustable of nominal voltage.
    b. Alternator Thermal Overload Protection – the system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
    c. Overcurrent Protective Device– the system shall have a thermal trip, instantaneous trip and maintenance mode per NEC240.87.

10. Other Control Features and Functions
    a. Event Logging – the controller keeps a record of up to 10,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a USB storage device or onto a PC through the service program.

        1) Event Snapshot – the control system shall capture 15 seconds of critical data around the time a fault or warning. This data shall be viewable on the controller and downloadable.
    b. Data Logging – the controller shall allow customized parameters to be logged based on a start trigger from the controller interface.
        1) The parameters are selectable from all monitored parameters.
        2) The sample period shall be configurable from 1 second to 1 day.
        3) The collected data shall be stored on a USB storage device plugged into the control panel.
11. Control Monitoring Requirements
    a. The generator set shall have alarms and status indication lamps that show non-automatic status, warning, and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning, or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
        1) All monitored functions must be viewable on the control panel display
        2) The following generator set functions shall be monitored:
            i. All output voltages - single phase, three phase, line to line, and line to neutral, 0.25% accuracy
            ii. All single phase and three phase currents, 0.25% accuracy
            iii. Output frequency, 0.25% accuracy
            iv. Power factor by phase with leading/lagging indication
            v. Total instantaneous kilowatt loading and kilowatts per phase, 0.5% accuracy
            vi. kVARS total and per phase, 0.5% accuracy
            vii. kVA total and per phase, 0.5% accuracy
            viii. kW hours
            ix. A display of percent generator set duty level (actual kW loading divided by the kW rating)
        3) Engine parameters listed below shall be monitored: (*are adjustable)
            i. Engine Speed*
            ii. Oil Pressure
            iii. Coolant Temperature
            iv. Runtime Hours
            v. Fuel Pressure
            vi. Fuel Consumption Rate
        4) Operational records shall be stored in the control beginning at system startup
            i. Total Run Time Hours
            ii. Total Loaded Hours
            iii. Total Unloaded Hours
            iv. Total kW Hours

v. Controller Hours
vi. Controller Run Time Hours
vii. ECM Run Time Hours
viii. Number of Starts
ix. Number of Crank Attempts
x. Last Crank Duration
xi. Last Start Runtime Duration
xii. Last Start Time of Day
xiii. Last Start Date (Day)
xiv. Last Start Date (Month)
xv. Last Start Date (Year)
xvi. Last Stop Time of Day
xvii. Last Stop Date (Day)
xviii. Last Stop Date (Month)
xix. Last Stop Date (Year)

5) The following operational records shall be resettable for maintenance purposes:
   i. Total Run Time Since Maintenance
   ii. Loaded Hours Since Maintenance
   iii. Unloaded Hours Since Maintenance
   iv. kW Hours Since Maintenance
   v. Reset Maintenance Records
6) For maintenance and service purposes, the controller shall store and display on demand the information:
   i. Generator Model
   ii. Generator Serial Number
   iii. ECM Serial Number
   iv. Alternator Part Number
   v. Engine Model Number
   vi. Engine Serial Number
   vii. Controller Serial Number
   viii. Firmware Version
7) The controller shall support a variety of maintenance parameters including:
   i. Last Start Time of Day
   ii. ECM Runtime Hours
   iii. Controller Runtime Hours
   iv. Last Stop Date (Month)
   v. Last Start Time of Day
   vi. Last Stop Date (Day)
   vii. Last Start Date (Day)
   viii. Number of Starts
   ix. Last Stop Time of Day
   x. Last Stop Time of Day
   xi. Controller Hours
   xii. Number of Crank Attempts
   xiii. Last Crank Duration
   xiv. Last Start Runtime Duration

xv. Last Start Time of Day
xvi. Last Start Time of Day
xvii. Last Start Date (Month)
xviii. Last Start Date (Year)
xix. Last Stop Time of Day
xx. Last Stop Time of Day
xxi. Last Stop Date (Year)

12. Generator Set Warning, Shutdown Alarm and Status
    a. The generator set shall have alarms and status indication lamps that show Non-Automatic Status, Warning, and Shutdown conditions. The controller shall indicate with a warning lamp and/or alarm, and on the digital display screen any shutdown, warning, or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
        1) OverCrank Shutdown
        2) UnderFrequency Shutdown
        3) OverFrequency Shutdown
        4) OverPower Shutdown
        5) Low Oil Pressure Shutdown
        6) High Coolant Temperature Shutdown
        7) Local Emergency Stop Shutdown
        8) Remote Emergency Stop Shutdown
        9) OverSpeed Shutdown
        10) ECM DTCs
        11) Loss ECM Comms Shutdown
        12) ECM Mismatch Shutdown
        13) High Oil Temperature Shutdown
        14) Alternator Protection Shutdown
        15) Protective Relay Shutdown OverPower
        16) Protective Relay Shutdown OverCurrent
        17) Protective Relay Shutdown Reverse VAR
        18) Protective Relay Shutdown ReversePower
        19) UnderVoltage Shutdown (L-L, L-N, each phase)
        20) OverVoltage Shutdown (L-L, L-N, each phase)
        21) OverCurrent Shutdown
        22) Excitation Overvoltage Shutdown
        23) Low Fuel Level Shutdown
        24) Low Coolant Level Shutdown
        25) Generator Over Power Shutdown
    b. Conditions resulting in generator warning (generator will continue to operate):
        1) UnderFrequency Warning
        2) OverFrequency Warning
        3) OverPower Warning
        4) Low Oil Pressure Warning
        5) Low Coolant Temperature Warning
        6) High Coolant Temperature Warning
        7) Low Battery Voltage Warning
        8) High Battery Voltage Warning
        9) Battery Charger Fault Warning

10) High Oil Temperature Warning
11) GFCI Warning
12) UnderVoltage Warning (L-L, L-N, each phase)
13) OverVoltage Warning (L-L, L-N, each phase)
14) OverCurrent Warning
15) High Fuel Level Warning
16) Low Fuel Level Warning
17) Critically Low Fuel Level Warning
18) Generator Over Power Warning
19) ECM DTCs

13. Inputs and Outputs
    a. Standard Dedicated User Inputs – the controller shall have dedicated inputs for:
        1) Two-Wire Input
            i. Remote Engine Start
        2) Digital Input
            i. Auxiliary Fault (Shutdown)
            ii. Auxiliary Warning
            iii. Battery Charger Fault
            iv. Breaker Close
            v. Breaker Trip
            vi. Coolant Temperature
            vii. Excitation Over Voltage
            viii. Fuel Level
            ix. Fuel Leak Alarm
            x. Low Fuel Level Switch
            xi. Ground Fault Relay
            xii. Remote Emergency Stop
            xiii. Local Emergency Stop
        3) Analog Voltage Input – Scalable Up To $\pm$ 10 VDC
            i. Speed Bias
            ii. Voltage Bias
    b. Standard Dedicated User Outputs – the controller shall have dedicated outputs for:
        1) Relay Driver Output
            i. Run
            ii. Crank
            iii. Horn
            iv. Common Failure
            v. Close Breaker
            vi. Trip Breaker
    c. Optional Configurable User Inputs and Outputs
        1) User Configurable Inputs
            i. 2 Analog, 0-5 VDC
            ii. 4 Dry Contact Digital
        2) User Configurable Relay Outputs
            i. 14 NO/NC Relays
            ii. 1 Common Fault Relay

d. PLC-like capability for applying logic to customize generator system behavior.

14. Communications
    a. CAN
        1) If the generator set engine is equipped with an ECM, the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards.
    b. Modbus®
        1) Non-isolated for RSA III
        2) Isolated for Modbus devices
        3) Isolated for paralleling communication
        4) RJ45 for Modbus TCP, SNMP, and BACnet
    c. Simple Network Management Protocol (SNMP)
        1) Industry standard SNMP communication shall be available.
        2) The controller shall support SNMP communication via an RJ-45 Ethernet connection.
    d. BACnet®
        1) Industry standard BACnet® communication shall be available.
        2) The controller shall support BACnet® communication via an RJ-45 Ethernet connection.
    e. Communication Connections
        1) All communication connections shall be accessible in a dedicated customer connection area that is separated from factory wiring into the controller to prevent field connections from interfering with factory wiring.
        2) The controller shall not require any additional hardware to support Modbus®, SNMP or BACnet® communication.
15. Paralleling
    a. The controller shall be capable of paralleling with other generators with the same controller through a dedicated communication network between the controllers and onboard paralleling capabilities.
    b. The controller shall support paralleling up to eight generators on a common bus.
    c. The controller shall support paralleling a single generator with utility using kW, kVAR, and Power Factor settings.
    d. Synchronization
        1) The controller shall support onboard synchronization to allow matching of voltage, frequency and phase before closing a circuit breaker or contactor to connect the generator to the bus.
        2) The controller shall use first-on logic to determine which generator will close to the dead bus first.
        3) The controller shall support 3 common forms of synchronizing, Automatic (synch and close breaker), Sync-check (synch-no closure) and Permissive (no active synch, allow manual close if in synch).
        4) The controller shall announce a fail to synch fault when synchronization is not achieved within the programmed time delay.
        5) The controller shall actively maintain synchronizing efforts to achieve synchronization even after the time delay has expired.

6) The controller shall be capable of actively displaying the synchronizing parameter values for both the generator and the bus when synchronizing; voltage, frequency and phase.
7) The controller shall be capable of displaying the phase rotation (ABC or CBA) for both the generator and the bus and prevent closure to the bus when phase rotation does not match the generator.

e. Load Sharing
1) The controller shall actively share real and reactive power amongst all generators on the common bus, on a per-unit or percentage basis.
2) The controller shall support soft load and unload of the generator.
3) The controller shall be capable of operating with droop control.

f. Circuit Breaker/Contactor Control
1) The controller shall be capable of operating a circuit breaker or contactor to apply electricity to the parallel electrical bus.
2) The controller system shall have a normally closed contact (fail safe) that will keep the breaker tripped until such conditions are met to allow closure.
3) The controller system shall have a normally open contact to provide an energizing signal to close the circuit breaker.
4) The controller system shall have normally open contact for control of a contactor.
5) The controller will announce a Fail to Close warning when closure is not detected after 1 closure attempt.
6) The controller will announce a Fail to Close shutdown when the number of attempts exceeds the setting (max attempts).
7) The controller will monitor current to detect a failure to open the generator circuit breaker.
8) The controller will keep the generator running until the generator circuit breaker is seen open in order to keep the bus live to prevent other devices from closing to this bus without synchronizing.

16. Generator Management
a. Allows the start and stop of generators based on load demand or state of other generators including:
1) Start Power
2) Stop Power
3) Start Accumulator
4) Stop Accumulator
5) Total Online Capacity
6) Total Available Capacity
7) Total Bus Power
8) Total Bus Capacity
9) Negotiated Order
10) Stopped by Gen Management
11) Start Command

b. The generator management can be configured to operate based on:
1) Engine Run Time
2) Fuel Level
3) Manual Order

c. The controller shall have a programmable disconnect point (kW) below which point the controller shall automatically trip the generator circuit breaker.

17. Protective Relays
    a. The controller shall provide a standard set of protective relay functions with programmable limits and time delays
        1) Over Voltage (59)
            i. User adjustable range – 100% to 130%
            ii. User adjustable range time delay – 0 to 120 seconds
        2) Under Voltage (27)
            i. User adjustable range – 70% to 100%
            ii. User adjustable time delay – 0 to 120 seconds
        3) Over Frequency (81O)

            i. User adjustable range – 100% to 140%
            ii. User adjustable time delay – 0 to 120 seconds
        4) Reverse Power (32R)
            i. User adjustable range – 0% to 50%
            ii. User adjustable time delay – 0 to 120 seconds
        5) Over Power (32O)
            i. User adjustable range – 90% to 150%
            ii. User adjustable time delay – 0 to 120 seconds
        6) Loss of Field (40 Reverse VARS)
            i. User adjustable range – 10% to 100%
            ii. User adjustable time delays – 0 to 120 seconds
        7) Over Current with Voltage Range
            i. User adjustable range – 100% to 200%
            ii. User adjustable time delay – 0 to 120 seconds

I. Generator Overcurrent and Fault Protection
1. The generator shall be provided with a factory installed, 80% rated line circuit breaker rated at 1000.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
2. The circuit breaker(s) shall incorporate a thermo-magnetic trip unit.
3. Load side lugs shall be provided from the factory. The line circuit breaker shall include auxiliary contacts, shunt trip, undervoltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.
4. The shunt trip device shall be connected to trip the generator breaker when the generator-set is shut down by other protective devices.
5. When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the other generator-set alarms.
6. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

J. Alternator
1. The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet

the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby @40C. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

2. The alternator shall have a maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
3. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
4. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 289.00 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

K. Vibration Isolation
1. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 ACCESSORIES

A. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

B. The generator set shall be supplied with a common failure relay to provide means of signaling fault and/or shutdown conditions.
1. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
2. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).
3. Once energized the relay shall remain latched until the system is reset by the main controller switch.

C. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)

D. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries, with the following features:
1. Automatic 3-stage float to equalization charge

2. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations
3. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
4. LED lamp for power ON indication
5. Current limited during engine cranking, short circuit, and reverse polarity conditions
6. Temperature compensated for ambient temperatures for -40°C to 60°C
7. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
8. UL 1012 Listed
9. CSA Certified

E. The generator set shall be furnished with rodent guards to prevent rodent intrusion and protect internal components.

F. Enclosure shall have an external emergency stop button that is recessed in the enclosure panel for protection.

G. The generator shall be supplied with a thermostatically controlled strip heater to prevent the accumulation of moisture and dampness and to maintain the stator windings above the dew point. The heater shall be wired to be “on” at all times that the generator set is not operating.

H. Block Heater - The block heater shall be thermostatically controlled, 3,000 watt, 480 VAC - single phase, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

I. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.

J. Supply flexible fuel lines to provide a flexible connection between the engine fuel fittings and the fuel supply tank piping and for the fuel return lines from the injector pump per engine manufacturer’s recommendations. Flex line shall have a protective steel wire braid to protect the hose from abrasion.

K. Remote annunciator panel – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source availability, contactor position, and loaded or unloaded test for up to four transfer switches. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.

L. Supply a Modbus to Ethernet Converter that provides one RJ45 jack for standard Ethernet 10/100 connection, and a terminal block for RS-485 connection, and is powered by 12 VDC. The Baud rate on the Modbus RTU side shall be selectable 9600 or 19200. The converter shall support Simple Network Management Protocol (SNMP) users to poll or issue trap commands.

M. The controller must have the capability to communicate to a personal computer (IBM or compatible) running Windows ’9X, Windows XT, Windows 7, Windows 8, or Windows NT.

N. A variety of connections shall be available based on requirements:

1. A single connection to a PC. A cable length of up to 1220 m (4000 ft) must be supported.
2. Multiple devices at a single location connected to a PC.
3. A single connection from a device to a PC over phone lines.
4. Multiple devices to a PC over phone lines.

O. When equipped with communications modules, transfer switches and power monitors along with generator set controllers must be able to be connected to the same communication network with no additional interfaces being required.

P. The capability to connect up to 128 devices (generator set controls and transfer switches) on a single network must be supported.

Q. Cabling is to be device to device in a daisy chain fashion with no limitation on device locations within the network.

R. The network must be self- powered. No power wiring between devices is allowed.

S. A single software package with the following capabilities is required:
1. Any combination of transfer switches and generator set controls.
2. Up to 128 devices at a single site must be supported.
3. The same software package must support communications over phone lines. The software shall allow communications with up to 128 sites (phone numbers) including phone number fields large enough for International communication.
4. Access to individual devices by the software shall be protected by password.
5. To support future expansion, it must be possible to add devices (ATS and generator set controllers), up to 128 and sites up to 128, with the installed software. Changing to a different software package is not acceptable.
6. All displays, data inquires, and program functions allowed on the controllers, both generator set and ATS, shall also be available through the software.
7. A single software screen must be capable of displaying data from multiple devices simultaneously.
8. It shall be possible to reset shutdown faults, and restart the generator set using the software.
9. If a transfer switch is used, it must be possible to start the generator set and transfer the loads to the generator.

T. A single software package with the following capabilities is required:
1. Monitor and control any combination of transfer switches and generator controls.
2. Support up to 247 devices at a single site.
3. Support communications over phone lines. The software shall allow communications with up to 247 sites (phone numbers) including phone number fields large enough for International communication.
4. Password-protected data access to individual devices.
5. Expandable to up to 247 devices without changing to a different software package.
6. View up to 100 recent events including engine starts, faults, shutdowns, and warnings.

U. All displays, data inquires, and program functions allowed on the controllers, both generator set and ATS, shall also be available through the software.

V. The software must be menu driven with separate menus for transfer switches and for generator set functions.

W. It shall be possible to reset shutdown faults, and restart the generator set using the software.

2.3 SOURCE QUALITY CONTROL

A. Non-Conforming Work
1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.
   a. **Design Prototype Tests.** Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:
      1) Maximum power (kW)
      2) Maximum motor starting (kVA) at 35% instantaneous voltage dip.
      3) Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
      4) Governor speed regulation under steady-state and transient conditions.
      5) Voltage regulation and generator transient response.
      6) Harmonic analysis, voltage waveform deviation, and telephone influence factor.
      7) Three-phase short circuit tests.
      8) Alternator cooling air flow.
      9) Torsional analysis to verify that the generator set is free of harmful torsional stresses.
      10) Endurance testing.
   b. **Final Production Tests.** Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
      1) Single-step load pickup
      2) Safety shutdown device testing
      3) Rated Power @ 0.8 PF
      4) Maximum power
      5) Upon request, a witness test, or a certified test record sent prior to shipment.
   c. **Site Tests.** The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
      1) Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
      2) Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
      3) Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation, normal and emergency line-to-line voltage and frequency, and phase rotation.
      4) Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic

shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service in accordance with requirements indicated:
   1. Notify Owner no fewer than 5 working days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:
   1. Coordinate size and location of concrete bases for engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

D. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

E. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping sized in accordance with allowable back pressure for the engine and indicated on mechanical plans.
   1. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a minimum of 9 inches (225 mm) of clearance from combustibles.
   2. Drain Piping: Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless steel flexible connector, and Schedule 40 black steel.

3.4 CONNECTIONS

A. Piping installation requirements. are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.

C. Connect cooling-system water piping to engine generator and remote radiator with flexible connectors.

D. Connect engine exhaust pipe to engine with flexible connector.

E. Connect fuel piping to engines with a gate valve and union and flexible connector.

F. Ground equipment in accordance with NFPA 70.

G. Connect wiring in accordance with NFPA 70. Provide flexible conduit routed to the engine generator from a stationary element.

H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 FIELD OR SITE QUALITY CONTROL

A. Testing Agency:
1. Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections
1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in first two subparagraphs below, as specified in NETA ATS. Certify compliance with test parameters.
    a. Visual and Mechanical Inspection:
        1) Compare equipment nameplate data with Drawings and the Specifications.
        2) Inspect physical and mechanical condition.
        3) Inspect anchorage, alignment, and grounding.
        4) Verify that the unit is clean.
    b. Electrical and Mechanical Tests:
        1) Verify phase rotation, phasing, and synchronized operation as required by the application.
        2) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells in accordance with manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
        1) Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.

2) Verify acceptance of charge for each element of the battery after discharge.
3) Verify that measurements are within manufacturer's specifications.
   i. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
   ii. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
   iii. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wc (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
   iv. Exhaust Emissions Test: Comply with applicable government test criteria.
   v. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 percent step-load increases and decreases and verify that performance is as specified.

b. Coordinate tests with tests for transfer switches and run them concurrently.
c. Test instruments to have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.
d. Leak Test: After installation, inspect exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.
e. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.
f. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
g. Remove and replace malfunctioning units and retest as specified above.
h. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.
i. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts to be manufacturer's authorized replacement parts and supplies.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION

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PART 1 – GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, connection, and testing of open-transition automatic transfer switches with bypass isolation, indicated as automatic transfer switches or ATS in this section.

1.2 RELATED WORK

A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.

B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirement for seismic restraint for nonstructural components.

C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.

D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.

E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personal safety and to provide a low impedance path for possible ground fault currents.

F. Section 26 05 33, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits.

G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Short circuit and coordination study, and requirements for a coordinated electrical system.

H. Section 26 32 13, ENGINE-GENERATORS: Requirements for normal and emergency power generation.

I. Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS: General communications requirements that are common to more than one section in Division 27.

J. Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATION SYSTEMS: Raceways for communications cabling.

K. SECTION 27 15 00, COMMUNICATIONS HORIZONTAL CABLING: Communications media for interconnecting automatic transfer switches and remote control and annunciation components.

1.3 QUALITY ASSURANCE

A. Quality Assurance shall be in accordance with Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES) in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

B. A factory-authorized representative shall be capable of providing emergency maintenance and repairs at the project site within 4 hours maximum of notification.

C. Automatic transfer switch, bypass/isolation switch, and annunciation control panels shall be products of the same manufacturer.

1.4 FACTORY TESTS

A. ATS shall be thoroughly tested at the factory to assure that there are no electrical or mechanical defects.

B. Factory Tests shall be in accordance with Paragraph, MANUFACTURED PRODUCTS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Perform visual inspection to verify that each ATS is as specified.
2. Perform mechanical test to verify that ATS sections are free of mechanical defects.
3. Perform insulation resistance test to ensure electrical integrity and continuity of entire system.
4. Perform main switch contact resistance test.
5. Perform electrical tests to verify complete system electrical operation.

1.5 SUBMITTALS

A. Submit in accordance with Paragraph, SUBMITTALS in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, and the following requirements:
1. Shop Drawings:
   a. Submit sufficient information to demonstrate compliance with drawings and specifications.
   b. Include voltage rating, continuous current rating, number of phases, withstand and closing rating, dimensions, weights, mounting details, conduit entry provisions, front view, side view, equipment and device arrangement, elementary and interconnection wiring diagrams, factory relay settings, and accessories.
   c. For automatic transfer switches that are networked together to a common means of annunciation and/or control, submit interconnection diagrams as well as site and building plans, showing connections for normal and emergency sources of power, load, control and annunciation components, and interconnecting communications paths. Equipment locations on the diagrams and plans shall match the site, building, and room designations on the drawings.
   d. Complete nameplate data, including manufacturer's name and catalog number.
   e. A copy of the markings that are to appear on the automatic transfer switches when installed.
   f. Certification from the manufacturer that representative ATS have been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.
2. Manuals:
   a. Submit, simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.
      1) Schematic signal and control diagrams, with all terminals identified, matching terminal identification in the automatic transfer switches.
      2) Include information for testing, repair, troubleshooting, assembly, disassembly, and factory recommended/required periodic maintenance procedures and frequency.
      3) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
   b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two

weeks prior to the final inspection.
1) Include complete "As Installed" diagrams that indicate all pieces of equipment and their interconnecting wiring.
2) Include complete diagrams of the internal wiring for each piece of equipment, including "As Installed" revisions of the diagrams.
3) The wiring diagrams shall identify the terminals to facilitate installation, maintenance, operation, and testing.

3. Certifications:
   a. When submitting the shop drawings, submit a certified test report from a recognized independent testing laboratory that a representative sample has passed UL 1008 prototype testing.
   b. Two weeks prior to final inspection, submit the following.
      1) Certification by the manufacturer that the ATS conform to the requirements of the drawings and specifications.
      2) Certification by the Contractor that transfer switches have been properly installed, adjusted, and tested.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

B. Institute of Electrical and Electronic Engineers (IEEE):

446-95.....Emergency and Standby Power Systems for Industrial and Commercial Applications

C37.90.1-12 .....Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

C62.41.1-02 .....Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

C62.41.2-02 .....Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

C. International Code Council (ICC):

IBC-15.....International Building Code

D. National Electrical Manufacturers Association (NEMA):

250-14.....Enclosures for Electrical Equipment (1000 Volts Maximum)

ICS 6-06.....Enclosures

ICS 4-15.....Application Guideline for Terminal Blocks

MG 1-16.....Motors and Generators

E. National Fire Protection Association (NFPA):

70–17 National Electrical Code (NEC)

99-15 Health Care Facilities

110-16.....Emergency and Standby Power Systems

F. Underwriters Laboratories, Inc. (UL):

50-15 Enclosures for Electrical Equipment

508-99.....Industrial Control Equipment

891-05.....Switchboards

1008-14.....Transfer Switch Equipment

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Automatic transfer switches shall comply with IEEE, NEMA, NFPA, UL, and have the following features:
   1. Automatic transfer switches shall be open transition switches, 4-pole, draw-out construction, electrically operated, mechanically held open contact type, without integral overcurrent protection. Automatic transfer switches utilizing automatic or non-automatic molded case circuit breakers, insulated case circuit breakers, or power circuit breakers as switching mechanisms are not acceptable.
   2. Automatic transfer switches shall be completely factory-assembled and wired such that only external circuit connections are required in the field.
   3. Each automatic transfer switch shall be equipped with an integral bypass/isolation switch.
   4. Ratings:
      a. Phases, voltage, continuous current, poles, and withstand and closing ratings shall be as shown on the drawings.
      b. Transfer switches are to be rated for continuous duty at specified continuous current rating on 60Hz systems.
   5. Markings:
      a. Markings shall be in accordance with UL 1008.
   6. Tests:
      a. Automatic transfer switches shall be tested in accordance with UL 1008. The contacts of the transfer switch shall not weld during the performance of withstand and closing tests when used with the upstream overcurrent device and available fault current specified.
   7. Surge Withstand Test:
      a. Automatic transfer switches utilizing solid-state devices in sensing, relaying, operating, or communication equipment or circuits shall comply with IEEE C37.90.1.
   8. Housing:
      a. Enclose automatic transfer switches in wall- or floor-mounted steel cabinets, with metal gauge not less than No. 14, in accordance with UL 508, or in a switchboard assembly in accordance with UL 891, as shown on the drawings.
      b. Enclosure shall be constructed so that personnel are protected from energized bypass- isolation components during automatic transfer switch maintenance.
      c. Automatic transfer switch components shall be removable without disconnecting external source or load power conductors.
      d. Finish: Cabinets shall be given a phosphate treatment, painted with rust-inhibiting primer, and finish-painted with the manufacturer's standard enamel or lacquer finish.
      e. Viewing Ports: Provide viewing ports so that contacts may be inspected without disassembly.

9. Operating Mechanism:
    a. Actuated by an electrical operator.
    b. Electrically and mechanically interlocked so that the main contact cannot be closed simultaneously in either normal and emergency position.
    c. Normal and emergency main contacts shall be mechanically locked in position by the operating linkage upon completion of transfer. Release of the locking mechanism shall be possible only by normal operating action.
    d. Contact transfer time shall not exceed six cycles.
    e. Operating mechanism components and mechanical interlocks shall be insulated or grounded.
10. Contacts:
    a. Main contacts: Silver alloy.
    b. Neutral contacts: Silver alloy, with same current rating as phase contacts.
    c. Current carrying capacity of arcing contacts shall not be used in the determination of the automatic transfer switch rating, and shall be separate from the main contacts.
    d. Main and arcing contacts shall be visible for inspection with cabinet door open and barrier covers removed.
11. Manual Operator:
    a. Capable of operation by one person in either direction under no load.
12. Replaceable Parts:
    a. Include the main and arcing contacts individually or as units, as well as relays, and control devices.
    b. Automatic transfer switch contacts and accessories shall be replaceable from the front without removing the switch from the cabinet and without removing main conductors.
13. Sensing Features:
    a. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100% of nominal, and dropout voltage is adjustable from 75 to 98% of pickup value. Factory set for pickup at 90% and dropout at 85%.
    b. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
    c. Voltage/Frequency Lockout Relay: Prevent premature transfer to the engine-generator. Pickup voltage shall be adjustable from 85 to 100% of nominal. Factory set for pickup at 90%. Pickup frequency shall be adjustable from 90 to 100% of nominal. Factory set for pickup at 95%.
    d. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
    e. Test Switch: Simulate normal-source failure.
    f. Switch-Position Indication: Indicate source to which load is connected.
    g. Source-Available Indication: Supervise sources via transfer switch normal- and emergency-source sensing circuits.
    h. Normal Power Indication: Indicate "Normal Source Available."
    i. Emergency Power Indication: Indicate "Emergency Source Available."
    j. Transfer Override Control: Overrides automatic retransfer control so that automatic transfer switch shall remain connected to emergency power source regardless of condition of normal source. Control panel shall indicate override status.
    k. Engine Starting Contacts: One isolated and normally closed and one isolated and normally open; rated 5 A at 30 V DC minimum.
    l. Engine Shutdown Contacts: Time delay adjustable from zero to 15 minutes, and

factory set for 5 minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

m. Engine-Generator Exerciser: Programmable exerciser starts engine-generator(s) and transfers load to them from normal source for a preset time, then retransfers and shuts down engine-generator(s) after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period.

14. Controls:
    a. Controls shall provide indication of switch status and be equipped with alarm diagnostics.
    b. Controls shall control operation of the automatic transfer switches.
15. Factory Wiring: Train and bundle factory wiring and label either by color-code or by numbered/lettered wire markers. Labels shall match those on the shop drawings.
16. Annunciation, Control, and Programming Interface Components: Devices for communicating with remote programming devices, annunciators, or control panels// and paralleling switchgear// shall have open-protocol communication capability matched with remote device.
17. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to the automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit in-rush and seal currents are rated for actual currents to be encountered.

2.2 SEQUENCE OF OPERATION

A. The specified voltage decrease in one or more phases of the normal power source shall initiate the transfer sequence. The automatic transfer switch shall start the engine-generator(s) after a specified time delay to permit override of momentary dips in the normal power source.

B. The automatic transfer switch shall transfer the load from normal to emergency source when the frequency and voltage of the engine-generator(s) have attained the specified percent of rated value.

C. Engine Start: A voltage decrease, at any automatic transfer switch, in one or more phases of the normal power source to less than the specified value of normal shall start the engine-generator(s) after a specified time delay.

D. Transfer to Emergency System Loads: Automatic transfer switches for Emergency System loads shall transfer their loads from normal to emergency source when frequency and voltage of the engine-generator(s) have attained the specified percent of rated value. Only those switches with deficient normal source voltage shall transfer.

E. Transfer to Equipment Branch Loads: Automatic transfer switches for Equipment Branch loads shall transfer their loads to the engine-generator on a time-delayed, staggered basis, after the Emergency System switches have transferred. Only those switches with deficient normal source voltage shall transfer.

F. Retransfer to Normal (All Loads): Automatic transfer switches shall retransfer the load from emergency to normal source upon restoration of normal supply in all phases to the specified percent or more of normal voltage, and after a specified time

delay. Should the emergency source fail during this time, the automatic transfer switches shall immediately transfer to the normal source whenever it becomes available. After restoring to normal source, the engine- generator(s) shall continue to run unloaded for a specified interval before shut-down.

2.3 BYPASS-ISOLATION SWITCH

A. Provide each automatic transfer switch with two-way bypass-isolation manual type switch. The bypass-isolation switch shall permit load by-pass to either normal or emergency power source and complete isolation of the automatic transfer switch, independent of transfer switch position. Bypass and isolation shall be possible under all conditions including when the automatic transfer switch is removed from service.

B. Operation: The bypass-isolation switch shall have provisions for operation by one person through the movement of a maximum of two handles at a common dead front panel in no more than 15 seconds. Provide a lock, which must energize to unlock the bypass switch, to prevent bypassing to a dead source. Provide means to prevent simultaneous connection between normal and emergency sources.
   1. Bypass to normal (or emergency): Operation of bypass handle shall allow direct connection of the load to the normal (or emergency) source, without load interruption or by using a break-before-make design, or provide separate load interrupter contacts to momentarily interrupt the load.
      a. Ensure continuity of auxiliary circuits necessary for proper operation of the system.
      b. A red indicating lamp shall light when the automatic transfer switch is bypassed.
      c. Bypassing source to source: If the power source is lost while in the bypass position, bypass to the alternate source shall be achievable without re-energization of the automatic transfer switch service and load connections.
   2. Isolation: Operation of the isolating handle shall isolate all live power conductors to the automatic transfer switch without interruption of the load.
      a. Interlocking: Provide interlocking as part of the bypass- isolation switch to eliminate personnel-controlled sequence of operation, and to prevent operation to the isolation position until the bypass function has been completed.
      b. Padlocking: Include provisions to padlock the isolating handle in the isolated position.
      c. Visual verification: The isolation blades shall be visible in the isolated position.
   3. Testing: It shall be possible to test (normal electrical operation) the automatic transfer switch and engine–generator(s) with the isolation contacts closed and the load bypassed without interruption of power to the load.

C. Ratings: The electrical capabilities and ratings of the bypass-isolation switch shall be compatible with those of the associated automatic transfer switch, including any required additional withstand tests.

2.4 REMOTE ANNUNCIATOR SYSTEM

A. Remote annunciator panel shall annunciate conditions for indicated automatic transfer switches. Annunciation shall include the following:
   1. Sources available, as defined by actual pickup and dropout settings of automatic transfer switch controls.
   2. Switch position.
   3. Switch in test mode.
   4. Failure of communication link.

B. Remote annunciator panel shall be visual and audible type with LED display panel, audible signal, and silencing switch.

1. Panel shall indicate each automatic transfer switch monitored, the location of automatic transfer switch, and the identity of load it serves.
2. Mounting: Steel cabinet, flush or surface mounted, as shown on the drawings.

2.5 REMOTE ANNUNCIATOR AND CONTROL SYSTEM

A. Include the following functions for indicated automatic transfer switches:
1. Indication of sources available, as defined by actual pickup and dropout settings of automatic transfer switch controls.
2. Indication of automatic transfer switch position.
3. Indication of automatic transfer switch in test mode.
4. Indication of failure of communication link.
5. Key-switch or user-code access to control functions of panel.
6. Control of automatic transfer switch test initiation.
7. Control of automatic transfer switch operation in either direction.
8. Control of time-delay bypass for transfer to normal source.

B. Malfunction of remote annunciator and control system or communication link shall not affect functions of automatic transfer switches. Automatic transfer switch sensing, controlling, or operating functions shall not depend on remote annunciator and control system for proper operation.

C. Remote annunciation and control system shall include the following features:
1. Touchscreen type operator interface.
2. Control and indication means grouped together for each automatic transfer switch.
3. Label each indication and control group. Indicate the automatic transfer switch it controls, the location of the automatic transfer switch, and the identity of the load that it serves.
4. Digital Communication Capability: Matched to that of automatic transfer switches supervised.
5. Mounting: Steel cabinet, flush or surface mounted, as shown on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install automatic transfer switches and associated remote components in accordance with the NEC, as shown on the drawings, and manufacturer’s instructions.

B. Anchor automatic transfer switches with rustproof bolts, nuts, and washers not less than 1/2 inch diameter, in accordance with manufacturer’s instructions, and as shown on drawings.

C. In seismic areas, automatic transfer switches shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.

D. Mount automatic transfer switches on concrete slab. Unless otherwise indicated, the slab shall be at least 4 inches thick. The top of the concrete slab shall be approximately 4 inches above finished floor. Edges above floor shall have 1/2 inch chamfer. The slab shall be of adequate size to project at least 100 mm (8 inches) beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Cut off and bush conduits 75 mm (3 inches) above slab surface. Concrete work shall be as

specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.

E. Anchor remote control and/or annunciator panel to wall.

3.2 ACCEPTANCE CHECKS AND TESTS

A. An authorized representative of the automatic transfer switch manufacturer shall technically supervise and participate during all of the field adjustments and tests. Major adjustments and field tests shall be witnessed by the Resident Engineer and/or COR. The manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

B. Perform manufacturer's required field tests in accordance with the manufacturer's recommendations. In addition, include the following:
   1. Visual Inspection and Tests:
      a. Compare equipment nameplate data with specifications and approved shop drawings.
      b. Inspect physical, electrical, and mechanical condition.
      c. Confirm correct application of manufacturer's recommended lubricants.
      d. Verify appropriate anchorage, required area clearances, and correct alignment.
      e. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
      f. Verify grounding connections.
      g. Verify ratings of sensors.
      h. Vacuum-clean enclosure interior. Clean enclosure exterior.
      i. Exercise all active components.
      j. Verify that manual transfer warning signs are properly placed.
      k. Verify the correct operation of all sensing devices, alarms, and indicating devices.
   2. Electrical tests:
      a. Perform insulation-resistance tests.
      b. After energizing circuits, demonstrate the interlocking sequence and operational function for each automatic transfer switch at least three times.
         1) Test bypass-isolation unit functional modes and related automatic transfer switch operations.
         2) Power failure of normal source shall be simulated by opening upstream protective device. This test shall be performed a minimum of five times.
         3) Power failure of emergency source with normal source available shall be simulated by opening upstream protective device for emergency source. This test shall be performed a minimum of five times.
         4) Low phase-to-ground voltage shall be simulated for each phase of normal source.
         5) Operation and settings shall be verified for specified automatic transfer switch operational feature, such as override time delay, transfer time delay, return time delay, engine shutdown time delay, exerciser, auxiliary contacts, and supplemental features.
         6) Verify pickup and dropout voltages by data readout or inspection of control settings.
         7) Verify that bypass and isolation functions perform correctly, including the physical removal of the automatic transfer switch while in bypass mode.
      c. Ground-fault tests: Verify that operation of automatic transfer switches shall not cause nuisance tripping or alarms of ground fault protection on either source.
      d. When any defects are detected, correct the defects and repeat the tests as requested by the Resident Engineer and/or COR at no additional cost to the Government.

3.3 FIELD SETTINGS VERIFICATION

A. The automatic transfer switch settings shall be verified in the field by an authorized representative of the manufacturer.

3.4 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that the automatic transfer switches are in good operating condition and properly performing the intended function.

3.5 INSTRUCTION

A. Furnish the services of a factory-trained technician for one 4-hour training period for instructing personnel in the maintenance and operation of the automatic transfer switches, on the dates requested by the Resident Engineer and/or COR.

END OF SECTION

SECTION 27 00 10 – TECHNOLOGY GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS AND DEFINITIONS

A. Scope: This specification section applies to all Division 27 specification sections and all Division 28 specification sections with the exception of Fire Alarm. All systems under the specifications indicated above are referenced also in this contract documents as “technology systems”.

B. Drawings and specifications: The words “drawings” and “specifications” used on this section refer to all contract drawings and specifications describing the scope of work of the technology system.

C. Installer and Contractor: The word “installer” where used on the drawings or specifications without any further description shall reference the installer of the system under reference. The word “contractor” where used on the drawings or specifications without any further description shall reference to the General Contractor (or Construction Manager) holding the prime agreement with the owner for the construction of this project.

D. Provide and Install: The word, "provide" where used on the drawings or specifications shall mean, "furnish, install, mount, connect, test, complete, document and make ready for operation". The word "install" where used on the drawings or specifications shall mean, "mount, connect, test, complete, and make ready for operation".

E. The word Engineer (also referenced as A&E) where used on the drawings or specification refers to the design engineer of the project working for the project architect or the owner. It does not refer to an engineer working for the General contractor, Construction Manager or any of the installers in the project.

F. Complete systems: All technology systems are intended to be complete systems, including all materials, labor and programming to make it an operation system.

G. Active equipment: Active equipment is defined as equipment composed of electronic component and electric materials, design to work with power applied to it. Cables are not considered active equipment.

1.2 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. Objective: The intent of the design drawings and specifications is to provide the installer of a technology system a scope of work for bidding purposes and to make sure different bids received by the entity holding the bidding for the technology system are at the same level of scope for comparison purposes. The drawings and specifications are not intended to show every single element of the project to produce a buyout list for the installer. In general, for all technology systems, all active components are specifically called out but

small wires andsmall installation materials (such as nut, bolts, washers, termination blocks, clamps, ties, etc) are not indicated in the documents. Guidelines for installation of those systems are provided in the specification to allow the installer to produce the complete buyout list of materials.

B. Accuracy: The Drawings are diagrammatic and are not intended to show exact locations of conduit runs, outlet boxes, junction boxes, pull boxes, etc. The locations of equipment, appliances, fixtures, conduits, outlets, boxes and similar devices shown on the Drawings are approximate only. Exact locations shall be as accepted by the Architect or Engineer during construction. Obtain in the field all information relevant to the placing of technology systems work and in case of interference with other work, proceed as directed by the Architect or Engineer.

C. Distances: Although most drawings have a scale referenced on each sheet, the drawings are a two dimensional representation of the system, so design drawings do not indicate changes in elevation that cause additional lengths and quantities of materials. It is the responsibility of the installer of each technology system to field verify all distances before bidding to properly estimate all cable distances and materials.

D. Discrepancies: Notify the A&E of any discrepancies found during construction of the project and do not proceed with that portion of the project, until a written definitive statement is received providing clear direction. If a conflict exists between the contract documents and any applicable code or standard, the most stringent requirement shall be included for this project. The Engineer shall make the decision regarding questionable areas of conflict.

E. Existing Conditions: All existing conditions might not be indicated in the design drawings. The installer of each system shall check site and existing conditions thoroughly before biddingand advice the Engineer of discrepancies prior to bid.

F. Coordination: Although design technology drawings were intended to be coordinated with other trades, the fact that installer for other non-technology system might have changes to their design drawings, requires the Contractor to produce coordination drawings for a specific space, including all elements of all trades for space planning and coordination purposes.

1.3 ABBREVIATIONS

A. Abbreviations: The following abbreviations or initials may be used:
1. ABV CLG - Above Ceiling
2. AC - Alternating Current
3. ADA - American Disabilities Act
4. AFF - Above Finished Floor
5. AFG - Above Finished Grade
6. AMP - Ampere
7. ANSI - American National Standards Institute
8. AWG - American Wire Gauge

9. BC - Bare Copper
10. CCTV - Closed Circuit Television
11. CATV - Community antenna television
12. CLG - Ceiling
13. COAX - Coaxial Cable
14. CPU - Central Processing Unit
15. DC - Direct Current
16. DEG - Degree
17. EMT – Electrical Metallic Tubing
18. GND - Ground
19. IDF - Intermediate Distribution Frame (Telecom Room)
20. IMC - Intermediate Metallic Conduit
21. IN - Inches
22. IP - Internet Protocol
23. JB - Junction Box
24. KVA - Kilo-Volt-Amps
25. KW - Kilowatts
26. LBS - Pounds
27. LED - Light Emitting Diode
28. MAX - Maximum
29. MDF - Main Distribution Frame (Main Telecom Room)
30. MIC - Microphone
31. MIN - Minimum
32. MTD - Mounted
33. MTG - Mounting
34. CEC - National Electrical Code
35. NECA - National Electrical Contractors Association
36. NEMA - National Electrical Manufacturers Association
37. NFPA - National Fire Protection Association
38. NIC - Not in Contract
39. OFE - Owner furnished equipment
40. OSHA - Occupational Safety and Health Administration
41. PB - Pullbox
42. PWR - Power
43. PVC - Polyvinylchloride
44. EF - Telecommunications Entrance Facility
45. TR - Telecommunications Room
46. TTB - Telephone Terminal Board
47. V - Volt
48. WP - Weatherproof

1.4 CODES AND STANDARDS

A. Application: The codes, standards and practices listed herein generally apply to the entire project and all technology systems. Other codes, standards or practices that are more specific will be referenced within a particular specification.

B. Requirements: All articles, products, materials, fixtures, forms or types of construction covered in the specifications will be required to meet or exceed all applicable standards of manufacturer, testing, performance, capabilities, procedures and installation according to the requirements of ANSI, NEMA, IEEE, CEC, BICSI and TIA referenced documents where indicated and the manufacturer's recommended practices. Requirements indicated on the contract documents which exceed but are not contrary to governing codes shall be followed.

C. Compliance and Certification: The installation shall comply with the governing state and local codes or ordinances. The completed technology system installation shall be inspected and certified by all applicable agencies that it is in compliance with all codes.

D. Applicability: The codes and standards and practices listed herein, and their respective dates are furnished as the minimum requirements. List of applicable codes:
   1. State Code: California Administrative Code
   2. Building Code: California Building Code, current version

E. UL Labels: All materials shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. No equipment shall be installed if there is no labeling or listing service is available for such equipment.

1.5 MATERIALS ALTERNATES AND SUBSTITUTIONS

A. Definitions:
   1. Basis of design: A product or group of products from an identified manufacturer that was used as the basis of systems layouts and installation details, part of the contract documents.
   2. Prototype: Is a product or a group of products that are not yet ready for commercial use because they are in the testing phase (Beta testing) of the product development.
   3. Alternates: Products or manufacturers listed in the contract documents as acceptable compare to the basis of design. Use of alternates shall follow the same system architecture as the basis of design.
   4. Obsolete: A product that has been discontinued by the manufacturer or declared in end of life, and it is no longer being manufactured.
   5. Substitution: A product not listed in the contract documents but capable of similar characteristics as the basis of design operating as a direct replacement in the system in reference. The installers can propose a substitution if all requirements are meet as indicated in this specification.
   6. Substitutions that create a change in system architecture are products that create a very different system configuration impacting other trades (i.e. change in power/cooling requirements, changes in raceways layout or sizes, changes in equipment space requirements, changes in low voltage wiring layouts, types and quantities, etc) but providing a similar end result as the system/products basis of design.

B. Use of Prototype. Prototypes are not allowed in any technology system.

C. Use of alternates. Alternates are allowed and installer shall follow these requirements:
1. Where several brand names make or manufacturers are listed as acceptable alternates each shall be regarded as equally acceptable, based on the design selection. Where a manufacturer's model number is listed, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Engineer's review and acceptance. Where three or more manufacturers are listed, one of the listed manufacturers shall be submitted for acceptance.
2. The use of alternate products does not allow the change of system architecture with such products.

D. Use of substitutions. Substitutions are only allowed when they meet all the requirements below:
1. Substitutions are only allowed when a particular specification section for a technology system, allows the use of substitutions for that particular system.
2. The performance of all substitutions components must meet or exceed those of the basis of design. Should an installer wish to submit a substitution product or a product set stated in the construction documents as 'acceptable', it shall be the responsibility of the installer to submit to the Engineer an item-for-item CROSS-REFERENCE for all specifications of the product, all related specifications and product data sheets, for the proposed substitution. Use the substitution request form indicated in Addendum 1 of this specification.
3. The Engineer has the authority to reject a substitution without cause and the installer shall provide the basis of design and no additional compensation.
4. Substitutions of unnamed manufacturers will not be acceptable.
5. Certification of substitutions: When a basis of design is specified to be in accordance with a trade association or government standard requested by the Engineer, installer shall provide a certificate that the substitution complies with the referenced standard. Upon request of Engineer, Contractor shall submit supporting test data to substantiate compliance.
6. Substitutions that create a change in system architecture are allowed under the following conditions:
    a. Substitution request for this type of system requires submitting the overall cost of substitution including the cost of changing other systems affected as well as there- design cost for such systems. Without this information this type of substitution will not be evaluated at all.

1.6 SHOP DRAWINGS AND SUBMITTALS

A. General: Shop drawings shall be submitted for equipment and material as indicated in the individual specification sections for each system. .

B. Quantity of shop drawings submittals: Follow Division 1 requirements for quantity of shop drawings and submitting requirements. If the project does not have a Division 1

specification, shop drawings shall be submitted in quantity of one (1) for electronic format submittal and quantity of four (4) for hardcopies.

C. Electronic submittals. Submittals in electronic format (PDF) are accepted.

D. When cut sheets of products are submitted and the manufacturer cut sheets indicate several model numbers or variations of the same product, the cut sheet shall be highlighted by the installer to indicate the specific product that will be provided for this project. Submittals received with cut sheets indicating multiple parts numbers and not highlighted will be rejected and not reviewed.

E. Equipment and material quantities are not reviewed by the A&E as part of this submittal process. Equipment quantities are to be provided by the installer as indicated in contract documents. Approved shop drawings indicating any changes in equipment quantities or overall scope of work different from contract documents do not constitute approval by the A&E of those changes. The contract documents and any changes issued by the A&E in the form of Supplemental Information during the construction process are always to be followed for equipment quantities and scope of work.

F. All electronic equipment prone to obsolescence and with lead times less than 3 months shall be submitted for approval no sooner than 12 months before the date set for substantial completion of the project. Electronic equipment prone to obsolescence includes devices like flat panel displays, transceivers, servers, players, workstation, and routers.

G. Equipment and materials installed not in accordance with the approved shop drawings shall be replaced at the installer's expense.

H. Multiple stages of shop drawings shall be required as indicated in each specification section. For final completion and testing the installer shall provide a submittal with the following information:
   1. Detailed course syllabus for each type of training required in the specifications.
   2. A proposed schedule of training sessions in compliance with the specification sections and indicating place where the training will take place.
   3. A copy of all training material to be used during each session.
   4. Test result sheets for all testing done by the installer prior to the system acceptance test.

PART 2 - PRODUCTS

2.1 IDENTIFICATION AND LABELING TAGS

A. All conduit, cabinets, cables, wires, wiring forms, terminal blocks, and terminals shall be clearly identified with pre-printed labels or tags.

B. The only approved types of labels for inside premise environments for any technology

systems are:

1. Non-laminated thermal transfer labels, printed with a high-quality thermal transfer printer.
2. Laminated thermal transfer labels printed with a high-quality thermal transfer printer.
3. Thermal transfer polyolefin tape printed with a high-quality thermal transfer printer.
4. Self-laminated dot-matrix labels, printed with a high-quality dot-matrix printer.
5. Non-laminated dot-matrix labels, printed with a high-quality dot matrix printer.

C. For labeling of cables or equipment in outdoor environments use only marker plates attached to cable or equipment with cable ties. Do not use any labels with adhesive materials. Use different color plates for different cable types. Use only waterproof ink for writing on marker plates.

D. Any type of write-on labels (except for outdoor marker plates), handwriting on cable jackets or directly on equipment, labels made with masking tape or any other type of tape not listed in previous paragraph are not acceptable and shall be corrected with approved labeling methods at no additional cost to the owner.

2.2 TECHNOLOGY EQUIPMENT AND MATERIALS

A. General: Each item of equipment or material shall be manufactured by a company regularly engaged in the manufacturer of the type and size of equipment, shall be suitable for the environment in which it is to be installed, shall be approved for its purpose, environment, and application, and shall bear a label as indicated in paragraph 1.4.E. of this section.

B. Installation Requirements: Each item of equipment or material shall be installed in accordance with instructions and recommendations of the manufacturer and the contract documents.

C. Required Accessories: All equipment specified in the technology systems shall be provided with all required accessories for proper operation and mounting. Typically these accessories are not specifically indicated in the design drawings but shall be provided per this specification section. Such accessories include items such as power supplies, power cords, rack ears, rack rails, bolts, lugs, faceplates, etc.

PART 3 - EXECUTION

3.1 INSTALLATION PRACTICES

A. WORKMANSHIP: The installation of materials and equipment shall be performed in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a quality level of workmanship. Personnel who install materials and equipment shall be qualified by training and experience to perform their

assigned tasks.

B. STANDARD OF QUALITY: To define good workmanship, all installation practices described in BICSI standards shall be followed.

C. PROTECTION OF EQUIPMENT: Equipment for Technology systems shall at all times during construction be adequately protected against mechanical/chemical damage by the elements or work perform by other trades. Equipment shall be stored in dry permanent shelters. If equipment or materials has been damaged, such equipment shall be replaced at no additional cost or time extension to the Contract. Damaged equipment and materials include the following conditions:
   1. Equipment that has visible scratches, cracks or equipment that has paint or finished surface peeled off.
   2. Equipment with visible indication of rust or water intrusion.
   3. Equipment that has dents on the metal enclosures and are clearly visible to the end user.
   4. Equipment that has been sprayed with paint, fireproofing materials, or other type of chemicals, when the equipment was not intended to have this type of materials applied to it, per contract documents.
   5. Equipment that has been burnt by controlled fires, power surges, power sags or by lightning.
   6. Equipment that has a known damage to any parts, electronic board or component, even if such component or board has no specific use in the project.
   7. Cables that have visible damages to the jackets even if cables are not broken and still provide electrical continuity.
   8. Cables sprayed with paints that affect the warranty of the cable as defined by the cable manufacturer.
   9. Equipment with screws with stripped heads.

D. CLEAN EQUIPMENT: All equipment installed in spaces accessible to the building occupants like in racks, cabinets, wall mounted panels, credenzas, etc. shall be free of dust at the time the space part of the project gets the final Certificate of Occupancy and at the time of the acceptance test by the A&E. A clean equipment is defined as an equipment that if wiped with a finger, in any surface, does not leave visible debris and dust in the finger, also equipment with no visible signs of dust inside the equipment, like in ventilation fans.

E. IDENTIFICATION AND TAGGING: All technology systems items shall be labeled and identified as specified in the Contract Documents. Such identification shall be in addition to the manufacturer's nameplates and shall serve to identify the item's function and the equipment or system which it serves or controls. Refer to Identification Section of the specifications for additional information. All labels of equipment and wiring shall match the labeling used in the shop drawings for the system.

3.2 COORDINATION

A. General: The installer shall compare shop drawings with those of other trades and report

any conflicts between them to the A&E. Obtain from the A&E written instructions to make the necessary changes in any of the affected work. All work shall be installed in cooperation with other Trades installing interrelated work.

B. Adjustments: Locations of conduit and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Determine the exact routing and location of all systems prior to fabrication or installation.

C. Replacement: All work shall be installed in a way to permit removal (without damage to other parts) of all other system components provided under this Contract requiring periodic replacement or maintenance. All conduits shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles.

3.3 REQUEST OF IP ADDRESSES

A. General: When contract documents require the installer of any of the technology systems to use IP addresses for the configuration of such system, inside the owner's controlled IP network,the installer shall request the owner to provide such IP addresses. The installer shall request such information no less than one (1) month in advance from the moment the installer will be programming the system and by using the form named "Network Connections Programming Plan" indicated in Attachment 3 of this specification. An electronic copy of this form is available upon request from TLC Engineering.

B. Completing the form. The Network Connections Programming plan shall be completed in separate by each trade that requires IP addresses. This form has two parts. The first part indicates all the different device types for a system (i.e. cameras, workstation, servers, controllers, VoIP phones, etc). The second part is a list of all devices required classified by their type and properly indicating location where the device will be used.

C. Requests that do not follow this process or have incomplete information will be ignored and will not be processed.

D. Reprogramming cost of any technology systems due to un-approved addresses used by the installer shall be at the installer's expense.

3.4 TELECOM ROOM/EQUIPMENT ROOM READINESS

A. In any projects where the technology systems require the use of network equipment (switches, routers, firewalls, etc) provided by the owner, the Contractor shall complete all telecom roomsto a point where they are suitable for the owner to deploy such equipment in those rooms. At a minimum the following conditions shall be meet at all rooms in order for the owner to install the equipment:
   1. All power outlets in the telecom rooms shall be fed from the permanent source of power. Temporary power shall not be provided.
   2. Backup power (generator and/or UPS) shall be already operational, tested and connected to the final power distribution system.

3. The mechanical equipment providing the cooling for the telecom rooms shall be fully operational. Temporary cooling shall not be accepted.
4. Fire suppression system (sprinkler or gas based system) protecting the telecom rooms shall be fully operational and tested.
5. All light fixtures in the telecom rooms shall be fully operational.
6. All walls to the telecom rooms shall be completed and including the last coat of paint.
7. The ceiling and flooring of the telecom rooms shall be finished.
8. All horizontal and backbone cabling system part of the structured cabling system (SCS) shall be installed, terminated and tested.
9. The final and permanent doors to the telecom rooms shall be installed with a key core different from all other construction cores in the site.
10. Telecom rooms shall be cleared of any materials being stored inside the room.
11. Telecom rooms shall be clean. Clean will be measured as not having any debris left in the room and not having dust in rack, cabinets, or wall mounted panels. If wiping a finger in any of the surfaces of such equipment leaves visible dust residue in the finger, the room will not be considered clean.
12. Hallways and rooms leading into the telecom rooms shall have no more sanding to be done in the walls and the floor shall be completed to avoid dust from these spaces moving into the telecom rooms.
13. Prior to the owner deploying the equipment in these rooms, the Contractor shall provide disposable sticky mats at the entrance of each telecom room to capture dust and/or dirt from people's shoes or boots coming into the room. The sticky mats shall be selected as to cover the width of the door opening. Sticky mats shall contain no less than 60 sheets in each unit. Used sheets of the mats shall be replaced no less than on a daily basis orif worn out before the end of the day. Sticky mats shall be provided until the project receives the final Certificate of Occupancy.

B. In projects where the network equipment is part of the contract documents, the contractor is required to provide all equipment functioning and clean at the end of the project. The contractor is responsible to determine at what point this delicate equipment can be installed in the telecom room. The contractor shall make sure the recommended manufacturer guidelines are applied to the installation of the equipment when it comes to cleanness. It is highly recommended that all steps indicated above are followed even for this type of project.

3.5 SYSTEMS WARRANTY AND SERVICE

A. General: At a minimum all technology system shall include a warranty from the manufacturer and installer of the system for no less than one (1) year with the following exceptions:
1. Upon completion of installation, provide a manufacturer's Limited Lifetime extended product and performance warranty and at least a 20-year assurance of compliant performance with current or future application based on ANSI/TIA/EIA-568-D for backbone and horizontal cable system infrastructure.
2. When specific equipment or software manufacturers include a warranty longer than one year, the manufacturer's warranty shall be transferred to the owner in the same

terms as indicated by the manufacturer.

B. Warranty coverage. The warranty for the technology system shall cover the following elements:
1. All equipment parts, cabling and materials.
2. Any software updates/patches issued during the warranty period by the manufacturer.
3. The labor to replace those parts and programming time to re-configure equipment.
4. Shipping and freight charges to send equipment back and forth from the manufacturer and/or site.
5. Tool rentals such as scaffold or lifts to access equipment.
6. The troubleshooting time to detect the faults in the system.
7. All travel time and expenses associated with the service.

C. Start of warranty. The warranty period for the technology systems starts the day the project gets the Certificate of Occupancy (CO), for new construction projects. For retrofit jobs of a particular system, the warranty starts when the project is accepted by A&E. For most equipment/software manufacturer's the warranty period starts when the equipment is shipped from the factory, so it is the responsibility of the installer of each system to provide additional warranty coverage from the manufacturer to cover the additional time of warranty up to the CO date plus one year.

D. Service calls. During the warranty period the installer shall support the system when called by owner/contractor for service. All equipment/software service shall be done by personnel with the same qualifications as the personnel who installed the system and as indicated in each technology system specification section. Service calls shall be taken during business hours (same time zone as the project) for normal service and twenty (24) hours three hundred and sixty five (365) days in the year for emergency service. Emergency Service shall be defined as the loss or failure of any critical component necessary to maintain the overall integrity and operation of the system. Normal service shall be defined as the loss or failure of a system component that does not compromise the complete operation of the system and allows the owner to operate the system at a minimum of 90% of its capacity. See individual specification sections for delineation on critical components and normal service.

E. Response time for service. The maximum allowed response time after a service call for emergency service shall be four (4) hours and for normal service twenty four (24) hours.

F. Equipment registration. All equipment/software part of the technology system shall be registered to the owner with the manufacturer of the equipment/software for warranty and support. Equipment/software registered with the manufacturer to the name of the Contractor or installer shall be removed from the project and replaced with equal equipment registered to the owner at no additional cost to the owner.

G. Periodic preventive maintenance visits. During the warranty period the installer of the system shall provide no less than two (2) preventive maintenance services. These services shall be provided at 6 months from start of the warranty period and a few weeks before the

end of the warranty period. The installer of the system shall coordinate with the owner the precise dates for this type of service. During these visits the following task shall be perform:

1. Clean up of any active equipment that shows visible accumulation of dirt, dust of debris of any kind.
2. Replacement of any consumable parts in the system that require replacement per manufacturer's instructions during the warranty period, such as filters.
3. Oiling/greasing of any mechanical parts that require period maintenance as per manufacturer's instructions during the warranty period.
4. Run manufacturer's recommended test for each piece of equipment installed. The installer shall provide at the end of the service a report of such test.
5. Visual observation of all devices in the system to spot any anomalies.
6. Review of error logs from any system components and analysis of such logs with explanation to owner on the cause of those errors.

H. Extended service agreement. Prior to final acceptance testing, and within thirty 30-days of project completion, the installer of each technology system shall submit to the Owner an option to purchase extended service coverage. This proposal shall provide for the purchase option of 1, 3, or 5, year coverage. Coverage shall include, at a minimum, the same provisions as during the warranty period.

3.6 ENGINEER'S FINAL ACCEPTANCE TEST

A. The technology systems shall be tested during installation by the installer as frequently as required to solve any installation issues and non-compliance of system specifications. Technology systems will not be considered delivered to the owner until final acceptance test is passed. The final acceptance test shall be done in the presence of the A&E and/or the owner. The installer shall request in writing with 2 weeks in advance the presence of the A&E and/or owner for the final acceptance test.

B. In order for the installer of the system to request final acceptance the following task shall be completed:

1. All components shall be inspected to ensure they have been properly installed by the installer, securely attached, and remain clean and unmarred
2. All equipment shall be properly adjusted, clearly labeled, and fully operational.
3. The installer shall have tested the system previously to ensure the final acceptance test will be successful. Detailed proof of test shall be sent to the A&E with the request for final acceptance
4. All permanent and final labels as requested in the identification and tagging section of this specification are completed.
5. No temporary conditions shall be present in the system.
6. All batteries on all system components shall be connected.
7. All system programming shall be completed as indicated in the specification for each technology system.

C. All test equipment required for the Final acceptance shall be provided by the installer of the system unless specifically indicated by the A&E.

D. The A&E shall define the scope of the testing but the installer shall be prepared for testing every single component of the system. During the day of the test the A&E will indicate the testing process and procedures for each system. Test could include operation of the system during power outages. The installer of the system shall be available during the complete testing process to answer questions from the Engineer and to demonstrate specific parts of the system. If personnel form the installer or test equipment is not available, the test will be considered and marked as a failure.

E. A punch list of the items to be corrected will be prepared by the A&E during the final acceptance test. The installer shall correct all items and request a second day for verificationof all punch-list items by the A&E and Owner. During the second test, no additional punch list items shall be expected, and only the items in the punch list will be tested.

F. If during the testing process the A&E and/or Owner consider that the rate of failure of the test is too high (more than 5 failures or non-compliance with specifications in one hour of test), the test will be cancelled unilaterally by the A&E and/or owner. The installer shall correct all items and re-schedule the final acceptance test again. The new test will start over from the beginning and nothing previously tested will be accepted. The installer shall not be entitled to additional compensation for the additional effort to test the system during this condition. To the contrary, the Contractor/Installer shall reimburse the owner of the project with the cost of the additional hours of testing required to be spent by the A&E and owner's team. The rate to be used for this reimbursement will be $150 per hour per person required by the A&E and Owner to complete the test.

G. Upon successful completion of the final acceptance test the installer of the system will receive a written notice by the A&E and/or Owner acknowledging the acceptance of the test

H. See individual specification sections for system specific requirements for testing.

3.7 TRAINING AND INSTRUCTION

A. Training for each technology system shall be provided as indicated in this specification and in the individual specification section for each system.

B. The following training guidelines shall be followed for all technology system
   1. Training shall not be scheduled in a way that no attendee or presenter shall be required to attend more than 6 hours of training per day.
   2. Prior to starting all training, the training submittal shall be approved. See section one of this specification for details on the training submittal
   3. No training shall be scheduled prior to the system being completed and accepted by the A&E.
   4. Training shall be conducted during normal business hours of the client, at a date and time of mutual convenience to the Owner and installer. All training sessions need to be scheduled by the installer at least 2 weeks in advance. The Owner shall be notified

in writing by the installer on when are the possible dates for each session.

5. All different types of training shall be videotaped and delivered to the owner as part of the closeout information in digital copy. All tapes shall be recorded in hi-quality MPEG2 or HD recorders, and the media turned to the owner shall be in electronic format viewable through QuickTime or Windows Media Player.
6. The installer is responsible for completing list of attendants for each session of training. All these sheets shall be submitted as part of the close out information

3.8 AS BUILT DOCUMENTS

A. Production: During the course of this project the contractor shall maintain record "as-built drawings". One set shall be maintained at the site and at all times and it shall be accurate, clear, and complete, showing the actual location of all equipment as installed. The "As-Built" drawings shall show all technology systems work installed complete to the present stage of progress. These drawings shall be available for review by the A&E's field representatives at all times.

B. Completion: At the completion of the Work, transfer onto the second set of drawings all changes marked in colored and submit to the A&E.

C. Final: Upon installer's completion of the Engineer's final punch list, transfer all "As-Built" conditions and all requirements by the Engineer to a reproducible set of drawings. Submit full size drawings and one (1) set of CAD/Autodesk Revit© disks for review and acceptance.

D. Additional documents. At project completion, the installer of the technology system shall provide, as part of the as-built documents, updated tables, equipment schedules, configuration worksheets and labeling system used. See individual system specification section for more details on these documents.

E. See individual specification sections for each system for additional requirements for As-Built documents.

3.9 CLOSE OUT DOCUMENTS

A. Closeout information shall be provided to the owner in electronic format at the end of the project. The file shall be organized by each system and shall follow this organization:
   1. PART 1 – OPERATION AND MAINTENANCE MANUALS. Operation and Maintenance manuals as issued by the manufacturer of each system's component. Such manuals shall include all maintenance procedures required to be done by the owner. Also, when required by each individual specification section, a short form operation guide, prepared by installer) for the system.
   2. PART 2 – INVENTORY OF EQUIPMENT INSTALLED. A detailed list of all relevant active equipment (equipment with electronic components with a market value over $200) installed in the project including the following information and presented in

electronic format (Microsoft Excel):

a. Make
b. Model
c. Serial number
d. Room location
e. Warranty period, including manufacturer's extended warranties.

3. PART 3 – PROOF OWNERSHIP, DELIVERY AND ACCEPTANCE. The following letters/documents shall be attached in this part:
   a. Acceptance letter signed by A&E for each of the technology systems installed.
   b. Proof of training by submitting sign in sheets for each training session done
   c. Signed transmittal for all training videos and training material.
   d. Signed transmittal for all spare parts and consumables delivered to the owner.
   e. A list of all the user names and passwords for all the different software programs used by the technology systems and any equipment with password codes. All levels of passwords shall be provided, from the lowest hierarchy to the highest.
   f. At least four (4) copies of all physical keys to different devices part of the technology systems. Each key shall be individually tagged in a key ring. All keys shall be included and organized inside a key ring management enclosure.
   g. A list of all software modules and licenses delivered to the owner. The list shall include part numbers, serial numbers, license certificate of authenticity, hardware key (dongles) numbers and software version. This list shall have a clear signature, name and date on person that received this software by the Owner.
   h. A copy of all official equipment and software registrations with manufacturer.
4. PART 4 – AS BUILT DOCUMENTS. All as-built documents as indicated in this specification section

END OF SECTION

SECTION 27 05 26 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.
4. Grounding rods.
5. Grounding labeling.

1.2 DEFINITIONS

A. BCT: Bonding conductor for telecommunications.

B. TGB: Telecommunications grounding busbar.

C. TMGB: Telecommunications main grounding busbar.

D. Service Provider: The operator of a service that provides telecommunications transmission delivered over access provider facilities.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For communications equipment room signal reference grid. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
1. Installation Supervision: Installation shall be under the direct supervision of ITS Technician, who shall be present at all times when Work of this Section is performed at Project site.
2. Field Inspector: Currently registered by BICSI as a designer RCDD to perform the on-site inspection.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a

qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

C. Comply with TIA-607-B.

2.2 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
   1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
   2. Cable Tray Equipment Grounding Wire: No. 6 AWG.

C. Cable Tray Grounding Jumper:
   1. Not smaller than No. 6 AWG and not longer than 12 inches. If jumper is a wire, it shall have a crimped grounding lug with two holes and long barrel for two crimps. If jumper is a flexible braid, it shall have a one-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.

D. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with CEC for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
   1. Electroplated tinned copper, C and H shaped.

C. Signal Reference Grid Connectors: Combination of compression wire connectors, access floor grounding clamps, bronze U-bolt grounding clamps, and copper split-bolt connectors, designed for the purpose.

D. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

E. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

A. TMGB: Predrilled, wall-mounted, rectangular bars of hard-drawn solid copper, 1/4 by 4 inches in cross-section, length as indicated on Drawings. The busbar shall be NRTL listed for use as TMGB and shall comply with TIA-607-B.
   1. Predrilling shall be with holes for use with lugs specified in this Section.
   2. Mounting Hardware: Stand-off brackets that provide a 4-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
   3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

B. TGB: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross-section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with TIA-607-B.
   1. Predrilling shall be with holes for use with lugs specified in this Section.
   2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.
   3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600-V switchboards, impulse tested at 5000 V.

C. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with TIA-607-B. Predrilling shall be with holes for use with lugs specified in this Section.
   1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
   2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
   3. Rack-Mounted Vertical Busbar: 72 or 36 inches long, with stainless-steel or copper-plated hardware for attachment to the rack.

2.5 GROUND RODS

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet in diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the ac grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.

B. Inspect the test results of the ac grounding system measured at the point of BCT connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Bonding shall include the ac utility power service entrance, the communications cable entrance, and the grounding electrode system. The bonding of these elements shall form a loop so that each element is connected to at least two others.

B. Comply with NECA 1.

C. Comply with TIA-607-B.

3.3 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
   1. The bonding conductors between the TGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.
   2. The bonding conductors between the TMGB and structural steel of steel-frame buildings shall not be smaller than No. 6 AWG.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2 AWG minimum.

C. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

D. Conductor Support:
   1. Secure grounding and bonding conductors at intervals of not less than 36 inches.

E. Grounding and Bonding Conductors:
   1. Install in the straightest and shortest route between the origination and termination

point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
2. Install without splices.
3. Support at not more than 36-inch intervals.
4. Install grounding and bonding conductors in 3/4-inch PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.

3.4 GROUNDING ELECTRODE SYSTEM

A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 3/0 AWG.

3.5 GROUNDING BUSBARS

A. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 2 inches minimum from wall, 12 inches above finished floor unless otherwise indicated.

B. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.6 CONNECTIONS

A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.

B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
1. Use crimping tool and the die specific to the connector.
2. Pretwist the conductor.
3. Apply an antioxidant compound to all bolted and compression connections.

D. Primary Protector: Bond to the TMGB with insulated bonding conductor.

E. Interconnections: Interconnect all TGBs with the TMGB with the telecommunications backbone conductor. If more than one TMGB is installed, interconnect TMGBs using the grounding equalizer conductor. The telecommunications backbone conductor and grounding equalizer conductor size shall not be less than 2 kcmils/linear foot of conductor length (minimum size No. 1/0 AWG), up to a maximum size of No. 3/0 AWG unless otherwise indicated.

F. Telecommunications Enclosures and Equipment Racks: Bond metallic components of

enclosures to the telecommunications bonding and grounding system. Install top-mounted rack grounding busbar unless the enclosure and rack are manufactured with the busbar. Bond the equipment grounding busbar to the TGB No. 2 AWG bonding conductors.

G. Structural Steel: Where the structural steel of a steel frame building is readily accessible within the room or space, bond each TGB and TMGB to the vertical steel of the building frame.

H. Electrical Power Panelboards: Where an electrical panelboard for telecommunications equipment is located in the same room or space, bond each TGB to the ground bar of the panelboard.

I. Shielded Cable: Bond the shield of shielded cable to the TGB in communications rooms and spaces. Comply with TIA-568-C.1 and TIA-568-C.2 when grounding shielded balanced twisted- pair cables.

J. Rack- and Cabinet-Mounted Equipment: Bond-powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with CEC; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

K. Access Floors: Bond all metal parts of access floors to the TGB.

3.7 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches extends above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect grounding conductors to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

3.8 IDENTIFICATION

A. Labels shall be preprinted or computer-printed type.
   1. Label TMGB(s) with "fs-TMGB," where "fs" is the telecommunications space identifier

for the space containing the TMGB.

2. Label TGB(s) with "fs-TGB," where "fs" is the telecommunications space identifier for the space containing the TGB.
3. Label the BCT and each telecommunications backbone conductor at its attachment point: "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   2. Test the bonding connections of the system using an ac earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing a TMGB and a TGB and using the process recommended by BICSI TDMM. Conduct tests with the facility in operation.
      a. Measure the resistance between the busbar and the nearest available grounding electrode. The maximum acceptable value of this bonding resistance is 100 milliohms.
   3. Test for ground loop currents using a digital clamp-on ammeter, with a full-scale of not more than 10 A, displaying current in increments of 0.01 A at an accuracy of plus/minus 2.0 percent.
      a. With the grounding infrastructure completed and the communications system electronics operating, measure the current in every conductor connected to the TMGB and in each TGB. Maximum acceptable ac current level is 1 A.

B. Excessive Ground Resistance: If resistance to ground at the BCT exceeds 5 ohms, notify Architect promptly and include recommendations to reduce ground resistance.

C. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 27 05 36 – CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Ladder cable tray.
   2. Wire-mesh cable tray.
   3. Cable tray accessories.
   4. Warning signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.
   1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.
   1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
   2. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
      a. Vertical and horizontal offsets and transitions.
      b. Clearances for access above and to sides of cable trays.
      c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
      d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

C. Delegated-Design Submittal: For seismic restraints.
   1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
   2. Design Calculations: Calculate requirements for selecting seismic restraints.
   3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Cable trays and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the cable trays will remain in place without separation of any parts when subjected to the seismic forces specified."
   2. Component Importance Factor: 1.5.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.
   1. Temperature Change: 120 deg F, ambient surfaces.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in CEC and marked for intended location, application, and grounding.
   1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:
   1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
   2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
   3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAY

A. Description:
   1. Configuration: Two longitudinal side rails with transverse rungs swaged or welded to side rails, complying with NEMA VE 1.
   2. Width: 12 inches unless otherwise indicated on Drawings.
   3. Minimum Usable Load Depth: 3 inches.
   4. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
   5. Rung Spacing: 6 inches o.c.
   6. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
   7. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
   8. No portion of the rungs shall protrude below the bottom plane of side rails.
   9. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load when tested according to NEMA VE 1.
   10. Fitting Minimum Radius: 12 inches.

11. Class Designation: Comply with NEMA VE 1, Class 5AA.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
14. Covers: Solid type made of same materials and with same finishes as cable tray.

B. Materials and Finishes:
1. Stainless Steel:
a. Materials: Low-carbon, passivated stainless steel, Type 316L, ASTM F 593 and ASTM F 594.
b. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593, and ASTM F 594.

2.4 WIRE-MESH CABLE TRAY

A. Description:
1. Configuration: Galvanized- steel wire mesh, complying with NEMA VE 1.
2. Width: 2 inches unless otherwise indicated on Drawings.
3. Minimum Usable Load Depth: 1 inch.
4. Straight Section Lengths: 10 feet, except where shorter lengths are required to facilitate tray assembly.
5. Structural Performance: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
6. Class Designation: Comply with NEMA VE 1, Class 5AA.
7. Splicing Assemblies: Bolted type using serrated flange locknuts.
8. Splice-Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

B. Materials and Finishes:
1. Steel
a. Straight Sections and Fittings: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33.
b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1
c. Fasteners Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
d. Finish: Hot-dip galvanized after fabrication, complying with ASTM A123/A123 M, Class B2.
1) Hardware: Galvanized, ASTM B 633.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Barrier Strips: Same materials and finishes as for cable tray.

C. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

A. Lettering: 1-1/2-inch-high, black letters on yellow background with legend “Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel.”

2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA FG 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

B. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

C. Remove burrs and sharp edges from cable trays.

D. Fasten cable tray supports to building structure.

E. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb.

F. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

G. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

H. Support bus assembly to prevent twisting from eccentric loading.

I. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

J. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.

K. Support wire-basket cable trays with center support hangers.

L. Support center support hangers for wire-basket trays with 1/4-inch- diameter rods.

M. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

N. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.

O. Make changes in direction and elevation using manufacturer's recommended fittings.

P. Make cable tray connections using manufacturer's recommended fittings.

Q. Seal penetrations through fire and smoke barriers.

R. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

S. Install cable trays with enough workspace to permit access for installing cables.

T. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

U. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

V. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to CEC unless additional grounding is specified.

B. Cable trays shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with single-conductor power conductors shall be bonded together with a grounding conductor run in the tray along with the power conductors and bonded to the tray at 72-inch intervals. The grounding conductor shall be sized according to CEC, Article 250.122, "Size of Equipment Grounding Conductors," and Article 392, "Cable Trays."

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After

completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to CEC, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
   2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
   3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by CEC. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
   4. Verify that there are no intruding items such as pipes, hangers, or other equipment in

the cable tray.

5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.
1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

SECTION 27 05 53 – IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Color and legend requirements for labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes.
5. Signs.
6. Cable ties.
7. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for communications identification products.

B. Identification Schedule:
1. Outlets: Scaled drawings indicating location and proposed designation.
2. Backbone Cabling: Riser diagram showing each communications room, backbone cable, and proposed backbone cable designation.
3. Racks: Scaled drawings indicating location and proposed designation.
4. Patch Panels: Enlarged scaled drawings showing rack row, number, and proposed designations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with CEC and TIA 606-B.

B. Comply with ANSI Z535.4 for safety signs and labels.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Equipment Identification Labels:
1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: Preprinted, 3-mil-thick, polyester flexible labels with acrylic pressure-sensitive adhesive.
1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating protective shields over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof black ink marker recommended by tag manufacturer.

D. Self-Adhesive Labels: Polyester, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
1. Minimum Nominal Size:
a. 1-1/2 by 6 inches for raceway and conductors.
b. 3-1/2 by 5 inches for equipment.
c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters of raceway or cable they identify, that stay in place by gripping action.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:
1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, and ANSI Z535.4.

C. Tag: Type I:
   1. Pigmented polyolefin, bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
   2. Width: 3 inches.
   3. Thickness: 4 mils.
   4. Weight: 18.5 lb/1000 sq. ft.
   5. Tensile according to ASTM D 882: 30 lbf and 2500 psi.

2.6 SIGNS

A. Baked-Enamel Signs:
   1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch grommets in corners for mounting.
   3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:
   1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396- inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
   2. 1/4-inch grommets in corners for mounting.
   3. Nominal Size: 10 by 14 inches.

C. Laminated-Acrylic or Melamine-Plastic Signs:
   1. Engraved legend.
   2. Thickness:
      a. For signs up to 20 sq. in., minimum 1/16 inch thick.
      b. For signs larger than 20 sq. in., 1/8 inch thick.
      c. Engraved legend with black letters on white face.
      d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting.

2.7 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except where used for color-coding.

B. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
   1. Minimum Width: 3/16 inch.
   2. Tensile Strength at 73 deg F according to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying communications identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of communications systems and connected items.

G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for

viewing from the floor.

H. Vinyl Wraparound Labels:
1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.
3. Provide label 6 inches from cable end.

I. Snap-Around Labels:
1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

J. Self-Adhesive Wraparound Labels:
1. Secure tight to surface at a location with high visibility and accessibility.
2. Provide label 6 inches from cable end.

K. Self-Adhesive Labels:
1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1- 1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

L. Snap-Around, Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

M. Underground-Line Warning Tape:
1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

N. Cable Ties: General purpose, except as listed below:
1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum-rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations with high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify covers of each junction and pull box with self-adhesive labels containing wiring system legend.
   1. System legends shall be as follows:
      a. Telecommunications.

D. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate shall be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:
   1. Wiring closet designation.
   2. Colon.
   3. Faceplate number.

E. Equipment Room Labeling:
   1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
   2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
   3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:
      a. Room number being served.
      b. Colon.
      c. Faceplate number.

F. Backbone Cables: Label each cable with a vinyl-wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

G. Horizontal Cables: Label each cable with a vinyl-wraparound label indicating the following, in the order listed:
   1. Room number.
   2. Colon.
   3. Faceplate number.

H. Locations of Underground Lines: Underground-line warning tape for copper, coaxial, hybrid copper/fiber, and optical-fiber cable.

I. Instructional Signs: Self-adhesive labels.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures: Self-adhesive labels Baked-enamel warning signs.
   1. Apply to exterior of door, cover, or other access.

K. Equipment Identification Labels:
   1. Indoor Equipment: Self-adhesive label.
   2. Equipment to Be Labeled:

a. Communications cabinets.
b. Uninterruptible power supplies.
c. Computer room air conditioners.
d. Power distribution components.

END OF SECTION

SECTION 27 13 00 – COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. High-count Category 3 twisted pair cable.
2. Twisted pair cable hardware, including plugs, jacks, patch panels, and cross-connects.
3. Grounding provisions for twisted pair cable.
4. Cabling identification.
5. Source quality control requirements for twisted pair cable.
6. 9/125 micrometer single-mode, inside plant optical fiber cable (OS1).
7. 9/125 micrometer single-mode, outside plant optical fiber cable (OS2).
8. Optical fiber cable connecting hardware, patch panels, and cross-connects.
9. Cabling identification products.
10. CATV coaxial cable.
11. Coaxial cable hardware.
12. Grounding.
13. Identification products.

B. Related Requirements:
1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for data cabling associated with system panels and devices.

1.2 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

C. EMI: Electromagnetic interference.

D. F/FTP: Overall foil screened cable with foil screened twisted pair.

E. FTP: Shielded twisted pair.

F. F/UTP: Overall foil screened cable with unscreened twisted pair.

G. IDC: Insulation displacement connector.

H. Jack: Also commonly called an "outlet," it is the fixed, female connector.

I. LAN: Local area network.

J. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.

K. RCDD: Registered Communications Distribution Designer.

L. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

M. S/FTP: Overall braid screened cable with foil screened twisted pair.

N. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

O. S/UTP: Overall braid screened cable with unscreened twisted pairs.

P. UTP: Unscreened (unshielded) twisted pair.

1.3 COPPER BACKBONE CABLING DESCRIPTION

A. Copper backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.4 OPTICAL FIBER BACKBONE CABLING DESCRIPTION

A. Optical fiber backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.5 COAXIAL BACKBONE CABLING DESCRIPTION

A. Coaxial cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Backbone cabling cross-connects may be located in communications equipment rooms or at

entrance facilities.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Nominal OD.
2. Minimum bending radius.
3. Maximum pulling tension.

B. Shop Drawings: Reviewed and stamped by RCDD.
1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration Drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:
a. Telecommunications rooms plans and elevations.
b. Telecommunications pathways.
c. Telecommunications system access points.
d. Telecommunications grounding system
e. Cross-connects.
f. Patch panels.
g. Patch cords.
4. Cross-Connects and Patch Panels: Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Optical fiber cable testing plan.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Connecting Blocks: One of each type.
2. Patch-Panel Units: One of each type.
3. Plugs: Ten of each type.
4. Jacks: Ten of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
1. Layout Responsibility: Preparation of Shop Drawings, cabling administration Drawings, and field testing program development by a Technician.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

1.9 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard, and the requirements of TIA-568-C.4.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

D. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC for the following types:
1. Communications, Riser Rated: Type CMR complying with UL 1666 and ICEA S-103-701.

B. RoHS compliant.

2.3 HIGH-COUNT CATEGORY 3 TWISTED PAIR CABLE

A. Description: 25-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 3 cable at frequencies up to 16MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 3 cables.

C. Conductors: 100-ohm, 24 AWG solid copper.

D. Shielding/Screening: Unshielded balanced twisted pairs (UTP).

F. Cable Rating: Riser.

G. Jacket: White thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Cable Connecting Hardware:
   1. Twisted pair cable hardware shall meet the performance requirements of Category 6.
   2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
   3. Cables shall be terminated with connecting hardware of same category or higher.
   4. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
   1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Features:
      a. Universal T568A and T568B wiring labels.
      b. Labeling areas adjacent to conductors.
      c. 24 or 48 ports.
   2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
   3. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to suit specified expansion criteria.

F. Plugs and Plug Assemblies:
   1. Male; eight position (8P8C); color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded twisted pair cable.
   2. Standard: Comply with TIA-568-C.2.
   3. Marked to indicate transmission performance.

G. Jacks and Jack Assemblies:
   1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded twisted pair cable.
   2. Designed to snap-in to a patch panel or faceplate.
   3. Standard: Comply with TIA-568-C.2.
   4. Marked to indicate transmission performance.

H. Patch Cords: Owner provided and installed.
   1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure

Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2.5 9/125 MICROMETER, SINGLE-MODE, INSIDE PLANT OPTICAL FIBER CABLE (OS1)

A. Description: Single mode, 9/125-micrometer, 12 fibers, tight buffered, optical fiber cable.

B. Standards:
1. Comply with TIA-492CAAA for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-83-596 for mechanical properties.

C. Maximum Attenuation: 1.0 dB/km at 1310 nm; 1.0 dB/km at 1550 nm.

D. Jacket:
1. Jacket Color: Blue.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

E. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and CEC for the following types:
1. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.

2.6 9/125 MICROMETER, SINGLE-MODE, OUTSIDE PLANT OPTICAL FIBER CABLE (OS2)

A. Description: Single mode, 9/125-micrometer, 12 fibers, single loose tube, optical fiber cable.

B. Standards:
1. Comply with TIA-492CAAB for detailed specifications.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with ICEA S-87-640 for mechanical properties.

C. Maximum Attenuation: 0.5 dB/km at 1310 nm; 0.5 dB/km at 1550 nm.

D. Jacket:
1. Jacket Color: Black.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.7 OPTICAL FIBER CABLE HARDWARE

A. Standards:
1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.

2. Comply with TIA-568-C.3.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
   1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths.

D. Connector Type: Type LC complying with TIA-604-10-B, Type MPO complying with TIA-604-5-D, connectors.

E. Plugs and Plug Assemblies:
   1. Male; color-coded modular telecommunications connector designed for termination of a single optical fiber cable.
   2. Insertion loss not more than 0.25 dB.
   3. Marked to indicate transmission performance.

F. Jacks and Jack Assemblies:
   1. Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single optical fiber cable.
   2. Insertion loss not more than 0.25 dB.
   3. Marked to indicate transmission performance.
   4. Designed to snap-in to a patch panel or faceplate.

2.8 GENERAL CATV CABLE CHARACTERISTICS

A. CATV Cable: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC for the following types:
   1. CATV Riser Rated: Type CATVR complying with UL 1666 installed in riser raceways or cable routing assemblies.
   2. CATV Cable: Type CATV installed in general purpose, riser, or plenum communications raceways or cable routing assemblies in fireproof riser shafts with firestops at each penetration.

2.9 CATV COAXIAL CABLE

A. Description: Coaxial cable with a 75-ohm characteristic impedance designed for CATV transmission.

B. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with CEC, "Community Antenna Television and Radio Distribution" Article. Types are as follows:
   1. RG-6/U: UL Type CATVR.
      a. No. 18 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.

b. Riser rated.
c. Gas-injected, foam-PE insulation.
d. Double shielded with 100 percent aluminum foil shield, 60 percent aluminum braided inner shield, and 40 percent aluminum braided outer shield.
e. Jacketed with black PVC or PE.
f. Suitable for indoor installations.

2.10 COAXIAL CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate coaxial cable with a 75-ohm characteristic impedance.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

C. Patch Cords: Factory-made cables in 36-inch lengths; terminated with modular Type BNC connector at each end.

2.11 CABLING IDENTIFICATION

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.12 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.

B. Comply with TIA-607-C.

2.13 SOURCE QUALITY CONTROL

A. Factory test cables on reels according to TIA-568-C.1.

B. Factory test cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.

B. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install cables parallel with or at right angles to sides and back of enclosure.

3.3 INSTALLATION OF PATHWAYS

A. Drawings indicate general arrangement of pathways and fittings.

B. Comply with CEC for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

D. Pathway Installation in Communications Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.4 INSTALLATION OF COPPER BACKBONE CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:
1 Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
2 Comply with BICSI's "Information Transport Systems Installation Methods Manual (ITSIMM)," Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
3 Install 110-style IDC termination hardware unless otherwise indicated.
4 Do not untwist twisted pair cables more than 1/2 inch from the point of termination to

maintain cable geometry.

5 Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.

6 Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

7 Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.

8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section Use lacing bars and distribution spools

9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.

10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

11. In the communications equipment room, install a 10-foot-long service loop on each end of cable.

12. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 INSTALLATION OF OPTICAL FIBER BACKBONE CABLES

A. Comply with NECA 1, NECA 301, and NECA/BICSI 568.

B. General Requirements for Optical Fiber Cabling Installation:
1. Comply with TIA-568-C.1 and TIA-568-C.3.
2. Comply with BICSI ITSIMM, Ch. 6, "Cable Termination Practices."
3. Terminate all cables; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train cable to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, provide a 10-foot-long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
11. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

3.6 INSTALLATION OF COAXIAL BACKBONE CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:
1. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
3. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend coaxial cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Outdoor Coaxial Cable Installation:
1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:
   1. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
      b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 12 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
   2. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
      b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 6 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
   3. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
      b. Electrical Equipment Rating Between 2 and 5 kVA: A minimum of 3 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
   4. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
   5. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.7 GROUNDING

A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."

B. Comply with TIA-607-B and NECA/BICSI-607.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.

D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.8 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B.
   1. Administration Class: 2.
   2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.

B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.

C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:
1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
   b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.

a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.

C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 27 15 00 – COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pathways.
2. UTP cabling.
3. Coaxial cable.
4. Cable connecting hardware, patch panels, and cross-connects.
5. Telecommunications outlet/connectors.
6. Cabling system identification products.
7. Cable management system.
8. Category 6 twisted pair cable.
9. Twisted pair cable hardware, including plugs and jacks.
10. Multiuser telecommunications outlet assembly.
11. Grounding provisions for twisted pair cable.
12. Source quality control requirements for twisted pair cable.

B. Related Sections:
1. Division 27 Section "Communications Backbone Cabling" for voice and data cabling associated with system panels and devices.
2. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.2 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel.

D. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

E. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

F. EMI: Electromagnetic interference.

G. FTP: Shielded twisted pair.

H. F/FTP: Overall foil screened cable with foil screened twisted pair.

I. F/UTP: Overall foil screened cable with unscreened twisted pair.

J. IDC: Insulation displacement connector.

K. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

L. LAN: Local area network.

M. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

N. RCDD: Registered Communications Distribution Designer.

O. Screen: A metallic layer, either a foil or a braid, placed around a pair or group of conductors.

P. Shield: A metallic layer, either a foil or a braid, placed around a pair or group of conductors.

Q. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom without ventilation openings.

R. S/FTP: Overall braid screened cable with foil screened twisted pair.

S. S/UTP: Overall braid screened cable with unscreened twisted pairs.

T. Trough or Ventilated Cable Tray: A fabricated structure consisting of longitudinal side rails and a bottom having openings for the passage of air.

U. UTP: Unshielded twisted pair.

1.3 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
   1. ANSI/TIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
   2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
   3. Bridged taps and splices shall not be installed in the horizontal cabling.
   4. Splitters shall not be installed as part of the optical fiber cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the

telecommunications outlet/connectors to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable cabling system shall provide interconnections between Distributor A, Distributor B, or Distributor C, and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
3. Bridged taps and splices shall not be installed in the horizontal cabling.

B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.

C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in ANSI/TIA-568-B.1, when tested according to test procedures of this standard.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1. For coaxial cable, include the following installation data for each type used:
   a. Nominal OD.
   b. Minimum bending radius.
   c. Maximum pulling tension.

B. Shop Drawings:
1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. Cabling administration drawings and printouts.
3. Wiring diagrams to show typical wiring schematics, including the following:

a. Cross-connects.
b. Patch panels.
c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:
   a. Vertical and horizontal offsets and transitions.
   b. Clearances for access above and to side of cable trays.
   c. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
   d. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Connecting Blocks: One of each type.
   2. Faceplates: One of each type.
   3. Jacks: Ten of each type.
   4. Multiuser Telecommunications Outlet Assemblies: One of each type.
   5. Patch-Panel Units: One of each type.
   6. Plugs: Ten of each type.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
   1. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
   2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

E. Telecommunications Pathways and Spaces: Comply with ANSI/TIA-569-A.

F. Grounding: Comply with ANSI-J-STD-607-C.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC for the following types:
   1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.
   2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to CEC, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
   3. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

C. RoHS compliant.

2.3 PATHWAYS

A. General Requirements: Comply with ANSI/TIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for

Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.4 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

2.5 UTP CABLE

A. Description: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a corresponding thermoplastic jacket to match system type as described on drawings.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with ANSI/TIA-568-B.1 for performance specifications.
   3. Comply with ANSI/TIA-568-B.2, Category 6.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and CEC for the following types:
      a. Communications, General Purpose: Type CM or CMG.
      b. Communications, Riser Rated: Type CMR, complying with UL 1666.
      c. Multipurpose: Type MP or MPG.
      d. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.6 UTP CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with ANSI/TIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

B. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

C. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
   1. Number of Terminals per Field: One for each conductor in assigned cables.

D. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Number of Jacks per Field: One for each four-pair UTP cable indicated.

E. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

F. Patch Cords: Provided and installed by owner.
   1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against

snagging.

2.7 COAXIAL CABLE

A. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

B. RG-6/U: CEC, Type CATV or CM.
1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

C. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with CEC "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
1. CATV Cable: Type CATV.
2. CATV Riser Rated: Type CATVR, complying with UL 1666.

2.8 COAXIAL CABLE HARDWARE

A. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.9 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with ANSI/TIA-568-B.1.

B. Workstation Outlets: Six-port-connector assemblies mounted in single faceplate.
1. Plastic Faceplate: High-impact plastic. Coordinate color with Division 26 Section "Wiring Devices."
2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.10 CATEGORY 6 TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250 MHz.

B. Standard: Comply with TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: Gray thermoplastic.

2.11 TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:
1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks:
1. 110-style IDC for Category 6.
2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
1. Features:
a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. 24 or 48 ports.
2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

G. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.

H. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.

2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

J. Faceplate:
1. Six port, vertical single gang faceplates designed to mount to double gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
   a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:
1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.12 MULTIUSER TELECOMMUNICATIONS OUTLET ASSEMBLY

A. Description: MUTOAs shall meet the requirements of "Twisted Pair Cable Hardware" Article.
1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Number of Connectors per Field:
   a. One for each four-pair unshielded or shielded twisted-pair cable indicated.
   b. One for each four-pair unshielded or shielded twisted-pair group of indicated cables, plus 25 percent spare positions.
3. Mounting: Recessed in ceiling.
4. NRTL listed as complying with UL 50 and UL 1863.
5. Label shall include maximum length of work area cords, based on TIA-568-C.1.
6. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.13 GROUNDING

A. Comply with requirements in Section 270526 "Grounding and Bonding for Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-C.

2.14 IDENTIFICATION PRODUCTS

A. Comply with ANSI/TIA-606-A and UL 969 for labeling materials, including label stocks,

laminating adhesives, and inks used by label printers.

B. Comply with requirements in Division 27 Section "Identification for Systems."

2.15 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to ANSI/TIA-568-B.1.

B. Factory test UTP cables according to ANSI/TIA-568-B.2.

C. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.3 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and ANSI/TIA-569-A-7.

B. Comply with ANSI/TIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Communications Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. Comply with NECA 1 and NECA/BICSI 568.

B. General Requirements for Cabling:
1. Comply with ANSI/TIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Install 110-style IDC termination hardware unless otherwise indicated.
4. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
   a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
   b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
5. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
6. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
7. MUTOA shall not be used as a cross-connect point.
8. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
9. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
10. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution

spools.

11. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
12. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
13. In the communications equipment room, install a 10-foot-long service loop on each end of cable.
14. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:
1. Comply with ANSI/TIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 6 feet long not less than 12 inches in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.

G. Separation from EMI Sources:
1. Comply with BICSI TDMM and ANSI/TIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power

lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

3.5 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

A. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.

B. Paint and label colors for equipment identification shall comply with ANSI/TIA-606-A for Class 2 level of administration.

C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

E. Cable and Wire Identification:
1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building- mounted device shall be identified with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.
5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
6. Uniquely identify and label work area cables extending from the MUTOA to the work area. These cables may not exceed the length stated on the MUTOA label.

F. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with ANSI/TIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
   a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long-distance, and digital subscription line telephone call.
   b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

3.9 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
   1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

END OF SECTION

SECTION 28 05 13 – CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Balanced twisted-pair cabling.
2. 50/125-micrometer, multimode optical-fiber cabling.
3. RS-232 cabling.
4. RS-485 cabling.
5. Fire alarm wire and cable.
6. Identification products.

1.2 DEFINITIONS

A. EMI: Electromagnetic interference.

B. IDC: Insulation displacement connector.

C. Low Voltage: As defined in CEC for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

E. RCDD: Registered Communications Distribution Designer.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate layout and installation of electronic safety and security cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Installation data for cables as specified in TIA 569-D.
2. For coaxial cable, include the following installation data for each type used:
a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling and asset identification system of the software.
3. Cabling administration drawings and printouts.
4. Wiring diagrams to show typical wiring schematics, including the following:
   a. Cross-connects.
   b. Patch panels.
   c. Patch cords.
5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

C. Sustainable Design Submittals:
1. Product Data: For each conductor and cable indicating lead content.
2. Product Data: For solvents and adhesives, indicating VOC content.
3. Laboratory Test Reports: For solvents and adhesives, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and CEC.

B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.

C. Grounding: Comply with TIA-607-B.

D. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

E. RoHS compliant.

2.2 CATEGORY 6 BALANCED TWISTED-PAIR CABLE

A. Description: Four-pair, balanced twisted-pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables and CEC for the following types:
1. Communications, Non-plenum: Type CMR complying with UL 1666 and ICEAS-103-701.
2. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser

communications raceway.

3. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to CEC, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

C. Conductors: 100-ohm, 23 AWG solid copper.
   1. Lead Content: Less than 300 parts per million.

D. Shielding/Screening: Unshielded twisted pairs (UTP).

E. Cable Rating: Plenum.

F. Jacket: White thermoplastic.

2.3 BALANCED TWISTED-PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.

B. General Requirements for Twisted Pair Cable Hardware:
   1. Comply with the performance requirements of Category 6.
   2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
   3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks:
   1. 110-style IDC for Category 6.
   2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
   1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
   1. Features:
      a. Universal T568A and T568B wiring labels.
      b. Labeling areas adjacent to conductors.
      c. Replaceable connectors.
      d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

G. Patch Cords: Provided and installed by Owner.

H. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Standard: Comply with TIA-568-C.2.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standard: Comply with TIA-568-C.2.
4. Marked to indicate transmission performance.

J. Faceplate:
1. Six port, vertical double gang faceplates designed to mount to double gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:
1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.4 50/125 MICROMETER, MULTIMODE, OPTICAL FIBER CABLE (OM2)

A. Description: Multimode, 50/125-micrometer, 1-fiber, conductive, tight buffer, optical fiber cable.

B. Conductive cable shall be steel armored type.

C. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.

D. Minimum Overfilled Modal Bandwidth-length Product: 500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

E. Jacket:
1. Jacket Color: Orange.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-D.

3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

F. Standards:
1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA-568-C.3 for performance specifications.
3. Comply with TIA-492AAAB for detailed specifications.

G. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and CEC for the following types:
1. Plenum Rated, Nonconductive: Type OFNP in listed plenum communications raceway.

2.5 OPTICAL FIBER CABLE HARDWARE

A. Standards
1. Comply with Fiber Optic Connector Intermateability Standard (FOCIS) specifications of the TIA-604 series.
2. Comply with TIA-568-C.3.

B. Connector Type Type LC complying with TIA-604-10-B, connectors.

C. Plugs and Plug Assemblies:
1 Male; color-coded modular telecommunications connector designed for termination of a single fiber optic cable.
2 Insertion loss not more than 0.25 dB.
3. Marked to indicate transmission performance.

D. Jacks and Jack Assemblies
1 Female; quick-connect, simplex and duplex; fixed telecommunications connector designed for termination of a single fiber optic cable.
2 Insertion loss not more than 0.25 dB.
3 Marked to indicate transmission performance.
4. Designed to snap-in to a patch panel or faceplate.

E. Faceplate
1 Six -port, vertical double-gang faceplates designed to mount to double-gang wall boxes.
2 Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
a. Flush mounting jacks, positioning the cord at a 45-degree angle

F. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria

G. Patch Cords: Factory-made, single-fiber cables in 36-inch lengths

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers

2.7 CABLE MANAGEMENT SYSTEM

A. Description: Computer-based cable management system, with integrated database and graphic capabilities.

B. Document physical characteristics by recording the network, TIA details, and connections between equipment and cable.

C. Information shall be presented in database view, schematic plans, or technical drawings.
1. AutoCAD drawing software shall be used as drawing and schematic plans software.

D. System shall interface with the following testing and recording devices:
1. Direct upload tests from circuit-testing instrument into the personal computer.
2. Direct download circuit labeling into labeling printer.

2.8 GROUNDING

A. Comply with TIA-607-C.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test balanced twisted-pair cables and optical-fiber cables on reels according to TIA-568- C.1.

C. Factory test balanced twisted-pair cables according to TIA-568-C.2.

D. Factory test multimode optical fiber cables according to TIA-526.14-B and TIA-568-C.3.

E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results. Structural Return Loss shall be less than 20 db.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Install wiring in metal pathways and wireways.
   1. Minimum conduit size shall be 3/4 inch. Control and data-transmission wiring shall not share conduits with other building wiring systems.

B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring on Racks and within Enclosures:
   1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
   2. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
   3. Install lacing bars and distribution spools.
   4. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
   5. Install conductors parallel with or at right angles to sides and back of enclosure.
   6. Connect conductors associated with intrusion system that are terminated, spliced, or interrupted in any enclosure onto terminal blocks.
   7. Mark each terminal according to system's wiring diagrams.
   8. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.2 GENERAL REQUIREMENTS FOR INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1, CEC, and TIA-568-C.1.

B. Comply with BICSI Information Technology Systems Installation Methods Manual for installation of equipment in communications equipment spaces.

C. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

D. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

E. Install balanced twisted-pair, optical-fiber, and coaxial cables and connecting materials after spaces are complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

F. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Leave a minimum of

6 inches of slack at outlet terminations and coil loosely into box after termination on outlet fitting.

G. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

H. Maintain minimum cable bending radius during installation and termination of cables.

I. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

J. Pulling Cable: Monitor cable pull tensions. Do not exceed manufacturer's rated cable-pulling tension.

K. Riser Cable: Riser cable support intervals shall be in accordance with manufacturer's recommendations.

L. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart. Cable supports shall be fastened to structural members or floor slabs in accordance with Section 270528.29 "Hangers and Supports for Communications Systems."
3. Cable shall not be run in contact
4. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items. Cables shall not be run through structural members or use structural members, pipes, ducts, or equipment as a support.

M. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Cable 72 inches long shall be neatly coiled not less than 12 inches in diameter below each feed point.

N. Separation from EMI Sources:
1. Comply with BICSI Telecommunications Distribution Methods Manual and TIA-569-D recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:
    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Luminaires: A minimum of 5 inches.

3.3 BALANCED TWISTED-PAIR CABLE INSTALLATION

A. Install using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
   1. Comply with TIA-568-C.2.
   2. Install 110-style IDC termination hardware unless otherwise indicated.
   3. Do not untwist balanced twisted-pair cables more than 1/2 inch from point of termination to maintain cable geometry.

3.4 OPTICAL-FIBER CABLE INSTALLATION

A. Comply with TIA-568-C.3.

B. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

3.5 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 270528.29 "Hangers and Supports for Communications Systems."
   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.

C. Wiring Method:
   1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
   2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, CEC, Types MI and CI,

is not permitted.

3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or pathway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.6 GROUNDING

A. For communication wiring, comply with TIA-607-B and with BICSI Telecommunications Distribution Methods Manual "Bonding and Grounding (Earthing)" chapter.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA-606-B.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visually inspect balanced twisted-pair and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding,

equipment and patch cords, and labeling of all components.

3. Test balanced twisted-pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
   a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
4. Optical-Fiber Cable Tests:
   a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
   b. Link End-to-End Attenuation Tests:
      1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA-526-14-B, Method B, One Reference Jumper.
      2) Attenuation test results for links shall be less than 2.0 db. Attenuation test results shall be less than that calculated according to equation in TIA-568- C.1.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 28 05 26 – GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes:
1. Grounding conductors.
2. Grounding connectors.
3. Grounding busbars.

1.2 DEFINITIONS

A. Signal Ground: The ground reference point designated by manufacturer of the system that is considered to have zero voltage.

1.3 ACTION SUBMITTAL

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Comply with UL 486A-486B.

B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.

C. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with CEC for specific types, sizes, and combinations of conductors and other items connected. Comply

with UL 486A-486B.

B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
   1. Electroplated tinned copper, C and H shaped.

C. Busbar Connectors: Cast silicon bronze, solderless compression-type mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.

D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING BUSBARS

A. Grounding Busbars: Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches in cross-section, length as indicated on Drawings. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
   1. Predrilling shall be with holes for use with lugs specified in this Section.
   2. Mounting Hardware: Stand-off brackets that provide at least a 2-inch
   3. Stand-off insulators for mounting shall be Lexan or PVC. Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

B. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
   1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
   2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
   3. Rack-Mounted Vertical Busbar: 72 or 36 inches stainless-steel or copper-plated hardware for attachment to the rack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."
   1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
   2. Bond shields and drain conductors to ground at only one point in each circuit.

B. Signal Ground:
   1. For each system, establish the signal ground and label that location as such.
   2. Bond the signal ground to the alternating-current (ac) power system service by connecting to one of the following listed locations, using insulated No. 6 AWG, stranded, Type THHN wire:
      a. Grounding bar in an electrical power panelboard if located in the same room or space as the signal ground.
      b. Telecommunications grounding busbar.

C. Comply with NECA 1.

3.2 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Grounding and Bonding Conductors:
   1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
   2. Install without splices.
   3. Support at not more than 36-inch intervals.

3.3 CONNECTIONS

A. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

B. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
   1. Use crimping tool and the die specific to the connector.
   2. Pretwist the conductor.
   3. Apply an antioxidant compound to all bolted and compression connections.

C. Shielded Cable: Bond the shield of shielded cable to the signal ground. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.

D. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with CEC; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted,

electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

B. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 28 15 00 – ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Card readers
   2. Cables

1.3 DEFINITIONS

A. Credential: Data assigned to an entity and used to identify that entity.

B. DTS: Digital Termination Service. A microwave-based, line-of-sight communication provided directly to the end user.

C. FIPS 201: Federal Information Processing Standard Publication 201. A federal government standard that specifies Personal Identity Verification (PIV) requirements for access to a space/area.

D. Identifier: A credential card; keypad personal identification number; or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.

E. Location: A Location on the network having a PC-to-controller communications link, with additional controllers at the Location connected to the PC-to-controller link with a TIA 485-A communications loop. Where this term is presented with an initial capital letter, this definition applies.

F. PC: Personal computer. Applies to the central station, workstations, and file servers.

G. RAS: Remote access services.

H. RF: Radio frequency.

I. ROM: Read-only memory. ROM data are maintained through losses of power.

J. TCP/IP: Transport control protocol/Internet protocol.

K. TWAIN: Technology without an Interesting Name. A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.

L. WMP: Windows media player.

M. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.

N. WYSIWYG: What You See Is What You Get. Text and graphics appear on the screen the same as they will in print.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Reference each product to a location on Drawings. Test and evaluation data presented in Product Data shall comply with SIA BIO-01.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Diagrams for cable management system.
2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:
   a. Workstation outlets, jacks, and jack assemblies.
   b. Patch cords.
   c. Patch panels.
4. Cable Administration Drawings: As specified in "Identification" Article.
5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

PART 2 - PRODUCTS

2.1 OPERATION

A. Security access system hardware shall use a single database for access-control and credential-creation functions.
   1. Access Control system shall be FIPS 201 complaint.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

B. Comply with CEC, "California Electrical Code."

C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.

2.3 CARD READERS

A. Manufacturer: Allegion.

B. All card-readers shall be FIPS 201 compliant. This requirement shall override any and all other non-FIPS-201-compatible requirements within this section.

C. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.

D. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.

E. Enclosure: Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:
   1. Indoors, controlled environment.
   2. Indoors, uncontrolled environment.
   3. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

F. Display: Digital visual indicator shall provide visible and audible status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

G. Touch-Plate and Proximity Readers:
   1. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique

identification code number.

2. The card reader shall read proximity cards in a range from direct contact to at least 6 inches from the reader.

2.4 CABLES

A. Plenum-Rated TIA 232-F Cables:
1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

B. Plenum-Rated TIA 485-A Cables:
1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. CEC Type: Type CMP
6. Flame Resistance: NFPA 262, Flame Test.

C. Multiconductor, PVC, Reader and Wiegand Keypad Cables:
1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. CEC, Type CMG.
3. Flame Resistance: UL 1581 vertical tray.
4. For TIA 232-F applications.

D. Paired, PVC, Reader and Wiegand Keypad Cables:
1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. CEC, Type CM.
3. Flame Resistance: UL 1581 vertical tray.

E. Paired, Plenum-Type, Reader and Wiegand Keypad Cables:
1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene- propylene jacket.
2. CEC, Type CMP.

3. Flame Resistance: NFPA 262 flame test.

F. Multiconductor, Plenum-Type, Reader and Wiegand Keypad Cables:
1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. CEC, Type CMP.
3. Flame Resistance: NFPA 262 flame test.

G. LAN Cabling:
1. Comply with requirements in Section 271513 "Communications Copper Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

B. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.3 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

C. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and optical fiber rating of components, and that ensure Category 6 and optical fiber performance of completed and linked signal paths, end to end.

D. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

E. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.4 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.

C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. between terminations.

E. Card Readers and Keypads:
1. Install number of conductor pairs recommended by manufacturer for the functions specified.
2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft.
3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 ft. between terminations.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. between terminations.

3.5 GROUNDING

A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Bond shields and drain conductors to ground at only one point in each circuit.

D. Signal Ground:
1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 INSTALLATION

A. Install card readers, keypads, push buttons.

3.7 IDENTIFICATION

A. In addition to requirements in this article, comply with TIA 606-B.

B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

C. At completion, cable and asset management software shall reflect as-built conditions.

3.8 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.
   2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
   3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

B. Devices and circuits will be considered defective if they do not pass tests and inspections.

3.10 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.
   1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.
   2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. See Section 017900 "Demonstration and Training."

B. Develop separate training modules for the following:
   1. Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
   2. Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
   3. Security personnel.
   4. Hardware maintenance personnel.
   5. Corporate management.

END OF SECTION

SECTION 28 31 00 – INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Intrusion detection with communication links to perform monitoring, alarm, and control functions.
2. Integration of other electronic and electrical systems and equipment.

B. Related Sections:
1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for power cabling between master control units and field-mounted devices and control units.
2. Section 280513 "Conductors and Cables for Electronic Safety and Security"
3. Section 281500 "Access Control Hardware Devices" for applications, interfaces, and workstations.
4. Section 282000 "Video Surveillance" for CCTV cameras that are used as devices for video motion detection.

1.2 DEFINITIONS

A. CCTV: Closed-circuit television.

B. PIR: Passive infrared.

C. RFI: Radio-frequency interference.

D. UPS: Uninterruptible power supply.

E. Control Unit: System component that monitors inputs and controls outputs through various circuits.

F. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.

G. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.

H. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.

I. Standard Intruder: A person who weighs 100 lb or less and whose height is 60 inches or less; dressed in a long-sleeved shirt, slacks, and shoes.

J. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.

K. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.

L. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.3 ACTION SUBMITTALS

A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
   1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify network and control interface devices and media to be used. Describe characteristics of network and other data communication lines.
      a. Indicate methods used to achieve systems integration.
      b. Indicate control, signal, and data communication paths and identify networks, control interface devices, and media to be used.
      c. Describe characteristics of network and other data communication lines.
      d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.
   2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
   3. UPS: Sizing calculations.
   4. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building. Include room layout for master control-unit console, terminal cabinet, racks, and UPS.
   5. Master Control-Unit Console Layout: Show required artwork and device identification.
   6. Device Address List: Coordinate with final system programming.
   7. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
   8. Details of surge-protection devices and their installation.
   9. Sensor detection patterns and adjustment ranges.

B. Design Data: Include method of operation and supervision of each component and each type

of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.

C. Samples for Initial Selection: For units with factory-applied color finishes.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Description: Hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions.

B. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.
1. Alarm Signal: Display at master control unit and actuate audible and visual alarm devices.
2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or control-unit failure.
3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or control unit.

C. System Control: Master control unit shall directly monitor intrusion detection devices, perimeter detection units, control units associated with perimeter detection units, and connecting wiring in a multiplexed distributed control system or as part of a network.

D. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.

E. Operator Commands:
1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.
3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
5. Protected Zone Test: Initiate operational test of a specific protected zone.
6. System Test: Initiate system-wide operational test.

F. Timed Control at Master Control Unit: Allow automatically timed "secure" and "access" functions of selected protected zones.

G. Automatic Control of Related Systems: Alarm or supervisory signals from certain intrusion detection devices control the following functions in related systems:
   1. Shift elevator control to a different mode.
   2. Open a signal path between certain intercommunication stations.
   3. Shift sound system to "listening mode" and open a signal path to certain system speakers.
   4. Switch signal to selected monitor from CCTV camera in vicinity of sensor signaling an alarm.

H. Response Time: Two seconds between actuation of any alarm and its indication at master control unit.

I. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from master control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at master control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.

J. Programmed Secure-Access Control: System shall be programmable to automatically change status of various combinations of protected zones between secure and access conditions at scheduled times. Status changes may be preset for repetitive, daily, and weekly; specially scheduled operations may be preset up to a year in advance. Manual secure-access control stations shall override programmed settings.

K. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

2.2 SYSTEM COMPONENT REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

B. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.

C. Comply with CEC.

D. Compatibility: Detection devices and their communication features, connecting wiring, and master control unit shall be selected and configured with accessories for full compatibility with the following equipment:
   1. Access control system specified in Section 281500 "Access Control Hardware Devices."
   2. Video surveillance system specified in Section 282000 "Video Surveillance."
   3. Fire alarm system specified in Section 283111 "Addressable Fire-Alarm Systems."

E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.
   1. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Listed and labeled by a qualified testing agency for compliance with NFPA 731.

F. Intrusion Detection Units: Listed and labeled by a qualified testing agency for compliance with UL 639.

G. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHz.

H. Tamper Protection: Tamper switches on detection devices, control units, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Master control-unit alarm display shall identify tamper alarms and indicate locations.

I. Self-Testing Devices: Automatically test themselves periodically, but not less than once per hour, to verify normal device functioning and alarm initiation capability. Devices transmit test failure to master control unit.

J. Antimasking Devices: Automatically check operation continuously or at intervals of a minute or less, and use signal-processing logic to detect blocking, masking, jamming, tampering, or other operational dysfunction. Devices transmit detection of operational dysfunction to master control unit as an alarm signal.

K. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to master control unit.

L. Remote-Controlled Devices: Individually and remotely adjustable for sensitivity and individually monitored at master control unit for calibration, sensitivity, and alarm condition.

2.3 ENCLOSURES

A. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.

B. Interior Electronics: NEMA 250, Type 12.

C. Exterior Electronics: NEMA 250, Type 4X, stainless steel.

D. Screw Covers: Where enclosures are readily accessible, secure with security fasteners of type

appropriate for enclosure.

2.4 DOOR AND WINDOW SWITCHES

A. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of two encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.

B. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.

C. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounted magnet and floor-mounted switch unit.

D. Remote Test: Simulate movement of actuating magnet from master control unit.

2.5 MICROWAVE-PIR DUAL-TECHNOLOGY SENSORS

A. Description: Single unit combining a sensor that detects changes in microwave signals and a PIR sensor that detects changes in ambient level of infrared emissions caused by standard-intruder movement within detection pattern.

B. Listed and labeled by a qualified testing agency for compliance with SIA PIR-01.

C. Device Performance: An alarm is transmitted when either sensor detects a standard intruder within a period of three to eight seconds from when the other sensor detects a standard intruder.
   1. Minimum Detection Pattern: A room 20 by 30 feet.
   2. PIR Sensor Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg F or less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps across two adjacent segments of detector's field of view.
   3. Microwave Sensor Sensitivity: Adjustable, able to detect standard-intruder movement within sensor's detection pattern at any speed between 0.3 to 7.5 fps. Sensor sensitivity adjustments shall be accessible only when sensor housing is removed, and sensors shall comply with 47 CFR 15.
   4. Activation Indicator: LED indicator shall not be visible during normal operation. Indicator shall light when sensor detects a standard intruder. Locate test enabling switch under sensor housing cover.
   5. Remote Test: When initiated by master control unit, start a test sequence for each detector element that simulates standard-intruder movement within sensor's detection patterns, causing an alarm.

2.6 MASTER CONTROL UNIT

A. Description: Supervise sensors and detection subsystems and their connecting

communication links, status control (secure or access) of sensors and detector subsystems, activation of alarms and supervisory and trouble signals, and other indicated functions.

1. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
2. Include a real-time clock for time annotation of events on the event recorder and printer.
3. Addressable initiation devices that communicate device identity and status.
4. Control circuits for operation of mechanical equipment in response to an alarm.

B. Construction: Desk-mounted console, modular, with separate and independent alarm and supervisory system modules. Arrangements that require removal of field wiring for module replacement are unacceptable.

C. Comply with UL 1076.

D. Console Controls and Displays: Arranged for interface between human operator at master control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: LCD, three line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
3. Control-Unit Network: Automatic communication of alarm, status changes, commands, and other communications required for system operation. Communication shall return to normal after partial or total network interruption such as power loss or transient event. Total or partial signaling network failures shall identify the failure and record the failure at the annunciator display and at the system printer.
4. Field Device Network: Communicate between the control unit and field devices of the system. Communications shall consist of alarm, network status, and status and control of field-mounted processors. Each field-mounted device shall be interrogated during each interrogation cycle.
5. Operator Controls: Manual switches and push-to-test buttons that do not require a key to operate. Prevent resetting of alarm, supervisory, or trouble signals while alarm or trouble condition persists. Include the following:
    a. Acknowledge alarm.
    b. Silence alarm.
    c. System reset.
    d. LED test.
6. Timing Unit: Solid state, programmable, 365 days.
7. Confirmation: Relays, contactors, and other control devices shall have auxiliary contacts that provide confirmation signals to system for their on or off status. Software shall interpret such signals, display equipment status, and initiate failure signals.
8. Alarm Indication: Audible signal sounds and a plain-language identification of the addressable detector originating the alarm appears on LED display at master control

unit. Annunciator panel alarm light and audible tone identify protected zone signaling an alarm.

9. Alarm activation sounds a siren.

E. Protected Zones: Quantity of alarm and supervisory zones as indicated, with capacity for expanding number of protected zones by a minimum of 25 percent.

F. Power Supply Circuits: Master control units shall provide power for remote power-consuming detection devices. Circuit capacity shall be adequate for at least a 25 percent increase in load.

G. UPS: UPS shall be sized to provide a minimum of six hours of master control-unit operation.

H. Cabinet: Lockable, steel enclosure arranged so operations required for testing, normal operation, and maintenance are performed from front of enclosure. If more than a single cabinet is required to form a complete control unit, provide exactly matching modular enclosures. Accommodate all components and allow ample gutter space for field wiring. Identify each enclosure by an engraved, laminated, phenolic-resin nameplate. Lettering on enclosure nameplate shall not be less than 1 inch high. Identify, with permanent labels, individual components and modules within cabinets.

I. Transmission to Monitoring Station: A communications device to automatically transmit alarm, supervisory, and trouble signals to the monitoring station, operating over a standard voice grade telephone leased line. Comply with UL 1635.

2.7 AUDIBLE AND VISUAL ALARM DEVICES

A. Bell: 10 inches in diameter, rated to produce a minimum sound output of 84 dB at 10 feet from master control unit.

1. Enclosure: Weather-resistant steel box equipped with tamper switches on cover and on back of box.

B. Klaxon Weatherproof Motor-Driven Hooter: UL listed, rated to produce a minimum sound output of 120 dB at 3 feet, plus or minus 3 dB, at a frequency of 470 Hz. Rated for intermittent use: two minutes on and five minutes off.

1. Designed for use in industrial areas and in high-noise, severe-weather marine environments.

C. Siren: 30-W speaker with siren driver, rated to produce a minimum sound output of 103 dB at 10 feet from master control unit.

1. Enclosure: Weather-resistant steel box with tamper switches on cover and on back of box.

2.8 SECURITY FASTENERS

A. Operable only by tools produced for use on specific type of fastener by fastener

manufacturer or other licensed fabricator. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.

B. Drive System Types: pinned Torx.

C. Socket Flat Countersunk Head Fasteners:
1. Heat-treated alloy steel, ASTM F835.
2. Stainless steel, ASTM F879, Group 1 CW.

D. Socket Button Head Fasteners:
1. Heat-treated alloy steel, ASTM F835.
2. Stainless steel, ASTM F879, Group 1 CW.

E. Socket Head Cap Fasteners:
1. Heat-treated alloy steel, ASTM A574.
2. Stainless steel, ASTM F837, Group 1 CW.

F. Protective Coatings for Heat-Treated Alloy Steel:
1. Zinc chromate, ASTM F1135, Grade 3 or Grade 4, for exterior applications and interior applications where indicated.
2. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INTEGRATION

A. Integrate intrusion detection system with the following systems and equipment:
1. Electronic door hardware.
2. Elevators.
3. Access control.
4. Fire-alarm system.
5. Video surveillance.

3.3 SYSTEM INSTALLATION

A. Comply with UL 681 and NFPA 731.

B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.

D. Security Fasteners: Where accessible to inmates, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in stainless- steel materials.

3.4 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceways according to Section 280528 "Pathways for Electronic Safety and Security," except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Wires and Cables:
   1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
   2. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
   3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable.
   4. Data and Television Signal Transmission Cables: Install according to Section 280513 "Conductors and Cables for Electronic Safety and Security."

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

G. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 270553 "Identification for Communications Systems."

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install instructions frame in a location visible from master control unit.

3.6 GROUNDING

A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.

B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

C. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

D. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Section 280526 "Grounding and Bonding for Electronic Safety and Security."

3.7 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
   1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
   1 Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
   2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."

F. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."

G. Tag all equipment, stations, and other components for which tests have been satisfactorily completed

3.8 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the intrusion detection system. Comply with documentation provisions in NFPA 731, Ch. 4, "Documentation and User Training.

END OF SECTION

SECTION 28 31 11 – ADDRESSABLE FIRE ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Device guards.
7. Remote annunciator.
8. Graphic annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.
11. Network communications.

1.2 DEFINITIONS

A. EMT: Electrical Metallic Tubing.

B. FACP: Fire Alarm Control Panel.

C. HLI: High Level Interface.

D. NICET: National Institute for Certification in Engineering Technologies.

E. PC: Personal computer.

F. VESDA: Very Early Smoke-Detection Apparatus.

1.3 ACTION SUBMITTALS

A. A full fire alarm submittal shall be provided to FM Global. All equipment shall be FM Approved and the system shall be designed and installed per FM Global Property Loss Prevention Data Sheet 5-40 *Fire Alarm Systems.*

B. Product Data: For each type of product, including furnished options and accessories.
1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

C. Shop Drawings: For fire-alarm system.
1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.

2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Provide program report showing that air-sampling detector pipe layout balances pneumatically within the airflow range of the air-sampling detector.
12. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring and equipment required for HVAC unit shutdown on alarm and override by firefighters' control system.
    c. Locate detectors according to manufacturer's written recommendations.
    d. Show air-sampling detector pipe routing.
13. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
14. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

D. General Submittal Requirements:
1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified, fire-alarm technician; Level III minimum.
    c. Licensed or certified by authorities having jurisdiction.

E. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.

3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
   3. Smoke Detectors, Fire Detectors, and Flame Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than one unit of each type.
   4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
   5. Keys and Tools: One extra set for access to locked or tamperproofed components.
   6. Audible and Visual Notification Appliances: One of each type installed.
   7. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.
   8. Filters for Air-Sampling Detectors: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
   9. Air-Sampling Fan: Quantity equal to one for every five detectors, but no fewer than one unit of each type.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, campus system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified & FM Global-placarded addressable system, with multiplexed signal transmission and voice/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
   1. Manual stations.

2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.
6. Automatic sprinkler system water flow.
7. Fire-extinguishing system operation.
8. Fire standpipe system.
9. Dry system pressure flow switch.
10. Fire pump running.

B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances, including voice evacuation notices.
2. Identify alarm and specific initiating device at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Activate voice/alarm communication system.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
8. Activate emergency lighting control.
9. Activate emergency shutoffs for gas and fuel supplies.
10. Record events in the system memory.
11. Record events by the system printer.
12. Indicate device in alarm on the graphic annunciator.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Alert and Action signals of air-sampling detector system.
4. Fire pump running.
5. Fire-pump loss of power.
6. Fire-pump power phase reversal.
7. Independent fire-detection and -suppression systems.
8. User disabling of zones or individual devices.
9. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.

9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Voice signal amplifier failure.
11. Hose cabinet door open.

E. System Supervisory Signal Actions:
1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit, connected network control panels, off-premises network control panels, and remote annunciators.
3. Record the event on system printer.
4. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.
5. Transmit system status to building management system.
6. Display system status on graphic annunciator.

2.3 FIRE-ALARM CONTROL UNIT

A. Match campus system.

B. General Requirements for Fire-Alarm Control Unit:
1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.
c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
d. The FACP shall be listed for connection to a central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
1. Pathway Class Designations: NFPA 72, Class A.
2. Pathway Survivability: Level 0.

3. Install no more than 50 addressable devices on each signaling-line circuit.
4. Serial Interfaces:
    a. One dedicated RS 485 port for central-station operation using point ID DACT.
    b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
    c. One USB port for PC configuration.
    d. One RS 232 port for VESDA HLI connection.
    e. One RS 232 port for voice evacuation interface.

E. Stairwell and Elevator Shaft Pressurization: Provide an output signal using an addressable relay to start the stairwell and elevator shaft pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.
1. Pressurization starts when any alarm is received at fire-alarm control unit.
2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

F. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

H. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the fire command center.
1. Indicate number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711.
    a. Allow the application of, and evacuation signal to, indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
    b. Programmable tone and message sequence selection.
    c. Standard digitally recorded messages for "Evacuation" and "All Clear."
    d. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification-appliance circuits of fire-alarm control unit.
2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.
   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
   1. Batteries: Sealed lead calcium.

K. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
   1. Double-action mechanism requiring two actions to initiate an alarm, breaking-glass or plastic-rod type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
   2. Station Reset: Key- or wrench-operated switch.
   3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:
   1. Comply with UL 268; operating at 24-V dc, nominal.
   2. Detectors shall be four-wire type.
   3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
   4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
   5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
   7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
c. Multiple levels of detection sensitivity for each sensor.
d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
a. Primary status.
b. Device type.
c. Present average value.
d. Present sensitivity selected.
e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.
1. Temperature sensors shall test for and communicate the sensitivity range of the device.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Continuous Linear Heat-Detector System:
   1. Detector Cable: Rated detection temperature 155 deg F. Listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short circuit wires at the location of elevated temperature.
   2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
   3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
   4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

E. Visible Notification Appliances: Cooper Wheelock strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
   1. Rated Light Output:
      a. 75 cd.
      b. 15/30/75/110 cd, selectable in the field.
   2. Mounting: Wall mounted unless otherwise indicated.
   3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
   4. Flashing shall be in a temporal pattern, synchronized with other units.
   5. Strobe Leads: Factory connected to screw terminals.
   6. Mounting Faceplate: Factory finished, red.

F. Voice/Tone Notification Appliances:
1. Comply with UL 1480.
2. Speakers for Voice Notification: Locate speakers for voice notification to provide the intelligibility requirements of the "Notification Appliances" and "Emergency Communications Systems" chapters in NFPA 72.
3. High-Range Units: Rated 2 to 15 W.
4. Low-Range Units: Rated 1 to 2 W.
5. Mounting: Flush.
6. Matching Transformers: Tap range matched to acoustical environment of speaker location.

G. Exit Marking Audible Notification Appliance:
1. Exit marking audible notification appliances shall meet the audibility requirements in NFPA 72.
2. Provide exit marking audible notification appliances at the entrance to all building exits.
3. Provide exit marking audible notification appliances at the entrance to areas of refuge with audible signals distinct from those used for building exit marking.

2.8 GRAPHIC ANNUNCIATOR

A. Graphic Annunciator Panel: Mounted in an aluminum frame with nonglare, minimum 3/16-inch-thick, clear acrylic cover over graphic representation of the facility. Detector locations shall be represented by red LED lamps. Normal system operation shall be indicated by a lighted, green LED. Trouble and supervisory alarms shall be represented by an amber LED.
1. Comply with UL 864.
2. Operating voltage shall be 24-V dc provided by a local 24-V power supply provided with the annunciator.
3. Include built-in voltage regulation, reverse polarity protection, RS 232/422 serial communications, and a lamp test switch.
4. Surface mounted in a NEMA 250, Type 1 cabinet, with key lock and no exposed screws or hinges.
5. Graphic representation of the facility shall be a CAD drawing and each detector shall be represented by an LED in its actual location. CAD drawing shall be at 1/8-inch per foot scale or larger.
6. The LED representing a detector shall flash two times per second while detector is an alarm.

2.9 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.
   1. Allow the control panel to switch the relay contacts on command.
   2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
   1. Operate notification devices.
   2. Operate solenoids for use in sprinkler service.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:
   1. Verification that both telephone lines are available.
   2. Programming device.
   3. LED display.
   4. Manual test report function and manual transmission clear indication.
   5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:
   1. Address of the alarm-initiating device.
   2. Address of the supervisory signal.
   3. Address of the trouble-initiating device.

4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.
8. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 NETWORK COMMUNICATIONS

A. Provide network communications for fire-alarm system according to fire-alarm manufacturer's written requirements.

B. Provide network communications pathway per manufacturer's written requirements and requirements in NFPA 72 and CEC.

C. Provide integration gateway using BACnet for connection to building automation system.

2.13 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
1. Factory fabricated and furnished by device manufacturer.
2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with

requirements in CEC including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before all other trades have completed cleanup shall be replaced.
2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.

B. Connecting to Equipment: Verify that fire-alarm system is operational before making changes or connections.
   1. Connect new equipment to monitoring equipment at the supervisingstation.

C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

D. Manual Fire-Alarm Boxes:
   1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
   2. Mount manual fire-alarm box on a background of a contrasting color.
   3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

E. Smoke- or Heat-Detector Spacing:
   1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
   2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
   3. Smooth ceiling spacing shall not exceed 30 feet.
   4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A or Annex B in NFPA 72.
   5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
   6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.

F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
   1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

H. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.3 PATHWAYS

A. Pathways shall be installed in EMT.

B. Exposed EMT shall be painted red enamel.

3.4 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Alarm-initiating connection to smoke-control system (smoke management) at firefighters' smoke-control system panel.
   2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
   3. Smoke dampers in air ducts of designated HVAC duct systems.
   4. Alarm-initiating connection to activate emergency lighting control.
   5. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   6. Supervisory connections at valve supervisory switches.
   7. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
   8. Data communication circuits for connection to building management system.
   9. Data communication circuits for connection to mass notification system.
   10. Supervisory connections at fire-extinguisher locations.
   11. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
   12. Supervisory connections at fire-pump engine control panel.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visual Inspection: Conduct visual inspection prior to testing.
      a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
      b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
   2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
   4. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

B. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

C. Fire-alarm system will be considered defective if it does not pass tests and inspections.

D. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

E. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 31 11 00 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, material, equipment and services necessary to provide all work, complete in place, as indicated on Drawings and specified herein.

B. Work specified in this Section includes, but is not limited to the following:
1. Site preparation.
2. Tree protection
3. Restore damaged improvements to original condition
4. Existing Utilities
5. Plant Salvage
6. Clearing and Grubbing
7. Salvaging topsoil
8. Boulder salvage
9. Site Improvements
10. Backfill requirements
11. Disposing of objectionable material

C. Related Work Specified in Other Sections
1. Section 01 50 00 – Temporary Facilities and Controls
2. Section 02 41 00 – Demolition
3. Section 31 23 00 – Excavation and Backfill
4. Section 31 22 00 – Grading
5. Section 32 93 00 - Plants

D. Related Documents
1. Landscape Plans, Notes 47-56 of Sheet L-002.

1.2 Definitions

A. ANSI: American National Standards Institute.

B. CAL-OSHA: California Occupational Safety and Health Administration.

C. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of weeds, roots, and other deleterious materials.

1.3 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 29 00, Payment Procedures.

1.4 SUBMITTALS

A. Follow Submittal procedure outlined in Section 01 33 00 – Submittal Procedures.

B. Project Record Documents: Record actual locations of pipe mains, valve, connections and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Do not remove or prune trees without written approval from Owner.

B. Prune to the standards of the International Society of Arborists and to ANSI 300.

1.6 PROJECT CONDITIONS

A. Except for materials indicated to be stockpiled or to remain the Owner’s property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.

B. Unidentified Materials; if unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner.

C. If necessary, the Owner will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.

1.7 EXISTING UTILITIES

A. Contractor is responsible to contact 811 U.S.A (800-642-2444) to stake and mark the location of all existing utilities before commencing Work. Pot hole as required to determine and verify location and depth.

B. Retain and protect in operating condition all active utilities traversing the site designated to remain.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 00 – Excavation and Backfll.

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Protect and maintain benchmarks and survey control points during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain during construction.

D. Verify existing conditions at the site and include all work evident by site inspection whether or not shown on the Drawings.

E. Also see Site Preparation notes (notes 47 – 56, Sheet L-002) for ecological and cultural site management.

3.2 TREE PROTECTION

A. Refer to Section 01 50 00 Temporary Facilities and Controls for additional instructions

B. See Site Preparation notes (notes 47 and 48, Sheet L-002) for plant protection.

3.3 PLANT SALVAGE

A. See Site Preparation notes (notes 47 and 49, Sheet L-002) for plant salvage.

3.4 RESTORATION

A. Restore damaged improvements to their original condition, as acceptable to the Owner.

B. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, as directed by the Owner.
   1. Employ a qualified, licensed arborist, to submit details of proposed repairs and to repair damage to trees and shrubs.
   2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Owner.

3.5 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
   1. If designated for partial removal, disconnect and seal or cap at terminations to remain.

B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.

C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.

D. Coordinate utility interruptions with utility company affected.

E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.

F. Excavate and remove underground utilities that are indicated to be removed.

G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

3.6 CLEARING AND GRUBBING

A. Prior to undertaking site clearance, coordinate with the Tribe to perform a cultural burn of the site. See Site Preparation notes (notes 47 – 56, Sheet L-002) for ecological and cultural site management.

B. Identify plant material for cultural reuse or reincorporation into the site prior to undertaking clearing and grubbing. See Site Preparation notes (notes 47 – 56, Sheet L-002).

C. Clear the site and remove obstructions, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots. Remove trash, debris, logs, concrete, masonry and other waste materials.

D. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

E. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18-inches below subgrade.

F. Use only hand methods for grubbing within drip line of remaining trees.

G. In areas not to be further excavated, fill depressions resulting from site clearing. Place and compact satisfactory soil materials per the geotechnical investigation report.

H. Clear undergrowth and deadwood without disturbing subsoil.

3.7 TOPSOIL SALVAGE

A. See Site Preparation notes (Note 51, Sheet L-002) for topsoil salvage and weed removal.

B. Remove sod and grass before stripping topsoil.

C. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

D. Remove trash, debris, weeds, roots, and other waste materials.

E. Stockpile topsoil materials designated to remain on site at a location approved by the Owner at a location away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

F. Do not stockpile topsoil within drip line of remaining trees.

G. Coordinate schedule to allow for a minimum of 3 to 6 months of thermosterilization of soil in accordance with Interim Weed Management Note 56 on Landscape Sheet L-002.

3.8 BOULDER SALVAGE

A. Stockpile boulders and rock encountered through site clearing and demolition for evaluation and potential reuse on site.

3.9 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.

C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.

3.10 BACKFILL

A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 00 – Excavation and Backfill.

3.11 DISPOSAL

A. Remove surplus unsuitable soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner’s property.

END OF SECTION

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SECTION 31 22 00 - GRADING

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section includes regulatory requirements, protection, site grading, excavation, backfilling, compaction, quality control, and restoration.

1.2 MEASUREMENT

A. Site Grading: Paid as a Lump Sum as included in the Bid Schedule Section 004100 including all work as described in Section 011000.

1.3 REFERENCES

A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.5 Kg) Rammer and 12 inch (300 mm) Drop.

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.5 Kg) Rammer and 18 inch (450 mm) Drop.

D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

F. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

1.4 SUBMITTAL REQUIREMENTS

A. In accordance with the requirements of Section 6705 of the Labor Code of the State of California, submit a detailed plan to the Engineer before excavation, showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth.

B. Plan must be submitted and approved by the Engineer prior to start of work.

1.5 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Structure: Foundation, manhole, septic tank, cleanout, catch basin, vault, or culvert.

C. Solid Rock: Large continuous masses of igneous, metamorphic, or sedimentary rock, which in the opinion of the Engineer cannot be excavated without drilling and blasting. Soil that is capable of

being excavated with rippers is not considered solid rock.

D. Loose Rock: Boulders and other detached stones, with a minimum volume of 1 cubic yard.

1.6 FIELD MEASUREMENTS

A. Verify that survey benchmarks, control points, and intended elevations are as shown on drawings.

1.7 PROTECTION

A. Barricade open excavations.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. Provide safe conditions for workers and passers-by.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.1 PREPARATION

A. Notify Underground Service Alert (800) 227-2600 in Northern California prior to excavation. Comply with their notice requirements.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, rock outcropping, and other features remaining as final landscaping.

D. Protect benchmarks, existing structures, fences, and paving from excavating equipment and vehicular traffic.

E. Maintain and protect utilities and structures to remain.

3.2 EXCAVATION

A. Use open cut method on all excavation unless otherwise shown on the drawings, required by permit, or approved in writing by the Engineer.

B. Stockpile excavated material on site. Any material not utilized for construction purposes may be spread onsite or removed from the site as designated by the Engineer.

C. The location for the disposal of all spoils which will not be used for backfilling, compaction, top soil, landscape, or any other foreseeable uses shall be disposed at the following location: **900 Upper Cappell Rd, Weitchpec CA.**

D. The use of the referenced spoils location shall be coordinated with its specific property owner and the Engineer prior to usage and disposal. Spoils property Owner shall have onsite their own equipment and operators ready to receive the spoils, spread material, and compact it at their discretion. The excavation scope and treatment of spoils shall be only to haul and deliver the material. The disposal site shall not be used prior to this arrangement or afterwards without express authorization and prior coordination.

3.3 CLASSIFICATION OF EXCAVATION

A. All excavation with equipment commonly used in the industry is classified as common excavation (except for drilling and blasting).

3.4 FIELD QUALITY CONTROL

A. The Owner, at its discretion, may acquire the services of a certified soils testing laboratory to perform baseline Modified Proctor density tests in accordance with Cal 216 or latest revision:

1. Tests may be performed at locations approved by the Engineer.
2. Test results from tests prior to construction will be made available to the contractor.
3. Testing is at the Owner’s expense.

B. Compaction testing will be determined at the Engineer's discretion.

C. If work does not meet specified requirements, remove, replace, and retest. All re-testing is at the contractor’s expense. Compaction tests shall be used as the basis for determination of acceptability of work performed under this contract.

3.5 PROTECTION OF FINISHED WORK

A. If vehicular traffic has altered finished work, reshape and re-compact.

END OF SECTION 31 22 00

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SECTION 31 23 00 - EXCAVATION AND FILL

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section includes requirements for excavation, backfilling, compaction, quality control, and restoration.

1.2 MEASUREMENT

A. Excavation and Fill: Cost to be per Cubic Yard per Bid Schedule Section 004100. Includes all labor material and equipment necessary for the excavation and fill to the lines and grades shown on the project plans for construction. Fill shall be compacted per this section. Measurement shall be made by weight tickets or performing field surveys after initial site grading and after fill is complete, and shall be measured by the in-place volume or by other methods agreed upon between the Contractor and the Engineer. No allowance will be made for shrink/swell of fill material during excavation or transport. No separate payment will be made for fill materials utilizing onsite soils.

B. Trenching & Backfilling: Cost to be included in other items. Includes excavating trenches and backfilling for all pipe and utilities in the project area.

1.3 REFERENCES

A. ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.5 Kg) Rammer and 12 inch (300 mm) Drop.

B. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.5 Kg) Rammer and 18 inch (450 mm) Drop.

D. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

F. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

1.4 SUBMITTAL REQUIREMENTS

A. In accordance with the requirements of Section 6705 of the Labor Code of the State of California, submit a detailed plan to the Engineer before excavation, showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth.

B. Submit the plan to the Engineer prior to start of excavation.

1.5 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Structure: Foundation, manhole, septic tank, cleanout, catch basin, vault, or culvert.

C. Solid Rock: Large continuous masses of igneous, metamorphic, or sedimentary rock, which in the opinion of the Engineer cannot be excavated without drilling and blasting. Soil that is capable of being excavated with rippers is not considered solid rock.

D. Loose Rock: Boulders and other detached stones, with a minimum volume of 1 cubic yard.

1.6 FIELD MEASUREMENTS

A. Verify that survey benchmarks, control points, and intended elevations are as shown on drawings.

1.7 PROTECTION

A. Barricade open excavations.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. Provide safe conditions for workers and passers-by.

PART 2 PRODUCTS

2.1 IMPORTED PIPE EMBEDMENT

A. Use crushed stone or gravel that is free of shale, clay, friable material, and debris. Grade in accordance with ASTM C136, within the following limits:

Sieve Size	Percent Passing
1 in	100
3/4 in	90 to 100
3/8 in	20 to 55
No. 4	0 to 10
No. 8	0 to 5

2.2 IMPORTED STRUCTURAL FILL

A. Use imported soil (if required) that has angular fragments and a low expansion index (less than 30 per ASTM D 4829). Use imported fill that complies with the requirements of Caltrans Class 2

Aggregate Sub-base:

Sieve Size	Percent Passing (Contract Compliance)
3 in (75mm)	100
1½ in (63mm)	87 to 100
No. 4 (4.75mm)	45 to 100
No. 200 (.075mm)	0 to 34

PART 3 EXECUTION

3.1 PREPARATION

A. Notify Underground Service Alert (800) 227-2600 in Northern California prior to excavation. Comply with their notice requirements.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, rock outcropping, and other features remaining as final landscaping.

D. Protect benchmarks, existing structures, fences, and paving from excavating equipment and vehicular traffic.

E. Maintain and protect utilities and structures to remain.

3.2 EXCAVATION

A. Use open cut method on all excavation unless otherwise shown on the drawings, required by permit, or approved in writing by the Engineer.

B. Stockpile excavated material on site. Any material not utilized for construction purposes may be spread onsite or removed from the site as designated by the Engineer.

3.3 CLASSIFICATION OF EXCAVATION

A. All excavation with equipment commonly used in the industry is classified as common excavation (except for drilling and blasting).

3.4 TRENCH EXCAVATION

A. Cut trenches sufficiently wide to enable installation and inspection. Remove water or materials that interfere with work. When groundwater is encountered the Contractor must submit a dewatering plan to the Engineer for approval.

B. Maintain trench sides as vertical as possible--between 12 inches and 24 inches wider than the outside diameter of the pipe barrel--below pipe level.

C. Excavate trench width above the pipe as wide as necessary for shoring, sheeting, and installation.

D. Center trench excavation on pipe alignment for a minimum clearance of 6 inches on each side of the pipe.

E. Hand trim for bell and spigot pipe joints. Remove loose matter.

F. Restore over-excavated areas. If the trench bottom is over-excavated below the intended grade, fill over-excavation with imported pipe embedment and compact to density equivalent to the in situ material.

G. Remove lumped subsoil, boulders, and rock up to ½ yd3 (measured by volume).

H. Excavate for additional trench depth when soil prevents adequate pipe support. Refill addition with imported pipe embedment. Remove large rock, boulders, and large stones to provide 3 inches of soil cushion on all sides of the pipe and pipe accessories.

I. Length of trench that may be left open at any one time is 100 yards. Do not leave trench open over night.

J. Stockpile excavated material in designated area on site, and remove excess material from site.

3.5 STRUCTURE EXCAVATION

A. Excavate for structures down to the levels indicated on the drawings or as directed by the Engineer. Excavate as large as necessary to accommodate the work forms. When necessary over-excavate to remove unsuitable soil and replace with engineered fill. Comply with all safety regulations.

B. Excavate a sufficient distance from walls and footings to provide forming except where concrete for walls or footings is directly against excavated surfaces.

C. Do not excavate below depths indicated in the drawings. Restore over-excavated areas to proper elevation by filling with imported structural fill. Do not interfere with 45 degree bearing splay of foundations.

D. Hand-trim the bottom of the excavation to prevent disturbing the soil below the required depth.

3.6 BACKFILLING

A. Use care to prevent disturbance or damage to utilities or structures in trench.

B. Maintain optimum moisture content to attain required compaction density.

C. Remove surplus fill materials from site.

D. Leave fill material stockpile areas free of excess fill materials.

3.7 TRENCH BACKFILLING

A. Use excavated soil as embedment unless Engineer determines it unsuitable. Unsuitable material

is defined as incapable of being compacted to specified density with optimum moisture content, solid or loose rock, lump material larger than 1 inch, organic matter, or debris.

B. Use excavated soil as final backfill unless the Engineer determines it unsuitable. Unsuitable final backfill material is solid or loose rock larger than 6 inches or lumps larger than 3 inches. Do not use organic matter or debris.

C. Backfill pipe embedment material in uniform layers on all sides of the pipe in lifts not to exceed 6 inches.

D. Use the following methods when placing final backfill material unless otherwise required by permits or authority.

Compact	Not to Exceed (In loose measure)
Roadways	6 inches thick
Rights-of-way and outside roadway	12 inches thick
Unimproved surfaces	24 inches thick

3.8 STRUCTURE BACKFILLING

A. Place structure fill material in uniform layers on all sides of the structure 6 inches thick.

B. Do not fill structure material until the structure footing or other portions of the structure have been inspected.

C. Use excavated soil as final backfill material unless Engineer determines it unsuitable. Unsuitable final backfill material is solid or loose rock larger than 6 inches or lumps larger than 3 inches. Do not use organic matter or debris.

3.9 COMPACTION

A. Compact final backfill to the percentage of maximum density determined by Cal 216 and as provided in “Percent of Maximum Density” table below, unless otherwise specified by the Owner.

Percent of Maximum Density				
Location	**Bedding**	**Haunching**	**Initial Backfill**	**Final Backfill**
Roadways, Improved Surfaces	95	95	95	95
Roadway Rights-of-Way Outside of Roadway Prism	90	90	90	90
Unimproved Surfaces, Fields, Etc.	90	90	80	80
Backfill Around Structures	95	95	95	95

3.10 FIELD QUALITY CONTROL

A. The Owner, at its discretion, may acquire the services of a certified soils testing laboratory to perform baseline Modified Proctor density tests in accordance with Cal 216 or latest revision:

1. Tests may be performed at locations approved by the Engineer.
2. Test results from tests prior to construction will be made available to the contractor.
3. Testing is at the Owner’s expense.

B. Compaction testing will be determined at the Engineer's discretion.

C. If work does not meet specified requirements, remove, replace, and retest. All re-testing is at the contractor’s expense. Compaction tests shall be used as the basis for determination of acceptability of work performed under this contract.

3.11 PROTECTION OF FINISHED WORK

A. If vehicular traffic has altered finished work, reshape and re-compact.

END OF SECTION 31 23 00

SECTION 31 25 00 - EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Clearing and Grubbing: Section 311100

B. Grading: Section 312200.

C. Excavation and Fill: Section 312300.

D. Division 32.

E. Division 33.

1.2 REFERENCES

A. Erosion and Sediment Control Guidelines: Conform to the latest edition of EPA Standards and Specifications for Erosion and Sediment Control". Refer to these guidelines for construction and maintenance of all items (Temporary and Permanent Structural, Vegetative and Biotechnical) included in the Storm Water Pollution and Prevention Plan (SWPPP).

B. Storm Water Management: Conform to the latest edition of EPA Stormwater Management Design Manual.

1.3 RESPONSIBILITY

A. A Storm Water Pollution and Prevention Plan (SWPPP) has been prepared for this project. Install and maintain the temporary storm water and diversion control items as shown on the drawings before starting any grading or excavation and maintain compliance of all Storm Water Pollution Plan/NPDES regulations. Provide any temporary sediment and erosion control measures that may be required within limits of the work, including any staging areas, throughout construction in conformance with the plan, and as directed by the Owner's Representative. Place the permanent control practices required before the removal of the temporary storm water diversion and control items.

B. During construction conduct operations in such a manner as to prevent or reduce to a minimum any damage to any water body from pollution by debris, sediment, chemical or other foreign material, or from the manipulation of equipment and/or materials in or near a stream or ditch flowing directly to a stream. Any water which has been used for wash purposes or other similar operations which become polluted with sewage, silt, cement, concentrated chlorine, oil, fuels, lubricants, bitumens, or other impurities shall not be discharged into any water body.

C. In the event of conflict between these specifications and the regulation of other Federal, State, or local jurisdictions, the more restrictive regulations shall apply.

D. The Contractor shall adhere to all requirements of the Storm Water Pollution Prevention Plan. Comply with all applicable regulatory requirements.

E. The Contractor will submit copies of certificates documenting that on-site workers have completed an Erosion & Sediment Control training as required.

1.4 DESCRIPTION

A. The Work shall consist of furnishing, installing, inspecting, maintaining, and removing soil and erosion control measures as shown on the contract documents or as ordered by the Director's Representative during the life of the contract to provide erosion and sediment control.

B. Temporary structural measures provide erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion. These are used during construction to prevent offsite sedimentation. Temporary structural measures shall include check dams, construction road stabilization, stabilized construction entrance, dust control, earth dike, level spreader, perimeter dike/swale, pipe slope drain, portable sediment tank, rock dam, sediment basin, sediment traps, silt fence, storm drain inlet protection, straw/hay bale dike, access waterway crossing, storm drain diversion, temporary swale, turbidity curtain, water bars or other erosion control devices or methods as required.

C. Permanent structural measures also control protection to a critical area. They are used to convey runoff to a safe outlet. They remain in place and continue to function after completion of construction. Permanent structural measures shall include debris basins, diversion, grade stabilization structure, land grading, lined waterway (rock), paved channel, paved flume, retaining wall, riprap, rock outlets, and stream bank protection or other erosion control devices or methods as required.

D. Vegetative measures shall include brush matting, dune stabilization, grassed waterway, vegetating waterway, mulching, protecting vegetation, seeding, sod, straw/hay bale dike, stream bank protection, temporary swale, topsoil, and vegetating waterways.

E. Biotechnical measures shall include wattling (live fascines, brush matting, brush layering, live cribwall, and branchpacking) vegetated rock gabions, live staking, tree revetment, and fiber rolls.

F. Weekly inspections will be completed by the Director's Representative. Comply with and correct all deficiencies found as a result of these inspections. At the end of the construction season when soil disturbance activities will be finalized or suspended until the following spring, the frequency of the inspections may be reduced. If soil disturbance is completely suspended and the site is properly stabilized, a minimum of monthly inspections must be maintained. The stabilization activities must be completed before snow cover or frozen ground. If vegetation is required, seeding, planting and/or sodding must be scheduled to avoid die-off from fall frosts and allow for proper germination/establishment. Weekly inspections must resume no later than March 15.

1.5 DEFINITIONS – TEMPORARY STRUCTURAL MEASURES

A. Check Dam: Small barrier or dam constructed of stone, bagged sand or gravel to reduce velocity of flow.

B. Construction Road Stabilization: Stabilization of construction roads to control erosion.

C. Stabilized Construction Entrance: A stabilized pad of aggregate underlain with geo-textile where traffic enters a construction site to reduce or eliminate tracking of sediment to public roads.

D. Dust Control: Prevent surface and air movement of dust from disturbed soil surfaces.

E. Earth Dike: A temporary berm or ridge of compacted soil, located to channel water to a sediment trapping device.

F. Level Spreader: A non-erosive outlet for concentrated runoff to disperse flow uniformly across a slope.

G. Perimeter Dike/Swale: A temporary ridge of soil excavated from an adjoining swale located along the perimeter of the site or disturbed area to prevent runoff from entering a disturbed area and preventing sediment laden runoff from leaving a construction site.

H. Pipe Slope Drain: A structure placed from the top of a slope to the bottom of a slope to convey runoff without causing erosion.

I. Portable Sediment Tank: A compartmented tank to which sediment laden water is pumped to retain sediment before pumping the water to adjoining drainage ways.

J. Rock Dam: A rock embankment located to capture sediment.

K. Sediment Basin: A barrier constructed across a drainage way to intercept and trap sediment.

L. Sediment Traps: A control device formed by excavation to retain sediment at a storm inlet or other points of collection.

M. Silt Fence: A barrier of geo-textile fabric installed on contours across the slope to intercept runoff by reducing velocity. Replace after 1 year.

N. Storm Drain Inlet Protection: A semi-permeable barrier installed around storm inlets to prevent sediment from entering a storm drainage system.

O. Straw/Hay Bale Dike: Intercept sediment laden runoff by reducing velocity. Replace after 3 months.

P. Access Waterway Crossing: A structure placed across a waterway to provide circulation for construction purposes.

Q. Storm drain Diversion: The redirection of a storm drain line or outfall channel for discharge into a sediment trapping device.

R. Temporary Swale: A temporary excavated drainage swale.

S. Turbidity Curtain: A flexible, impenetrable barrier used to trap sediment when construction occurs within water bodies or along a shoreline.

T. Water Bars: A ridge or channel constructed diagonally across a sloping road or right-of-way.

1.6 DEFINITIONS – PERMANENT STRUCTURAL MEASURES

A. Diversion: A parabolic or trapezoidal swale with a supporting ridge on the lower side constructed across a slope to intercept and convey runoff to stable outlets at non-erosive velocities.

B. Debris Basin: A barrier or dam constructed across a waterway to form a basin for catching and storing sediment or debris that gives protection downstream.

C. Grade Stabilization Structure: A structure to stabilize the grade by providing channel linings that can withstand high velocities.

D. Lined Waterway (rock): A waterway lined with stone to dispose of high velocity runoff.

E. Paved Channel (concrete): A waterway lined with concrete to dispose of high velocity runoff.

F. Paved Flume: A concrete lined channel to convey water down a steep slope.

G. Retaining Wall: A structural wall constructed to prevent soil movement down steep slopes.

H. Riprap: A layer of stone designed to protect slopes that are subject to erosion.

I. Rock Outlets: Rock placed at the outlet end of culverts, conduits or channels.

J. Stream Bank Protection: Stabilization of eroding stream banks through use of riprap, gabions or pre-cast concrete units.

1.7 DEFINITIONS – VEGETATIVE MATERIALS MEASURES

A. Brush Matting: Hardwood brush layered along a stream bank with a grid of stakes and wire. This acts as a mulch for seedlings established in the bank.

B. Dune Stabilization:

C. Grassed or Vegetating Waterway: A parabolic or trapezoidal channel below adjacent ground level stabilized by vegetation to convey water without causing erosion.

D. Mulches: Hay, straw, wood cellulose, fiber mats, flexible growth medium and other materials approved by the Director’s Representative.

E. Protecting Vegetation: Protecting trees, shrubs, ground cover and other vegetation from damage.

F. Temporary Seeding: Erosion control protection to a critical area for an interim period. A critical area is any disturbed, denuded slope subject to erosion.

G. Permanent Seeding: Grasses established and combined with shrubs to provide perennial vegetative cover on disturbed, denuded, slopes subject to erosion.

H. Sod: Used where a quick vegetative cover is required.

I. Straw/Hay Bale Dike: Intercept sediment laden runoff by reducing velocity. Replace after 3 months.

J. Stream Bank Protection: Stabilization of eroding stream banks through use of vegetation.

K. Temporary Swale: A temporary excavated drainage swale.

L. Topsoil: Placed before permanent seeding or sod is installed.

1.8 DEFINITIONS – BIOTECHNICAL MATERIALS MEASURES

A. Vegetative Rock Gabions: A combination of vegetation and rock gabions for slope stabilization. Live branch cuttings are layered through the gabion protruding beyond the face of the gabion.

B. Live Fascines: Bundles of branches staked into shallow trenches which are then filled with soil. They are oriented along a contour and placed in multiple rows.

C. Brush Matting: Hardwood brush layered along a stream bank with a grid of stakes and wire. This acts as a mulch for seedlings established in the bank.

D. Live Staking: Large stakes sharpened at the bottom end and forced vertically into the ground.

E. Brush Layering: Stabilize slope areas above the flow line of stream banks. Long branches are placed with cut ends into a terraced slope.

F. Live Crib Wall: A combination of vegetation and structural elements used along streams where flowing water is a hazard. Layers of logs are alternated with long branches protruding out between them.

G. Tree Revetment: Used for bank stabilization by placing tree trunks and branches overlapped and anchored to absorb energy, reduce velocity and capture sediment.

H. Branch Packing: Alternates live branch cuttings and tamped backfill to repair small localized holes in slopes. Used for areas less than 4’ deep and 6’ wide.

I. Fiber Roll: A coconut fiber, straw, or excelsior woven roll encased in a netting of jute, nylon, or burlap to dissipate water energy and provide a medium for introduction of herbaceous vegetation. Anchor into a bank and provide suitable backfill behind the roll where vegetation can be planted.

PART 2 PRODUCTS

2.1 MATERIALS

A. Plant Materials for biotechnical slope protection: Locate stands of specified species and obtain approval to harvest material from these stands or obtain from managed production beds that are maintained for commercial distribution. Install all plant materials within 8 hours of cutting or provide proper storage.

1. Shrub willows: “Streamco” purpleosier willow, and “Bankers” dwarf willow, Redosier Dogwood.

B. Seeding: Permanent see Section 329219.

2.2 COMPANIES-TEMPORARY STRUCTURAL

A. The following companies are manufacturers of temporary structural products. See highlighted notes to determine the specific products manufactured by each company.

1. Mirafi, 365 South Holland Drive, Pendergrass, Ga, 30567, (888) 795-0808, www.mirafi.com.
2. North American Green, 14649 Highway 41 North, Evansville, IN 47725, (800) 772-2040, www.nagreen.com.
3. Siltdam Inc., P.O. Box 960, Brockton MA, 02303, (800) 699-2374, www.spilldam.com.
4. Nedia Enterprises, Inc., 22187 Vantage Pointe Place, Ashburn, VA 20148, (888) 725-6999, www.nedia.com.
5. Belton Industries, 5600 Oakbrook Parkway, Norcross GA., 30093, (800) 225-4099, www.beltonindustries.com.
6. KriStar, 1219 Briggs Ave., Santa Rosa, CA 95401, (800) 579-8819, www.kristar.com.
7. Rolanka International Inc., 155 Andrew Drive, Stockbridge GA 30281, (800) 760-3215, www.rolanka.com.
8. Apex Resources Inc., 12910 Shelbyville Road, Louisville, KY 40243 (888) 677-2739, www.apexr.com.
9. MonoSol, LLC, 707 E. 80th PL., Merrillville, IN 46410 (800) 237-9552, www.terraloc.com.
10. Brockton Equipment Inc., P.O. Box 960, Brockton, MA 02303 (800) 699-2374, www.spilldam.com.
11. Aer-Flo Inc., 4455 18th St. East, Bradenton, FL 34203 (800) 823-7356, www.aerflo.com.
12. Contech Construction Products Inc., 9025 Centre Point Drive, Suite 400, West Chester, Ohio 45069, (800) 338-1122, www.contech-cpi.com.

2.3 COMPANIES-PERMANENT STRUCTURAL

A. Gabions, retaining walls, stone mattresses:
1. Contech Construction Products Inc., 9025 Centre Point Drive, Suite 400, West Chester, Ohio 45069, (800) 338-1122, www.contech-cpi.com.

2.4 COMPANIES-VEGETATIVE

A. Nedia Enterprises, Inc., 22187 Vantage Pointe Place, Ashburn, VA 20148, (888) 725-6999, www.nedia.com.

B. Agrecol Corporation, 2918 Agriculture Drive, Madison, Wi, 53718, (608) 226-2544, www.agrecol.com.

2.5 COMPANIES-BIOTECHNICAL

A. Biodegradable blankets
   1. Rolanka International Inc., 155 Andrew Drive, Stockbridge GA 30281, (800) 760-3215, www.rolanka.com.
   2. Nedia Enterprises, Inc., www.nedia.com.
   3. Kristar (800) 579-8819.

PART 3 EXECUTION

3.1 WORK AREAS

A. The Director's Representative has the authority to limit the surface area of erodible earth exposed by earthwork operations and to direct the Contractor to provide immediate temporary or permanent erosion measures to minimize damage to property and contamination of watercourses and water impoundments. Under no circumstances will the area of erodible earth material exposed at one time exceed 50,000 sq. ft. The Director's Representative may increase or decrease this area of erodible earth material exposed at one time as determined by his analysis of project, weather and other conditions. The Director's Representative may limit the area of clearing and grubbing and earthwork operations in progress commensurate with the Contractor's demonstrated capability in protecting erodible earth surfaces with temporary, permanent, vegetative or biotechnical erosion control measures.

B. Schedule the work so as to minimize the time that earth areas will be exposed to erosive conditions. Provide temporary structural measures immediately to prevent any soil erosion.

C. Provide temporary seeding on disturbed earth or soil stockpiles exposed for more than 7 days or for any temporary shutdown of construction. In spring, summer or early fall apply rye grass at a rate of 1 lb/ 1000 sq.ft. In late fall or early spring, apply certified Aroostook Rye at a rate of 2.5 lbs./ 1000 sq. ft. Apply hay or straw at a rate of 2 bales/ 1000 sq. ft. or wood fiber hydromulch at the manufacturer's recommended rate. Hay or straw shall be anchored.

D. Coordinate the use of permanent controls or finish materials shown with the temporary erosion measures.

E. All erosion and sediment control devices must be maintained in working order until the site is stabilized. All preventative and remedial maintenance work, including clean out, repair, replacement, re-grading, re-seeding, or re-mulching, must be performed immediately.

F. After final stabilization has been achieved temporary sediment and erosion controls must be removed. Areas disturbed during removal must be stabilized immediately.

END OF SECTION 31 25 00

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SECTION 31 37 00 - ROCK SLOPE PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Rock Slope Protection
B. Geotextile Fabric

1.2 MEASUREMENT

A. Rock Slope Protection: Paid by the Ton. Includes supply and installation of rock slope protection as shown in the project plans.
B. Geotextile Fabric: Paid by the Square Foot. Includes supply and installation of geotextile fabric in locations shown in the project plans.

1.3 REFERENCES

A. State of California, Department of Transportation, Standard Specifications, current edition.
B. Section 02300 – Earthwork

PART 2 PRODUCTS

2.1 MATERIALS

A. Rock Slope Protection: 1/4 Ton Rock, In accordance with State of California, Department of Transportation, Standard Specifications, Section 72. 1/4 ton RSP defined as nominally average 12” to 18” diameter, 165 LBS/CF clean rock.
B. Geotextile Fabric: Rock slope protection fabric, In accordance with State of California, Department of Transportation, Standard Specifications, Section 88.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify base conditions under provisions of Section 02300.

3.2 PLACING ROCK SLOPE PTOTECTION

A. Install Work in accordance with State of California, Department of Transportation, Standard Specifications, Section 72.

3.3 PLACING GEOTEXTILE

A. Install geotextile in accordance with State of California, Department of Transportation, Standard Specifications, Section 72.

END OF SECTION 31 37 00

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SECTION 32 05 13 - TOP SOIL

PART 1 GENERAL

1.1 SUMMARY

A. The Work under this Section includes providing all labor, materials, tools, and equipment necessary for satisfactorily furnishing and placing topsoil.

1.2 PAYMENT

A. Payment for this item is included in landscaping item

1.3 SUBMITTALS

A. Submit material sample for testing and analysis and or submit test data for material including textural analysis, gradation, organic matter content, ph rating.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil furnished by the Contractor shall consist of a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be reasonably free from roots, hard clay, coarse gravel, stones larger than one inch in any dimension, noxious weeds, tall grass, brush, sticks, stubble or other material which would be detrimental to the proper development of vegetative growth. Topsoil shall be obtained from naturally well-drained sites where topsoil occurs at least 4 inches deep. Topsoil shall not be obtained from bogs or marshes.

B. Topsoil shall conform to the following grading:

Sieve Sizes	**Percentage Passing**
1-inch	100%
1/2 inch	95% - 100%
No.4	75% - 100%
No.10	60% - 100%
No.200	10% - 60%

C. Topsoil shall contain not less than 3%, or more that 20% organic matter, by weight as determined by loss-on-ignition of oven-dried samples in accordance with ASTM D5268. Organic material shall be decomposed and free of wood.

D. The Engineer shall be notified on the location from which the Contractor proposes to procure topsoil at least fourteen (14) calendar days prior to delivery of topsoil to the Project from that location. The topsoil and its source must be inspected/tested by the Engineer and approved for use before beginning any procurement, hauling, or work directly including topsoil.

E. Topsoil sources lacking organic matter may be used if, prior to delivery to the Project, sufficient organic matter in the form of pulverized peat moss or rich organic soil from other sources is thoroughly mixed with the topsoil to provide a product meeting the above requirements.

F. Organic material for incorporation into topsoil, if required, shall be partially decomposed fibrous or cellular stems and leaves of any of several species of Sphagnum mosses, or rotted manure. Organic material may require chopping or shredding to insure thorough mixing.

G. All topsoil shall be fertilized as follows: the application rates of the fertilizer per 1,000 square feet of ground area of topsoil furnished by the Contractor shall be determined by the Engineer, based on soil analysis tests so that the total natural and applied chemical constituents are as follows:

1. Nitrogen 1.0 lb. minimum - 1.5 lb. maximum per 500 cubic feet
2. Phosphoric Acid 1.0 lb. minimum - 2.0 lb. maximum per 500 cubic feet
3. Potassium 1.0 lb. minimum - 2.0 lb. maximum per 500 cubic feet

PART 3 EXECUTION

3.1 CONSTRUCTION

A. All areas beyond sidewalks and roadway shoulders that are disturbed during construction which are not scheduled to be covered with pavement, concrete, or base course, shall be graded to a neat, uniform gradeline and appearance, as determined by the Engineer, and covered with a neat uniform, six inch minimum thickness of topsoil, unless otherwise shown on the Drawings, or directed by the Engineer.

B. The topsoil shall be evenly spread on the designated areas to a depth, which, after settlement and compaction, shall be six inches, unless otherwise directed by the Engineer. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work, as determined by the Engineer. Roadway surfaces shall be kept clean during hauling and spreading operations.

C. After spreading has been completed, large clods, stones larger that one-inch in any dimension, roots stumps, and other litter shall be collected and removed.

D. The final grading of the topsoil prior to seeding shall be to a tolerance that will not permit ponding of water in excess of one inch in depth.

E. The Contractor shall provide labor personnel experienced with landscaping work that involves fine grading of topsoil for residential and commercial lawns.

F. The Engineer will determine the location of those areas requiring finish grading and the time required to bring the graded topsoil to the desirable finish appearance.

G. The Contractor shall remove and dispose of all excess materials resulting from finish grading of the topsoil. The work required to remove and dispose of this excess material from piles placed adjacent to the work will be considered incidental to other work under the contract.

END OF SECTION 32 05 13

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SECTION 32 11 23 - AGGREGATE BASE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course

1.2 MEASUREMENT

A. Aggregate Base: Paid by the Ton. Includes subgrade preparation, supply of aggregate base, preparation and compaction of aggregate base, and testing.

1.3 REFERENCES

A. State of California, Department of Transportation, Standard Specifications http://www.dot.ca.gov/hq/esc/oe/construction_standards.html, latest edition.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, Department of Transportation, Standard Specifications, current addition.
B. Obtain materials from same source throughout the life of the project.

1.5 SUBMITTALS

A. Contractor must submit mix design to the Engineer for approval prior to placement of material in the field.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate for Base: Course: 1-1/2”- crushed rock or 3/4”- washed
In accordance with State of California, Department of Transportation, Standard Specifications 2022, Section 26.

PART 3 EXECUTION

3.1 PLACING AGGREGATE BASE

A. Install Work in accordance with State of California, Department of Transportation, Standard Specifications current edition.

3.7 PROTECTION

A. Immediately after placement, protect aggregate base from mechanical injury.

END OF SECTION 32 11 23

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SECTION 32 12 16 - ASPHALTIC CONCRETE PAVING (RIGID)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Asphaltic concrete paving
B. Aggregate base course

1.2 MEASUREMENT

A. Asphalt Concrete Paving: Paid by the Ton. Includes saw cutting of existing pavement, removal of existing pavement, asphalt concrete pavement, tack coating surfaces, placing, compacting, and rolling, furnishing the mix design, and testing.
B. Aggregate Base: Paid by the Ton. Includes subgrade preparation, supply of aggregate base, preparation and compaction of aggregate base, and testing.

1.3 REFERENCES

A. State of California, Department of Transportation, Standard Specifications, latest edition.
B. Division 31: Earthwork

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of California, Department of Transportation, Standard Specifications, current addition.
B. Obtain materials from same source throughout the life of the project.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees Fahrenheit, or when the receiving surface is wet or frozen.

1.6 SUBMITTALS

A. Contractor shall submit mix design to the Engineer for approval prior to placement of material in the field.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Concrete Pavement: Type A, ½ inch Maximum Medium, In accordance with State of California, Department of Transportation, Standard Specifications July 2006, Section 39.
B. Aggregate for Base Course: ¾- Class 2, In accordance with State of California, Department of Transportation, Standard Specifications July 2022, Section 26.
C. Primer: In accordance with State of California, Department of Transportation, Standard

Specifications July 2022.

D. Tack Coat: In accordance with State of California, Department of Transportation, Standard Specifications July 2022.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify base conditions under provisions of Section 00500.
B. Verify the compacted subgrade is ready to support paving and imposed loads.

3.2 PLACING AGGREGATE BASE

A. Install Work in accordance with State of California, Department of Transportation, Standard Specifications current edition.

3.3 PREPARATION – PRIMER

A. Apply primer in accordance with State of California, Department of Transportation, Standard Specifications current edition.

3.4 PREPARATION - TACK COAT

A. Apply tack coat in accordance with State of California, Department of Transportation, Standard Specifications current edition.

3.5 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with State of California, Department of Transportation, Standard Specifications current edition. Section 39.
B. Compact pavement by rolling to a minimum of ninety-five percent of the maximum density as determined by nuclear investigation per ASTM D2922. Compaction tests shall be taken at a minimum frequency of one test for every five hundred tons, or one test per shift. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Compaction testing will be performed by the Owner, and a log will be kept of tests taken and results obtained.
C. Perform rolling with consecutive passes to achieve even and smooth finish free of roller marks.

3.6 TOLERANCES

A. Flatness: Maximum variation of ¼ inch measured with a 10-foot straight edge.

3.7 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees Fahrenheit.

END OF SECTION 32 12 16

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SECTION 32 14 40 – STONE PAVING

PART 1 - GENERAL

SUMMARY

A. SECTION INCLUDES
1. Stone pavers set in aggregate setting beds.
2. Concrete edge restraints.
3. Joint Sand for Stone Pavers

B. RELATED SECTIONS
1. Section 32 11 23 – Base Aggregate

REFERENCES

C. ASTM International (ASTM):
1. ASTM C 33 – Standard Specification for Concrete Aggregates.
2. ASTM C 97 – Standard Test Method for Absorption and Bulk Specific Gravity of Dimension Stone.
3. ASTM C 99 – Standard Test Method for Modulus of Rupture of Dimension Stone. 4. ASTM C 170 – Standard Test Method for Compressive Strength of Dimension Stone.
4. ASTM C 241 – Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
5. ASTM C 615 – Standard Specification for Granite Dimension Stone.
6. ASTM C 880 – Standard Test Method for Flexural Strength of Dimension Stone.
7. ASTM D 698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
8. ASTM D 1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort.
9. ASTM D 4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
10. ASTM D 4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.

D. American Association of State Highway and Transportation Officials (AASHTO) M 288 – Standard Specification for Geotextile Specification for Highway Applications. C. Masonry Standards Joint Committee (MSJC):

E. 1. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures; Cold and hot weather requirements for mortar and grout.

PRICE AND PAYMENT PROCEDURES

F. Refer to Section 01 29 00, Payment Procedures.

SUBMITTALS

G. Refer to Section 01 33 00 Submittal Procedures.

H. Product Data: For materials other than water and aggregates.

I. Samples for stone pavers

QUALITY ASSURANCE

J. Installer shall have a minimum 5 years experience with similar materials and shall have a record of successful projects of comparable size.
   1. Mock-up:

K. Install mock-up using approved stone pavers including related accessories.
   1. Mock-up size: 10 feet by 10 feet

L. Accepted Mock-up may remain as part of the work.

M. Pre-installation Meeting:
   1. Hold a pre-installation conference, prior to start of stone paving installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and manufacturer's designated representative.
   2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of stone pavers and components, installer's qualifications, equipment, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.

PROJECT CONDITIONS

N. Cold-Weather Protection: Do not use frozen materials or build on frozen subgrade or setting beds.

O. Weather Limitations for Joint Sand:
   1. Joint Sand JS-1: Apply when ambient temperature is above 32 degrees F (15 degrees C), under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.
   2. Joint Sand JS-2: Apply when ambient temperature is above 40 degrees F (5 degrees C), under dry conditions with no rain forecast for 24 hours and when surface of pavement is completely dry.

PART 2 - PRODUCTS

STONE PAVERS

A. Stone Pavers: As described in the Landscape Architecture Plans.

B. Performance Requirements
   1. Modulus of Rupture: 1,900 psi per ASTM C 99.
   2. Compressive Strength: 17,622 psi per ASTM C 170.
   3. 3. Flexural Strength: 3,141 in.lb. per ASTM C 880.
   4. 4. Absorption: 0.647% per ASTM C 97.
   5. 5. Density: 160 lbs/cu.ft. per ASTM C 97.
   6. Static Coefficient of Friction: 0.62 in.lb. per ASTM C 1028.
   7. Abrasion Resistance: 70.92 in.lb. per ASTM C 241.
   8. Products: Subject to compliance with requirements, provide the following:
      a. Local river stone used in traditional stone pavement.
      b. Face Size: Of varying sizes as indicated in the plans.
      c. Edges: Rounded

EDGE RESTRAINTS

C. Provide flush curb edge restraints for vehicular applications of stone paving. See edge restraint for unit pavers in Det 3/L-501.

D. For pedestrian applications:
   1. Stone paving infill behind amphitheater steps will be restrained by concrete steps
   2. Stone paving lining sand pit will not be restrained.

AGGREGATE SETTING-BED MATERIALS

E. Class 2 Base Aggregate.

F. Sand for Leveling Course: Washed river sand from a local source. Provide gradations as follows:

Sieve Size	Percent Passing
3/8 in.(9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075 mm)	0 to 1 D.

G. Joint Sand:
   1. Apply if stone pavement is not traditionally constructed.
   2. Description: Dry mix, containing polymeric binding agent, activated with water.
   3. Manufacturer: Techniseal; www.techniseal.com
   4. Product:
      a. JS-1: Techniseal “RG+” Polymeric Jointing Sand.
   5. Joint Sand Colors: Provide color samples for selection from the manufacturer’s full range.

PART 3 - EXECUTION

PRE EXAMINATION

A. Verify that subgrade is properly compacted and ready for the work of this Section.

AGGREGATE SETTING-BED APPLICATIONS

B. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.

C. Provide edge restraints as indicated. Install edge restraints before placing stone pavers. Set pavers with a joint width not to exceed ½ inch, being careful not to disturb leveling base. Use string lines to keep straight lines.

INSTALLATION, GENERAL

D. A. Mix rocks of differing sizes and colors, as they are placed, to produce uniform blend of colors and textures.

E. Stone Cutting
   1. Stone cutting is not anticipated to be needed for pedestrian area installation. Apply for vehicular use application.
   2. Cut stone pavers with stone guillotine or snap cut machine to provide pattern indicated and to fit adjoining work neatly. Use full stones without cutting where possible.

F. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

G. Traditional pavement pattern is closely placed in an irregular pattern.

H. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz.

I. Joint Sand:
   1. Verify that pavers are completely dry.
   2. Spread Polymeric sand and fill joints completely.
   3. Sweep surface clean of sand prior to compaction to avoid staining.
   4. Compact pavers and add more sand if necessary until joints are completely filled to a minimum depth of 1.25 inches.
   5. Remove excess dust with leaf blower.
   6. Polymeric Sand Wetting:
      a. Perform wetting in three or more applications of water.
      b. Do not flood pavement or generate runoff.
      c. First application of water shall be in a fine mist; Do not displace sand. Wait 5 to 10 minutes.

d. Subsequent applications of water: Dampen surface in 5 to 10 minute intervals to gradually soak joints to a complete depth. Spot check joints by emptying sand to the bottom of a joint.
e. Allow joints to dry at least 24 hours before allowing traffic on pavers.
f. If there is a risk of rain within 24 hours, protect pavement with waterproof cover.

END OF SECTION

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SECTION 32 15 40 – DECOMPOSED GRANITE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, equipment, tools, accessories, transportation, and services as required for Decomposed Granite Paving.

B. Related Requirements
   1. Section 31 22 00, Grading
   2. Section 32 11 23, Base Aggregate

1.2 REFERENCES

1. Standards: Comply with pertinent provisions of following standards, in case of conflict between referenced standards, the more stringent requirements shall govern.
   a. ASTM, latest edition.
   b. AASHTO Specifications for Materials, latest edition.
2. Standard Specifications: Conform to all applicable requirements of the Standard Specifications listed below, whether specifically referred to or not, except as modified hereinafter.
   a. CalTrans Standard Specifications.

1.3 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 29 00, Payment Procedures.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Scheduling
   1. Inspection: The Tribe will determine the location, timing, and number of compaction tests to assure that specified requirements are met.

1.5 SUBMITTALS

A. Product Data
   1. Soil Sterilant: Submit written recommendation from a State of California appropriately licensed individual along with complete product data from proposed manufacturer, for review by Engineer.
   2. Decomposed Granite
      a. Sieve analysis of aggregate materials.
      b. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements.
      c. Certificates of compliance with the specified standards for natural materials and manufactured items.
   3. Material list of items proposed to be furnished under this section.

B. Samples
   1. Decomposed Granite Paving without stabilizer: Contractor shall submit a 5 lb. sample of decomposed granite to the Engineer for approval prior to delivery of material to the site.
   2. Decomposed Granite Paving with stabilizer: Contractor shall submit a 5 lb. sample of decomposed granite and 1 lb. stabilizer to the Engineer for approval prior to delivery of material to the site.
   3. The Contractor shall demonstrate to the satisfaction of the Engineer that he or his subcontractor possesses sufficient skills and minimum five years of experience to perform the work in all aspects required.
   4. A five-square-foot sample of decomposed granite paving shall be installed at the site for the Engineer's review and approval. The Contractor shall meet or exceed that quality of work in all subsequent work. Contractor shall be responsible for the removal of the sample at the completion of work.

1.6 QUALITY ASSURANCE

A. Tests and Inspections
   1. The Tribe will provide a qualified testing laboratory to observe and test placement of aggregate in accordance with the specifications.
   2. Tests will include inspection of subgrade prior to placing aggregate, inspection and testing of materials after mixing, and compaction tests to determine compliance with specification requirements.
   3. Grading Tolerance: Construct grades described in this section within a tolerance of plus or minus five hundredths (0.05) foot maximum variation in any ten foot length from the grades shown on drawings.

B. Surface Drainage: No area of the finished paving will hold water.

C. Qualifications of Workers: Provide at least one person who shall be thoroughly trained and experienced in the skills required, completely familiar with the design and application of work described for this section and present at all times during progress of the work of this section and direct all work performed under this section.

1.7 SITE CONDITIONS

A. Protection from Water Accumulation: Perform all operations in a manner which continuously allows proper disposal of surface run-off and prevents accumulation of water potentially causing soft areas impeding Work. Before leaving after each work day perform such operations as may be necessary to minimize possible damage or work slowdown caused by rain.

PART 2 - PRODUCTS

2.1 DECOMPOSED GRANITE PAVING

A. Description: Shall be California gold track fines.

B. Performance

1. Without Stabilizer

Sieve Size	% Passing
#4	95-100
#30	30-50
#200	5-15

2. With Stabilizer

Sieve Size	% Passing
#4	85-100
#8	55-80
#30	30-45
#200	10-20

3. Maximum dry density: 130 p.c.f.
4. Optimum moisture: 8.8%
   a. Color: Shall be uniform tan or buff color.
5. The performance characteristics of the decomposed granite should not be impacted by minor variations of the gradation (± 10%).

2.2 STABILIZER

A. Manufacturers

1. Stabilizer Solutions of Phoenix, Arizona (1-800-336-2468) or approved equal as supplied by Supply Side Products (888) 222-4341 or approved equal.

B. Description

1. Stabilizer™ binder additive. The organic binding agent shall be a premium non-toxic, colorless, odorless, non-staining concentrated powder that binds decomposed granite together to provide a natural appearing firm surface.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions

1. Surrounding areas, surfaces and appurtenances already in place shall be protected during installation of decomposed granite paving.

B. Surface Preparation

1. Prior to any installation, the area shall be treated with weed control treatment and pre-emergent treatment per Section 32 91 00, Planting Preparation.
2. Immediately prior to placing the decomposed granite, the subgrade shall be moistened.

C. Mixing
1. The binding agent shall be premixed at a standard rate of twelve to sixteen pounds (12-16 lbs.) per ton of decomposed granite. It is critical that Stabilizer be thoroughly and uniformly mixed throughout the decomposed granite.
2. Perform blending by the stationary plant method or a truck mounted mixer.
3. Portable mixers may not be used.
4. Mixing granular surfacing and stabilizer in situ is not acceptable.
5. Do not mix during, just prior to, or immediately following rainfall.
6. Blend for a minimum of 15-minutes.

3.2 INSTALLATION

A. DECOMPOSED GRANITE PAVING
1. Decomposed granite shall be as shown and detailed on the Plans and be approved by the Engineer, both to color and gradation.
2. Upon thorough moisture penetration, compact aggregate screenings to ninety five percent (95%) relative compaction by compaction equipment such as double drum roller (2-4 ton) or single drum roller (1,000 lbs.) vibratory plate tamp. Do not begin compaction for six (6) hours after placement and up to forty eight (48) hours.
3. Decomposed granite shall be installed in two inches (2") lifts compacted to a four inches (4") depth. Each lift shall be wetted, rolled, and compacted to ninety five percent (95%) relative density. The finish surface shall be firm and stable.
4. In general each layer shall be placed in spreads as wide as practicable and to the full width of the course before a succeeding layer is placed.
5. Installation of decomposed granite shall not occur on rainy days.
6. Fill in any low spots or cracks with additional decomposed granite.
7. Grade to smooth uniform slopes between elevation points or lines, and between such elevations and existing grades.
8. Tolerances: The finish grades of the decomposed granite paving shall conform to the lines and grades on the drawings and allow for drainage.
9. Finish rake granular surfacing smooth with a steel tine rake.
10. Final thickness of the completed path section shall not vary more than ½-inch from the dimensions indicated.

B. Watering
1. Water heavily to achieve full depth moisture penetration of the granular surfacing to activate entire depth of stabilizer. Apply minimum of twenty (20) GPM per one thousand square feet (1,000 sf) for a one hour duration.
2. Spray water in such a manner as to not disturb the path surface.
3. Test for depth of water penetration by random inspection of pavement cores. Following inspection fill holes with removed material and smooth to match adjacent surfacing.
4. Let watered surface stand for six to twenty four (6-24) hours until surface water is no longer present and the granular surfacing is moist but not wet.
5. Fill in any low spots or cracks with additional decomposed granite.
6. Compaction

7. While granular surfacing is still thoroughly moist, roll with a heavy lawn roller (minimum two hundred and twenty five pounds (225 lbs.) and maximum width of thirty inches (30”) to achieve finish grade and initial compaction.
8. Hand tamp edges and areas inaccessible to the roller.
9. Perform final compaction with a minimum 1-ton roller to achieve a dense, smooth, uniform surface texture.
10. Do not use whackers or vibratory rollers as the granular surfacing will not harden for weeks.

3.3 SITE QUALITY CONTROL

A. Non-Conforming Work
1. Remove and replace decomposed granite paving that is damaged, defective, or does not meet requirements of this section.

B. Site Tests and Inspections
1. Finished surface shall be smooth, uniform and solid, with no evidence of chipping or cracking. Dried, compacted surfacing shall be firm all the way through with no spongy areas.
2. Loose material shall not be present on the surface prior to extensive use.
3. Loose and unconsolidated material is evidence of improper bonding due to poor mixing or insufficient watering. Test the loose material for adequate stabilizer by wetting, then tamping and allowing it to dry. If the material is still unconsolidated, the stabilizer did not get mixed adequately throughout the surfacing. If the material now is solid, initial watering was insufficient, cracking or sponginess is evidence of excessive stabilizer in the mix.
4. Remove all unconsolidated surfacing material and replace in accordance with the pertinent requirements of this section.

3.4 CLEANING

A. Planting Areas: All excess decomposed granite shall be removed from planting areas.

3.5 PROTECTION

1. General: Following construction of each layer and following completion of the decomposed granite paving take all required measures necessary to prevent or repair segregation, raveling or rutting, and to maintain the layer in the specified condition until it is covered with a following layer or until all work is completed.

B. Final Acceptance: Immediately prior to final acceptance smooth any irregularities be rewetting rough areas thoroughly and rolling with one thousand to one thousand five hundred pound (1000-1500 lbs.) roller.

END OF SECTION

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SECTION 32 16 00 - CURBS, GUTTERS, SIDEWALKS & DRIVEWAYS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections include the following:
   1. Division 03: Concrete.
   2. Division 31: Earthwork.
   3. Division 32: Exterior Improvements.
   4. Division 33: Utilities

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.
B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities and general public access.

PART 2 PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Reinforcement to meet requirements and products specified in Caltrans Standard Specifications Section 52.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Shall be as defined in Caltrans Standard Specifications Section 40.

B. Normal-Weight Aggregates: Shall be 3/4” maximum size aggregate in mixes for Curb and Gutter.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.4 CURING MATERIALS

A. Curing materials to meet requirements and products specified in Caltrans Standard Specifications.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. A.D.A. Detectable Warning Panels
   1. The detectable warning panels shall be either lightweight concrete paver panels or vitrified polymer composite (VPC) panels as described below:
      a. LIGHTWEIGHT CONCRETE PANEL: The detectable warning panels shall be lightweight concrete paver panel, having a minimum size of 1’ x 2’ and be at least ¾” thick. The concrete panels shall be capable of reaching 10,000 psi and be reinforced with high tensile stainless steel pre-stressed tendons. The panel shall include a waterproofing admixture and surface treated with a penetrating silane sealer for resistance and decreased water absorption. The panel shall be safety yellow color throughout the panel.

b. VITRIFIED POLYMER COMPOSITE PANEL: Vitrified Polymer Composite (VPC) Cast in Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tiles shall be panels having a minimum size of 2' x 2' and shall have a minimum face thickness of 3/16" with a minimum embedment depth of 1- ¼". The panels shall have a minimum tensile strength of 18,000 psi and a minimum flexural strength of 25,000 psi. Panel shall be "Federal Yellow". Panels shall be "Armor-Tile" as manufactured by Engineered Plastics, Inc. or as approved by the Engineer.

c. STAINLESS STEEL PANEL: The detectable warning panel shall be manufactured of stainless steel and coated with a factory applied durable, skid resistant surface powder coating. The coating shall be UV stable. Panel shall be ADA compliant, safety yellow in color and manufactured by MetaDome, LLC or as approved by the Engineer.

d. TRUNCATED DOME CONFIGURATION: The detectable warning panel shall consist of surface of truncated domes aligned in a square grid pattern.
   i. Dome Size – Truncated domes in a detectable warning surface shall have a nominal diameter of 0.9 inches, a top diameter of 50% of the base diameter minimum to 65% of the base diameter maximum, and a height of 0.2 inches.
   ii. Dome Spacing – Truncated domes in a detectable warning surface shall have a center-to center spacing of nominal 2.35 inches.
   iii. Size – Detectable warning surfaces shall extend twenty-four (24) inches in the direction of travel and the full width of the curb ramp landing.
   iv. The detectable warning surface shall be located so that the nearest edge is 8" minimum from the face of the curb.
   v. The panel will be installed according to the manufacturer's recommendations. All cost for labor, material, and equipment shall be included in the price bid for "Detectable Warning Panels".

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 2,500 psi.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   3. Slump Limit: 3 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 6-1/2 percent plus or minus 1.5 percent for Curb and Gutter
   2. Air Content: 6 1/2 percent plus or minus 1.5 percent for sidewalks and driveways.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
   1. Fly Ash or Pozzolan: 20 percent.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine exposed sub-grades and sub-base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared base surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll base in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
   3. Base with soft spots and areas of pumping or rutting exceeding depth of 1 inch or as determined by the Engineer require correction according to requirements in Division 31.
   4. In areas that rut less than 1 inch the ruts shall be filled with base material, compacted and brought to grade.

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted sub-base surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

E. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
   1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

F. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

G. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a ¼-inch (6mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

H. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch (6- mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten sub-base to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
   1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.7 CONCRETE PROTECTION AND CURING

A. Refer to Caltrans Standard Specifications for Concrete Protection and Curing.

3.8 A.D.A. CURB RAMP CONSTUCTION

A. Sidewalk curb approach ramps shall be constructed to current A.D.A. standards as detailed in the plans.

B. Surface Texture: A.D.A. surface texture requirements shall be met with the installation of the A.D.A. compliant detectable warning panels inserted in the sidewalk approach ramps as indicated in the details.

C. Ramp Coloring: Curb ramp shall be Safety or Federal Yellow to meet A.D.A. contrast requirements and expansion material shall be used adjacent to the curb and gutter section.

D. Slope
   1. New construction
      a. Maximum slope shall be 1 foot vertical to 12 feet horizontal. Maximum rise for any run shall be thirty (30) inches or less.
   2. Reconstruction
      a. Curb ramps reconstructed where space limitations prevent the use of 1:12 slopes may have the following:
         i. Slopes between 10 and 12 to 1 are allowed a maximum rise of 6 inches.
         ii. Slopes between 8 and 10 to 1 are allowed for a maximum rise of 3 inches.
         iii. Slopes greater than 8 horizontal to 1 vertical are not allowed.
   3. Side slope
      a. When curb ramps are located where pedestrians must walk across the ramp, the ramp shall have flared sides with a maximum slope of 1-foot vertical to 10 feet horizontal.

3.9 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch (6 mm).
   2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
   3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
   4. Joint Spacing: 3 inches (75 mm).
   5. Contraction Joint Depth: Plus ¼ inch (6 mm), no minus.
   6. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 16 00

SECTION 32 16 23 - SIDEWALKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Preparation and placement of portland cement concrete sidewalk.

1.2 RELATED SECTIONS

A. Section 312318 - Excavation, Backfill, and Compaction for Pavements

B. Section 321723 – Pavement Markings

C. Construction Drawings

1.3 REFERENCE STANDARDS

A. American Concrete Institute (ACI) latest edition

1. 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

2. 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete

3. 305R Hot Weather Concreting

4. 306R Standard Specification for Cold Weather Concreting

5. 308 Standard Practice for Curing Concrete

B. American Standards for Testing and Materials (ASTM) latest edition

1. A185 Steel Welded Wire Fabric, Plain, for Concrete Reinforcement

2. A615 Deformed and Plain Billet-Steel for Concrete Reinforcement

3. C33 Concrete Aggregates

4. C78 Method for Flexural Strength Concrete (Using Simple Beam with Third-point Loading)

5. C94 Ready-Mixed Concrete

6. C143 Method for Slump of Hydraulic Cement Concrete

7. C150 Portland Cement

8. C171 Sheet Material for Curing Concrete

9. C231 Air-Content of Freshly Mixed Concrete by the Pressure Method

10. C260 Air-Entraining Admixtures for Concrete

11. C309 Liquid Membrane-Forming Compounds for Curing Concrete

12. C494 Chemical Admixtures for Concrete

13. D994 Preformed Expansion Joint Filler for Concrete (Bituminous)

14. D1190 Concrete Joint Sealer, Hot Poured, Elastic Type

15. D1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

16. D2628 Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

C. State Department of Transportation (DOT), Construction and Material Specifications, Latest Edition

1.4 QUALITY ASSURANCE

A. Establish and maintain required lines and elevations.

B. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.

1.5 SUBMITTALS

A. Submit materials certificate, which materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein to the Engineering Consultant of Record.

B. Within seven (7) calendar days of receipt of Notice-to-Proceed, submit for approval, certified laboratory test data or manufacturers certificates and data for the following items:

1. Portland cement concrete mix

2. Aggregate gradations

3. Preformed expansion joint filler

4. Field molded/poured sealant

5. Dowel bars
6. Expansion sleeves
7. Tie bars
8. Reinforcing steel bars
9. Welded wire fabric
10. Air entraining admixtures
11. Water-reducing and set-retarding admixtures (if used)

1.6 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with non-staining type of coating that will not discolor or deface surface of concrete.

B. Reinforcing Steel: Deformed steel bars, ASTM A 615, Grade 60.

C. Portland Cement: Shall conform to ASTM C150, Type I

D. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D994, D1751, D2628; FS HH-F-341, Type II, Class A or approved equal.

E. Joint Sealants: Conforming to ASTM D1190, non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant", Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 245", or Woodmont Products "Chem-Caulk" or approved equal.

F. Aggregate: Shall conform to ASTM C33.

G. Water: Shall be clean and potable

H. Dowel Bars: Shall conform to ASTM A615, grade 60, and plain steel bars.

I. Air Entraining Mixture: Shall conform to ASTM C260 (Sika AER by Sika Corporation, Air Mix by the Euclid Chemical Corporation or approved equal).

J. Curing Compound: Shall conform to ASTM C309 (Hydrocide by Sonneborn of Rexnord Chemical Products, Inc., and Polyseal 4 in 1 by Chem Masters Corporation or approved equal.

K. Joint Backup Rods: Shall be CCEVA Rod 100 by E-Poxy Industrials, Inc., Sealtight BACKER ROPE by W.R. Meadows, Inc. or approved equal.

2.2 MIX DESIGN AND TESTING

A. Mix concrete and deliver in accordance with ASTM C94.

B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following:

1. Compressive Strength: 2,500 psi, minimum at 28 days, unless otherwise indicated on Construction Drawings.

2. Air Entrainment: 4 to 6 percent

PART 3 - EXECUTION

3.1 PREPARATION

A. Proofroll prepared base material surface to check for unstable areas. Begin paving work only after unsuitable areas have been corrected and are ready to receive paving.

B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.2 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.

2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.

3. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8-inch in 10'-0"

2. Vertical face on longitudinal axis, not more than 1/4-inch in 10'-0"

4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.

B. Reinforcement: Fasten reinforcing bars or welded wire fabric (if required) accurately and securely in place with suitable supports and ties. Remove from reinforcement all dirt, oil, loose mill scale, rust, and other substances that will prevent proper bonding of the concrete to the reinforcement.

C. Concrete Placement

1. Concrete may be mixed and placed when the air temperature in the shade and away from artificial heat is a minimum of 35 degrees F and rising. Hot and cold weather concreting shall be in accordance with ACI 305R and 306R, respectively.

2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until set at required finish elevation and alignment.

3. Place concrete using methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.

4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement. Machine placement shall be at required cross section, line, grade, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified herein.

D. Joint Construction

1. Contraction Joints: Form joints between sections either by steel templates, 1/8-inch in thickness, of length equal to width of sidewalk, and with depth which will penetrate at least 2-inches below surface of sidewalk; or with 3/4-inch thick performed expansion joint filler cut to exact cross section of sidewalk; or by sawing to depth of at least 2-inches while concrete is between 4 and 24 hours old. If steel templates are used, they shall be left in place until concrete has set enough to hold it's shape, but shall be removed while forms are still in place.

2. Longitudinal Construction Joints: Tie concrete sidewalk, where specified on Construction Drawings, to concrete pavement with 1/2-inch round deformed reinforcement bars of length and spacing shown on construction Drawings.

3. Transverse Expansion Joints: Concrete sidewalk shall have filler cut to exact cross section of sidewalk. Joints shall be similar to type of expansion joint used in adjacent pavement.

E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

F. Joint Sealants: Seal joints with approved exterior pavement joint sealants. Install in accordance with manufacturer's recommendations.

3.3 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

B. Work edges of sidewalks and formed joints with edging tool, rounding edge to 1/2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and troweling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Broom finish by drawing fine-hair broom across surface perpendicular to flow of traffic. Repeat operation as necessary to produce fine line texture.

C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by the Owner.

D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in "water-curing" section of ACI 308.

3.4 BACKFILL

A. After concrete has set sufficiently, spaces on either side of sidewalk shall be refilled to required elevation with suitable material compacted in accordance with Section 312318.

3.5 CLEANING AND ADJUSTING

A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.

B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 32 16 23

SECTION 32 32 13 - POURED IN PLACE CONCRETE RETAINING WALL

PART 1 GENERAL

1.1 DESCRIPTION

A. This work shall consist of a poured in place concrete Retaining Wall constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or established by the Owner's Engineer.

1.2 SUMMARY

A. Related Sections include the following:
   1. Division 03: Concrete.
   2. Division 31: Earthwork.
   3. Division 32: Exterior Improvements.
   4. Division 33: Utilities

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.
B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
C. Shop Drawings shall be submitted for review by engineer prior to procurement and installation.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities and general public access.

PART 2 PRODUCTS

2.1FORM-FACING MATERIALS

A. Smooth-formed finished concrete: form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize the number of joints.
B. Rough-formed finished concrete: plywood, lumber, metal, or other approved materials. Provide lumber dressed on at least two edges and one side for tight fit.

2.2STEEL REINFORCEMENT

A. All Reinforcing Steel shall be deformed steel bars conforming to ASTM A 615- Grade 60.
B. All Reinforcing Steel to be welded shall be ASTM A 706 – Grade 0.
C. Provide splice where necessary and conform to ACI 318-08 unless noted otherwise.
D. Shop Drawings for steel shall be provided where steel is not detailed for installation.

2.3CONCRETE MATERIALS

A. Concrete Mix shall have a **Cement/Water Ratio not to exceed 0.40** unless noted otherwise.
B. Cementitious Material: use the following cementitious materials, of the same type, brand, and source, throughout the project:
    1. Portland Cement: ASTM C150, Type II
C. Normal-weight aggregates: ASTM C33, graded, ¾ inch (19 mm) nominal maximum coarse-aggregate size.
    1. Fine and Coarse Aggregates: free of materials with deleterious reactivity to alkali in cement.
D. Water: Clean (not detrimental to concrete). ASTM C94/C94M and potable.
E. Curing Compound: shall conform to ASTM C309.
F. Superplasticizers shall be considered in order to minimize the water/cement ratio well below the 0.40 upper limit.
G. Natural pozzolans shall be added to the mix for extra durability and chemical resistance.
    1. Condensed silica fume may be added up to 7% of the total cement/pozzolan content.
    2. Fly Ash shall be added: 15%min. and 25% maximum of the total cement/pozzolan content.
H. Epoxy compound shall conform to ASTM C881 Type VI.

2.4ADMIXTURES

A. Chemical Admixtures shall conform to ASTM 494.

2.5VAPOR RETARDERS

A. Plastic vapor retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397 not less than 6 mil thick. Include manufacturer’s recommended adhesive or pressure-sensitive joint tape.
B. Joint seams to overlap a minimum of twelve inches and be secured in place with manufacturer recommended and Engineer approved joint tape.

2.6CURING MATERIALS

A. Evaporation retarder: waterborne, monomolecular film forming, manufactured for application to fresh concrete.
B. Absorptive cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz/sq. yd. (305 g/sq. m) when dry.
C. Moisture-retaining cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
D. Water: potable.
E. Clear, waterborne, membrane-forming curing compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
F. Clear, waterborne, membrane-forming curing compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
G. Clear, solvent-borne, membrane-forming curing and sealing compound: ASTM C 1315, Type 1, Class A.
H. Clear, waterborne, membrane-forming curing and sealing compound: ASTM C 1315, Type 1, Class A.

2.7RELATED MATERIALS

A. Expansion and isolation joint filler strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.8CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
B. Provide concrete to the following criteria:
   1. Minimum compressive strength: 3,000 psi at 28 days.
   2. Maximum water-cementitious materials ratio: 0.45.
   3. Slump limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
   4. Air content: **4 percent**, plus or minus 1.5 percent at point of delivery for ¾ inch (19 mm) nominal maximum aggregate size.

2.9CONCRETE MIXING

A. Ready mix concrete: measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 degrees F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "manual of Standard Practice".

PART 3 EXECUTION

3.1 WALL EXCAVATION

A. Wall excavation shall be in accordance with the requirements of the Project specifications and in reasonably close conformity with the limits and construction stages shown on the plans. All excavation cuts and slopes shall be in accordance with governing safety regulations.

3.2 FOUNDATION PREPARATION

A. The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcement mat or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted, as directed by the Owner's Engineer.
B. Any unsuitable foundation material below the reinforced soil volume, as determined by the Owner's Engineer, shall be excavated for the full length of mat reinforcements, and to a depth as directed by the Owner's Engineer. Excavated unsuitable material shall be replaced as directed by the Owner's Engineer.
C. The maximum calculated applied bearing pressure at the foundation level is as shown on the elevation view for each wall. It is the responsibility of the Owner's Engineer to determine that this calculated applied bearing pressure is allowable for that location.

3.3 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
C. Concrete Form Work shall conform to ACI 347.

3.4 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.5 STEEL REINFORCEMENT

A. General: comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
B. Cover for reinforcement shall be 3" unless noted otherwise.

3.6 JOINTS

A. Construction of joints shall be provided only as noted on the drawings as specifically permitted by the owner.
B. General: construct joints true to line with faces perpendicular to surface plane of concrete.

C. Construction joints: install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.
D. Contraction joints in slabs-on-grade: form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved joints: form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed joints: form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch (3.2 mm) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
E. Isolation joints in slabs-on-grade: after removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.7 EXAMINATION

A. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed and positioned securely and will not cause hardship in placing concrete.

3.8 PREPARATION

A. Thoroughly compact concrete bearing area to a minimum depth of 6 inches. Compaction shall be a minimum of ninety-five percent (95%) relative compaction beneath all foundations.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
C. Cold-weather placement: comply with ACI 306.1.
D. Hot-weather placement: comply with ACI 301.

3.10 FINISHING FORMED SURFACES

A. Rough-formed finish: as cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   a. Apply to concrete surfaces.
B. Smooth-formed finish: as cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface

irregularities.

a. Apply to concrete surfaces exposed to public view.

C. Related unformed surfaces: at tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 CONCRETE PROTECTING AND CURING

A. General: protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation retarder: apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture curing: keep surfaces continuously moist for not less than seven days.
2. Moisture-retaining-cover curing: cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing compound: apply uniformly in continuous operation by power spray or heavy rainfall within three hours after initial application maintain continuity of coating and repair damage during curing period.
    i. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
4. Curing and sealing compound: apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 FIELD QUALITY CONTROL

A. Testing and inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

1. Testing services: tests shall be performed according to ACI 301.

3.13 BACKFILL PLACEMENT

A. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials, which become damaged or disturbed during backfill placement, shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Owner's Engineer. The Contractor, at their expense, shall correct any

misalignment or distortion of the wall facing due to placement of backfill outside the limits of this specification.

B. Backfill shall be compacted to 95 percent of AASHTO T 99 method C or D, with oversize correction, at optimum moisture content (±2%).

C. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have a placement moisture content equal to or within two percentage points of optimum moisture content (W_{opt} ±2%). Backfill material with placement moisture content in excess or less than W_{opt} ±2% shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The Contractor shall decrease the percentage of deviation from optimum moisture, if necessary, to obtain the specified density. The optimum moisture content shall be determined in accordance with AASHTO T 99 Standard Proctor Method A, with coarse particle correction according to AASHTO T 224.

D. Backfill shall be placed in complete horizontal lifts. The maximum lift thickness after compaction shall not exceed twelve (12) inches (305 mm). The Contractor shall decrease this lift thickness, if necessary, to obtain the desired density.

E. Compaction within three (3) feet (1 m) of the backface of the wall facing shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. Soil density tests are not generally required within this area.

F. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to rapidly direct run-off of rainwater away from the wall face. In addition, the Contractor shall not allow surface run-off from adjacent areas to enter the wall construction.

END SECTION 32 32 13

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SECTION 32 32 34 - HILFIKER M. S. E. SYSTEM Welded Wire Wall
(Hot Dipped Galvanized Wire)

PART 1 GENERAL

1.1 SUMMARY

This work shall consist of a **Welded Wire Retaining Wall (WWW)**, Mechanically Stabilized Earth Retaining Wall [MSE] constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or established by the Owner's Engineer.

1.2 SUBMITTALS

A. Contractor shall contract directly with Hilfiker and have their in-house engineer or outside consultant engineer design the specific wall system that is to be used for this project. The design obtained by Hilfiker shall be stamped and approved by a Registered Professional in the State of CA. The design shall be submitted to the project civil engineer for review and approval prior to commencement of work.
B. The contractor shall also submit a sample of the typical boulder that will be used for the rock faced MSE Walls and topping gabion baskets.

1.3 PERFORMANCE REQUIREMENTS

A single section or 3'x3'x6' Mock-Up section shall be provided prior to wall construction of wall to verify wire to be used and rock size, texture, and shape that will be filling the face and gabion baskets for the varying wall locations.

PART 2 PRODUCTS

2.1 MATERIALS

The Contractor shall make his own arrangements to purchase all **WWW** M.S.E. materials, including wire mesh reinforcement mats, backing materials, and all necessary incidentals from Hilfiker Retaining Walls, 1902 Hilfiker Lane, Eureka, CA 95503-5711, ph. 707/443-5093; www.hilfiker.com; info@hilfiker.com.

A. 2.1 Wire Reinforcement and Cap Mesh

Welded wire fabric for facing shall be formed by a 90-degree bend of the soil wire reinforcement mesh and a prong to interlock with the soil reinforcing mesh above. The reinforcing mesh shall be shop fabricated of cold drawn steel wire and shall be welded into the finished mesh fabric conforming to the minimum requirements of ASTM A-1064, with a yield strength minimum of 450 MPa [65 ksi]. Welded Wire Mesh for the **WWW** shall be as per project specifications, and will be hot dip galvanized (2.0 oz./SF, ASTM A-123; 605 g/m^2). Any damage done to the mesh galvanization

prior to installation shall be repaired in an acceptable manner and in a galvanized coating comparable to that provided.

B. 2.2 Backing Materials

1. 2.2.1 Backing Mats

Where required, as shown on the plans, steel backing mat shall be W5 vertical x W2.5 horizontal minimum (.2582" [6.6 mm] x .178" [4.5 mm] nom. dia.) welded wire fabric meeting ASTM A-1064 and hot dip galvanized (2.0 oz./SF, ASTM A-123; 605 g/m^2) in accordance with paragraph 2.1.

2. 2.2.2 Hardware Cloth

Where required, as shown on the plans, 20-Gauge metallic hardware cloth screen, or 23-Gauge PVC coated (Brown or Green) hardware cloth screen with openings not exceeding ¼ inch (6.4 mm) and a roll width of 26-inches. The hardware cloth screen shall be in accordance with ASTM A-740 and shall be placed between the backfill and steel backing mat. A minimum vertical lap of 2" and horizontal lap of 1" must be maintained to retain the wall backfill.

3. Filter Fabric

Where required, as shown on the plans, geotextile filter fabric shall be utilized to retain the soil.

2.2 SELECT GRANULAR BACKFILL MATERIALS

As shown on the plans, select granular backfill materials for the **WWW** wall structure shall be reasonably free from organic and otherwise deleterious materials and shall conform to the following gradation limits as determined by ASTM D-422:

Sieve Designation	Percent by Weight Passing Standard Sieves (AASHTO T 27 & T 11)
6 inches (152.4 mm)	100
3 inches (76.2 mm)	100 - 75
No. 200 (75 µm)	0 - 15

The backfill shall conform to all of the following additional requirements:

A. The Plasticity Index (P.I.), as determined by ASTM D-4318 (AASHTO T 90), shall not exceed 6.

B. The fraction finer than 15 microns (0.015 mm), as determined by ASTM D-422 (AASHTO T-88) shall not exceed 15 percent.

C. The material shall exhibit an angle of internal friction of not less than 34 degrees, as determined by the standard direct shear test ASTM D-3080-72 (AASHTO T-236), utilizing a sample of the material compacted to 90% percent of ASTM D-1557-92. No testing is required for backfill where 80 percent of the material is greater than ¾ inch (19mm). Before construction begins, the borrow selected shall be subject to show conformance with this frictional requirement.

In addition, backfill materials shall also meet the following corrosion requirements:

Resistivity	≥ 3000 OHM-cm (min)	AASHTO T 288
pH	5.0 to 10.0, inclusive	AASHTO T 289
Chlorides	≤ 100 mg/kg (ppm)	AASHTO T 291
Sulfates	≤ 200 mg/kg (ppm)	AASHTO T 290
Organic Content	<1%	AASHTO T267-86

A. 2.3 Acceptance of Material

The Contractor shall furnish to the Owner's Engineer a Certificate of Compliance certifying that the select granular backfill material complies with this section of the specifications. A copy of all test results performed by the Contractor, which are necessary to assure compliance with the specifications, shall also be furnished to the Owner's Engineer and the MSE supplier.

The frequency of sampling of Select Granular Backfill necessary to assure the above-mentioned requirements shall be directed by the Owner's Engineer.

Backfill not conforming to this specification shall not be used without written consent of the Engineer.

B. Free Draining, Permeable Backfill

If the M. S. E. will be subject to water inundation, the following permeable, free-draining backfill material shall be used:

Sieve Designation	Percent by Weight Passing Standard Sieves
6" (76 mm)	100
¾ " (19 mm)	50 - 90
No. 4 (4.75 mm)	20 – 50
No. 200 (75 μm)	0 - 2

PART 3 EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. 4.1 Wall Excavation

Wall excavation shall be in accordance with the requirements of the Project specifications and in reasonably close conformity with the limits and construction stages shown on the plans. All excavation cuts and slopes shall be in accordance with governing safety regulations.

B. 4.2 Foundation Preparation

The foundation for the structure shall be graded level for a width equal to or exceeding the length of the reinforcement mat or as shown on the plans. Prior to wall construction, the foundation, if not in rock, shall be compacted, as directed by the Owner's Engineer.

Any unsuitable foundation material below the reinforced soil volume, as determined by the Owner's Engineer, shall be excavated for the full length of mat reinforcements, and to a depth as directed by the Owner's Engineer. Excavated unsuitable material shall be replaced as directed by the Owner's Engineer.

The maximum calculated applied bearing pressure at the foundation level is as shown on the elevation view for each wall. It is the responsibility of the Owner's Engineer to determine that this calculated applied bearing pressure is allowable for that location.

C. M.S.E. Wall Erection

Standard wire mesh reinforcement mats, and applicable facing materials, shall be placed in 24" successive horizontal lifts in the sequence shown on the plans as backfill placement proceeds. Each standard lift must have the ability to compress a minimum of 2" without creating any outward bulge of the facing elements. Vertical tolerance (plumbness) and horizontal alignment tolerance shall not exceed two (2) inches (51mm) when measured at the junction of the wire facing and soil reinforcement along a 10-foot (3 m) straight edge.

The overall vertical tolerance of the wall (top and bottom) after construction shall not exceed one (1) inch (25 mm) per ten (10) feet (3 m) of wall height, unless the wall design requires a battered facing. For battered facing structures, the overall tolerance from the theoretical battered locations shall not exceed one-half (1/2) inch (13 mm) per ten (10) feet (3 m) of battered wall height.

D. Backfill Placement

Backfill placement shall closely follow erection of each course of reinforcement mats. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing. Any wall materials, which become damaged or disturbed during backfill placement, shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Owner's Engineer. The Contractor, at their expense, shall correct any misalignment or distortion of the wall facing due to placement of backfill outside the limits of this specification.

Backfill shall be compacted to 95 percent of AASHTO T 99 method C or D, with oversize correction, at optimum moisture content (±2%).

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill material shall have a placement moisture content equal to or within two percentage points of optimum moisture content (W_{opt} ±2%). Backfill material with placement moisture content in excess or less than W_{opt} ±2% shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift. The Contractor shall decrease the percentage of deviation from optimum moisture, if necessary, to obtain the specified density. The optimum moisture content shall be determined in accordance with AASHTO T 99 Standard Proctor Method A, with coarse particle correction according to AASHTO T 224.

Backfill shall be placed in complete horizontal lifts. The maximum lift thickness after compaction shall not exceed twelve (12) inches (305 mm). The Contractor shall decrease this lift thickness, if necessary, to obtain the desired density.

Compaction within three (3) feet (1 m) of the backface of the wall facing shall be achieved by at least three (3) passes of a lightweight mechanical tamper, roller or vibratory system. Soil density tests are not generally required within this area.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to rapidly direct run-off of rainwater away from the wall face. In addition, the Contractor shall not allow surface run-off from adjacent areas to enter the wall construction.

3.2 METHOD OF MEASUREMENT

A. Wire Mesh Facing

The unit of measurement for furnishing and fabricating all materials for the walls, including wire mesh reinforcement mats, applicable backing materials and other incidentals will be the square foot or square meter of wall surface area. The quantity shall be measured on the basis of supplied [may differ than installed] wall face area shown on the plans.

Measurement and payment for excavation and backfill quantities performed during **WWW** construction will be in accordance with the applicable sections of the contract specifications.

B. Wall Erection

The unit of measurement for wall erection will be the square foot of wall surface area complete and in place. The quantity to be paid for will be the actual quantity erected in place at the site. Payment shall include compensation for all labor and materials required to prepare the wall foundation, place the reinforcement mats, and position the backing mats and screens as shown on the plans.

• End of Section •

This information is proprietary to Hilfiker Retaining Walls, 1902 Hilfiker Lane, Eureka, CA 95503-5711, Telephone: 707-443-5093, Email: info@hilfiker.com.

HILFIKER RETAINING WALLS ARE COVERED BY ONE OR MORE OF THE FOLLOWING PATENTS:

3,631,682	4,068,482	4,329,089	
3,922,864	4,117,686	4,324,508	OTHER
243,697	4,051,570	4,343,572	PATENTS
243,613	4,266,890	4,391,557	PENDING
4,154,554	4,260,296	4,505,621	

Revision Date: Jun 12, 2012
w:\product info\3. specifications\product specs\www\www-hotdipped spec updated 6-12-12.doc

END SECTION 32 32 34

SECTION 32 80 00 - IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Projec scope is to provide site water via quick coupler and hose bibbs for establishment watering, and vegetable garden bed water. Section Includes:
   1. Point of Connection
   2. Backflow Prevention Device
   3. Backflow Preventer Cage
   4. Flow Sensor
   5. Piping.
   6. Encasement for piping.
   7. Manual valves.
   8. Pressure-regulators
   9. Transition fittings.
   10. Dielectric fittings.
   11. Miscellaneous piping specialties.
   12. Quick couplers.
   13. Boxes for automatic control valves.

B. RELATED SECTIONS
   1. Section 31 23 00 Excavation and Backfill
   2. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. Lateral Piping: Downstream from control valves to drip equipment. Piping is not under pressure.

B. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

C. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.3 PERFORMANCE REQUIREMENTS

A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Location of Equipment and Dripline: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent irrigation coverage of areas indicated.

C. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
   1. All Pressure Lines: 200 psig.

1.4 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 20 00, Price and Payment Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Wiring Diagrams: For power, signal, and control wiring as applicable.

C. Qualification Data: For qualified Installer.

D. Zoning Chart: Show each irrigation zone and its control valve. Provide scaled Record copy drawings at time of design completion; maintain one (1) copy on site for Construction Manager's review.

E. Controller Timing Schedule: Indicate timing settings for each automatic controller zone.

F. Field quality-control reports.

G. As-Built Record Set of Drawings. Note any changes from the original design plans.

H. Testing Data from all required pressure testing.

I. Independent Irrigation Audit: in accordance with California Code of Regulation Title 23 Waters, Division 2 Department of Water Resources Chapter 2.7 Model Water Efficient Landscape Ordinance, 492.12 Irrigation Audit, Irrigation Survey and Irrigation Water Use Analysis.

J. Operation and Maintenance Data: For controllers and automatic control valves to include in operation and maintenance manuals. Provide three (3) copies, in bound notebook form, for review/approval.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers that include a California C27 License, at least three years experience with installation of inline drip systems, and the name, title, addresses and phone numbers of at least two clients.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 TESTING:

A. Hydrostatic pressure testing
   1. After flushing, and the installation of valves the following tests shall be conducted in the sequence listed below. The Contractor shall furnish all equipment; materials and labor necessary to perform the tests and all tests shall be conducted in the presence of the Owner's Representative.
   2. Water pressure tests shall be performed on all pressure main lines before any couplings, fittings, valves and the like are concealed.
   3. Immediately prior to testing, all irrigation lines shall be purged of all entrapped air or debris by adjusting control valves and installing temporary caps forcing water and debris to be discharged from a single outlet.
   4. Test all pressure main line at 150 PSI. For a minimum of four (4) hours with an allowable loss of 5 PSI. Pressure and gauges shall be read in PSI, and calibrated such that accurate determination of potential pressure loss can be ascertained.
   5. Re test as required until the system meets the requirements. Any leaks, which occur during test period, will be repaired immediately following the test. All pipe shall be re tested until final written acceptance.
   6. The Contractor is responsible for proving documentation stating the weather conditions, date, the start time and initial water pressure readings, the finish time and final water pressure readings and the type of equipment used to perform the test. The documentation must be signed by a witness acceptable to the Owner, verifying all of the above-mentioned conditions.
   7. Submit a written report of the pressure testing results with the other above required information to the Owner's Representative for approval.

B. Backflow Preventer Testing
   1. The backflow preventer shall be tested according to procedures and results per the requirements of the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California or American Water Works Association whichever is more stringent.
   2. Testing shall be performed by a Backflow Prevention Assembly Tester with a current certification from the American Backflow Preventer Association.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

C. Storage of materials on site only in lockable storage container or lockable fenced yard. Owner not responsible for materials left on site. Coordinate location with the Construction Manager, if applicable.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless prior permission has been granted by the Construction Manager. Schedule and coordinate notice during the preconstruction period of the project. Provide reminder notices two weeks and again one week in advance.

B. POINT OF CONNECTION
   1. The point of connection of the irrigation system to its electrical power sources shall be provided by the irrigation installer. All connections shall be made by a licensed electrical Contractor per governing codes at the location shown on the drawings.
   2. The point of connection of the irrigation system to its potable and or non-potable water sources, including the main shutoff valve and backflow preventer shall be provided by the irrigation installer. All connections shall be made by a licensed Contractor per governing codes, at the location shown on the drawings.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTION DEVICE

A. The backflow prevention device shall be certified to NSF/ANSI 372 shall be ASSE Listed 1013, rated to 180 degree F, and supplied with full port ball valves.

B. The main body and access covers shall be low lead bronze (ASTM B 584)

C. The seat ring and all internal polymers shall be NSF Listed Noryl and the seat disc elastomers shall be silicone.

D. Backflow Preventer shall be as indicated on the drawings.

2.2 BACKFLOW PREVENTER CAGE

A. A heavy-duty steel mesh cage with rust proof finish. The caging shall be sized to allow space for the entire piping assembly associated with the Backflow Preventer unit, and all associated equipment.

B. The cage shall include the manufacturers' standard tamper proof locking mechanism.

C. Provide a concrete base as detailed on the drawings.

D. Backflow Preventer Cage type, manufacturer and color shall be as indicated on the plans.

2.3 FLOW SENSOR

A. Flow sensor shall be compatible with the irrigation controller.

B. Flow sensor shall be as indicated on the drawings.

2.4 PIPES, TUBES, AND FITTINGS

A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

B. Galvanized-Steel Pipe: ASTM A 53/A 53M, Standard Weight, Type E, Grade B.
   1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless-steel pipe with threaded ends.
   2. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
   3. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
   4. Cast-Iron Flanges: ASME B16.1, Class 125.

C. PE Pipe with Controlled OD: ASTM F771, PE 3408 compound, SDR 11.
   1. PE Butt, Heat-Fusion Fittings: ASTM D 3261.
   2. PE Socket-Type Fittings: ASTM D 2683.

D. PE Pressure Pipe: AWWA C906, with DR of 7.3, 9, or 9.3 and PE compound number required to give pressure rating not less than 200 psig.
   1. PE Butt, Heat-Fusion Fittings: ASTM D 3261.
   2. PE Socket-Type Fittings: ASTM D 2683.

E. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40.
   1. PVC Socket Fittings: ASTM D 2466, Schedule 40.
   2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
   3. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket ends.

F. PVC Pipe, Pressure Rated: ASTM D 2241, PVC 1120 compound, SDR 21 and SDR 26.
   1. PVC Socket Fittings: ASTM D 2467, Schedule 80.
   2. PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 MANUAL VALVES

A. PVC Ball Valves:
1. Manufacturers: As indicated in the Irrigation Schedule, or approved equal.

2.7 Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawing or approved equal.

A. Pressure Regulators:
1. Should unforeseen circumstances require separate pressure regulators due to excess water main pressure, these requirements shall apply.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hunter Industries Incorporated.
   b. Rain Bird Corporation.
   c. Toro Company (The); Irrigation Division.
3. Specifications:
   a. Inlet Pressure: Up to 200 PSI (13, 8 bar)
      1) Pressure Regulation: 15 to 100 psi (1, 0 to 6.9 bar)
   b. Accuracy: + 1 to 3 psi (+ 1- 0,2 bar)
4. Temperature: Up to 150ºF (66ºC)

2.8 DIELECTRIC FITTINGS

A. General Requirements: Where needed, assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:
1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   b. Zurn Plumbing Products Group; Wilkins Water Control Products.
2. Description: Factory-fabricated union, NPS 2 and smaller.
   a. Pressure Rating: 250 psig at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Couplings:
1. Manufacturers: As needed, subject to compliance with requirements, provide products by one of the following, or approved equal:
   a. Calpico, Inc.
   b. Lochinvar Corporation.
2. Description: Galvanized-steel coupling.
   a. Pressure Rating: 300 psig at 225 deg F.
   b. End Connections: Female threaded.
   c. Lining: Inert and noncorrosive, thermoplastic lining.

2.9 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI WH 201, with bellows or piston-type pressurized cushioning chamber and in sizes complying with PDI WH 201, Sizes A to F.

B. Pressure Gages: ASME B40.1. Include 4-1/2-inch- diameter dial, dial range of two times system operating pressure, and bottom outlet.

2.10 QUICK COUPLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or approved comparable product by one of the following:
   1. Buckner; a division of Storm Manufacturing Group Inc.
   2. Hunter Industries Incorporated.
   3. Rain Bird Corporation.
   4. Toro Company (The); Irrigation Division.
   5. Weathermatic.

B. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, locking rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

2.11 BOXES FOR AUTOMATIC CONTROL VALVES

A. Plastic Boxes:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
   2. Description: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
      a. Size: As indicated in Det 8/L5.2
      b. Shape: As indicated in Det 8/L5.2.
      c. Sidewall Material: PE, ABS, or FRP.
      d. Cover Material: PE, ABS, or FRP.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Perform all trenching, directional boring, sleeving and excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave ins.

B. The Contractor may directional bore lines where it is practical or where required on the plans.

1. Extend the bore 1’ past the edge of pavement unless noted differently on the plans.
2. Cap ends of each bore and locate ends at finished grade using metal stakes.
3. All boring and sleeving shall have detectable locator tape placed at the ends of the pipe.

C. Make trenches for mains, laterals and control wiring straight and true to grade and free of protruding stones, roots or other material that would prevent proper bedding of pipe or wire.

D. Excavate trenches wide enough to allow a minimum of 4 - inch between parallel pipelines and 8 inch from lines of other trades. Maintain 3 - inch vertical clearance between irrigation lines. Minimum transverse angle is 45 degrees. All pipes shall be able to be serviced or replaced without disturbing the other pipes.

E. Trenches for pipelines shall be made of sufficient depth to provide the minimum cover from finished grade as follows:
1. Pressure main line: 18 inches below finish grade and 36 inches below paved areas in Schedule 40 PVC sleeves.
2. Lateral lines: 12 inches below finish grade and 36 inches below paved areas in Schedule 40 PVC sleeves.
3. Control wiring: to the side of pressure main line and 24 inches below paved areas in Schedule 40 PVC sleeves.

F. On new on-site systems (post-meter), the required horizontal separation between potable water lines, reclaimed water constant pressure main lines and sewer lines shall be a minimum of four (4) feet apart as directed by the project engineer and/ or regulatory agency. Measurements shall be between facing surfaces, not pipe centerlines.

G. When trenching through areas of imported or modified soil, deposit imported or modified soils on one side of trench and subsoil on opposite side.

H. Backfill the trench per the requirements in paragraphs “Backfilling and Compacting” below.

I. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Construction Manager's approval before excavation.

3.3 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping free of sags and bends.

C. Install groups of pipes parallel to each other, spaced to permit valve servicing.

D. Install fittings for changes in direction and branch connections.

E. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.

F. Install expansion loops in control-valve boxes for plastic piping.

G. Lay piping on solid subbase, uniformly sloped without humps or depressions.

H. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

I. Install piping in sleeves under parking lots, roadways, and sidewalks.

J. Install sleeves made of SDR 21, 200 psi, or greater, PVC pipe and socket fittings, and solvent-cemented joints.

3.4 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Flanged Joints: Select rubber gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

E. Ductile-Iron Piping Gasketed Joints: Comply with AWWA C600 and AWWA M41.

F. Copper-Tubing Brazed Joints: Construct joints according to CDA's "Copper Tube Handbook," using copper-phosphorus brazing filler metal.

G. Copper-Tubing Soldered Joints: Apply ASTM B 813 water-flushable flux to tube end unless otherwise indicated. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
   1. Plain-End PE Pipe and Fittings: Use butt fusion.
   2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

I. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.5 VALVE INSTALLATION

A. Underground Iron Gate Valves, Resilient Seat: Comply with AWWA C600 and AWWA M44. Install in valve casing with top flush with grade.
   1. Install valves and PVC pipe with restrained, gasketed joints or thrust blocks similar to Det 1/l5.2.

B. Aboveground Valves: Install as components of connected piping system.

C. Pressure-Reducing Valves: Install in boxes for automatic control valves or aboveground between shutoff valves.

3.6 DRIP IRRIGATION SPECIALTY INSTALLATION

A. Install drip tubes with inline emitters on ground.

B. Install flush point valves in piping, typical, as indicated in Details 1 and 2/L5.3.

3.7 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

A. Equipment Mounting: Install exterior freestanding controllers on precast concrete bases.
   1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install control cable in same trench as irrigation piping and at least 2 inches or beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

3.8 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Section "Facility Water Distribution Piping" for water supply from exterior water service piping, water meters,

protective enclosures, and backflow preventers. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, valves, and devices to allow service and maintenance.

C. Connect wiring between controllers and automatic control valves.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tapes over underground piping during backfilling of trenches.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:
1. Upon completion and installation of all trenching, directional boring, and sleeving, all installed irrigation control wiring, lines and fittings shall be visually observed by the Owner's Representative unless otherwise authorized. Do not cover any wires, lines or fittings until they have been tested and observed by the Owner's Representative.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Any irrigation product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.11 BACKFILLING AND COMPACTING

A. Irrigation trenches shall be carefully backfilled with material approved for backfilling and free of rocks and debris one (1) inch in diameter and larger. When back filling trenches in areas of imported or modified planting soil, replace any excavated subsoil at the bottom and the imported soil or modified planting soil at the top of the trench.

B. Backfill shall be compacted with approved equipment to the following densities
1. Backfill under pavement and within 2 feet of the edge of pavement: Compact to 95% or greater of maximum dry density standard proctor.
2. Backfill of subsoil under imported planting mixes or modified existing planting soil: Between 85 and 90% of maximum dry density standard proctor.

3. Backfill of imported planting mixes or modified existing planting soil: Compact to the requirements of the adjacent planting mix or planting soil as specified in section “Planting Soil”.

C. Finish grade of all trenches shall conform to adjacent grades without dips or other irregularities. Dispose of excess soil or debris off site at Contractor's expense.

D. Any settling of backfill material during the maintenance or warranty period shall be repaired at the Contractor’s expense, including any replacement or repair of soil, lawn, and plant material or paving surface.

3.12 RESURFACING PAVING OVER TRENCHES

A. Restore all surfaces and repair existing underground installations damaged or cut as a result of the excavation to their original condition, satisfactory to the Owner’s Representative.

B. Trenches through paved areas shall be resurfaced with same materials quality and thickness as existing material. Paving restoration shall be performed by the project paving Sub-contractor or an approved Contractor skilled in paving work.

C. The cost of all paving restoration work shall be the responsibility of the irrigation Contractor unless the trenching thru the paving was, by previous agreement, part of the general project related construction.

3.13 STARTUP SERVICE

A. Verify that controllers are installed and connected according to the Contract Documents.

B. Verify that electrical wiring installation complies with manufacturer's submittal.

3.14 ADJUSTING

A. Adjust settings of controllers as required at time of install.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required.

C. Adjust dripline to ensure proper coverage. Calilfornia law requires irrigation to remain within planting beds, no leakage to paved areas is allowed. .

3.15 CLEANING

A. Flush dirt and debris from piping before installing irrigation system.

3.16 DEMONSTRATION

A. Train Store manager maintenance personnel to adjust, operate, and maintain automatic control valvesand controllers.

3.17 PIPING SCHEDULE

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Underground irrigation main piping,
   1. Schedule 40, PVC pipe and socket fittings, and solvent-cemented joints.

C. Lateral piping, [shall be the following:
   1. Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.

3.18 VALVE SCHEDULE

A. As indicated in the Irrigation Schedule L1.3

3.19 WALKTHROUGH AT TIME OF COMPLETION

A. Provide any keys, valve keys, etc. to operate any and all components of system.

3.20 WELO AUDIT

A. At the Contractor's expense, the Contractor shall be responsible for obtaining an independent audit of the irrigation system compliant with WELO for final sign offs.

3.21 WARRANTY AND RECORD DRAWINGS

A. Provide Owner's Representative with three (3) scaled copies of Record Drawings. Same scale/dimension as original.

B. Provide Water Manager with one (1) reduced scale laminated copy for retainage and use.

C. Provide Owner's Representative with one (1) Digital Record Drawing of scaled drawing.

D. The Contractor shall provide a written guarantee to the Owner covering all materials, installation, workmanship, and against defects for a period of one (1) year. Contractor shall be responsible for maintaining system and protecting it from all damage (at no cost to Owner) for the duration of one year after date of substantial completion as part of the landscape maintenance period.

E. Provide minimum of one (1) startup with Store Manager in attendance. Show system operation and locations of mainline, drain valve, backflow, and pump.

F. Provide a minimum of two (2) winterization programs for system. Ensure Store Manager is in attendance.

G. Schedule meeting with chosen manufacturer's Representative for "smart" controller training and documentation.

END OF SECTION

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SECTION 32 91 00 – PLANTING PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. The scope of work includes all labor, materials, tools, supplies, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of Planting Soil and /or the modification of existing site soil for use as Planting Soil, complete as shown on the drawings and as specified herein.

B. The scope of work in this section includes, but is not limited to, the following:
   1. Locate, purchase, deliver and install soil amendments.
   2. Harvest and stockpile existing site soils suitable for Native Soil.
   3. Modify existing stockpiled site soil.
   4. Modify existing site soil in place for use as Native Soil.
   5. Install existing or modified existing soil for use as Native Soil.
   6. Fine grade Native Soil.
   7. Install Compost into Native Soil.
   8. Clean up and disposal of all excess and surplus material.

C. Related Sections
   1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
      a. Review Site Preparation notes on Landscape Sheet L-002 (notes 47-56) which describe site preservation, fire renewal, soil and plant salvage, and reuse of materials onsite.
   2. Related Specification Section
      a. Section 32 93 00 - Plants

1.2 References:

A. The following specifications and standards of the organizations and documents listed in this paragraph form a part of the Specification to the extent required by the references thereto. In the event that the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. In the event that the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail.
   1. ASTM: American Society of Testing Materials cited section numbers.
   2. U.S. Department of Agriculture, Natural Resources Conservation Service, 2003. National Soil Survey Handbook, title 430-VI. Available Online.
   3. US Composting Council www.compostingcouncil.org and http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf.

4. Methods of Soil Analysis, as published by the Soil Science Society of America (http://www.soils.org/).
5. Up by Roots: healthy soils and trees in the built environment. 2008. J. Urban. International Society of Arboriculture, Champaign, IL.

1.3 CONTRACT DOCUMENTS

A. Shall consist of specifications, general conditions, and the drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.4 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 29 00, Payment Procedures.

1.5 VERIFICATION

A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities, and shall immediately inform the Owner's Representative of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Owner's Representative.

1.6 PERMITS AND REGULATIONS

A. The Contractor shall obtain and pay for all permits related to this section of the work unless previously excluded under provision of the contract or general conditions. The Contractor shall comply with all laws and ordinances bearing on the operation or conduct of the work as drawn and specified. If the Contractor observes that a conflict exists between permit requirements and the work outlined in the contract documents, the Contractor shall promptly notify the Owner's Representative in writing including a description of any necessary changes and changes to the contract price resulting from changes in the work.

B. Wherever references are made to standards or codes in accordance with which work is to be performed or tested, the edition or revision of the standards and codes current on the effective date of this contract shall apply, unless otherwise expressly set forth.

C. In case of conflict among any referenced standards or codes or among any referenced standards and codes and the specifications, the more restrictive standard shall apply or Owner's Representative shall determine which shall govern.

D. Comply with the requirements of the California Code of regulation Title 23 waters, Division 2 Department of Water Resources Chapter 2.7 Model water efficient landscape ordinance, 492.5 Soil management report.
1. Where requirements of specification section Planting Soil are more stringent than the California code, the more stringent requirements shall prevail.

1.7 PROTECTION OF WORK, PROPERTY AND PERSON

A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to the Contractor's actions.

1.8 CHANGES IN WORK

A. The Owner's Representative may order changes in the work, and the contract sum adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

B. All changes in the work, notifications and contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.9 CORRECTION OF WORK

A. The Contractor shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Owner's Representative, at the soonest possible time that can be coordinated with other work and seasonal weather demands but not more than 180 (one hundred and eighty) days after notification.

1.10 DEFINITIONS

A. Acceptable drainage: Drainage rate is sufficient for the plants to be grown. Not too fast and not too slow. Typical rates for installed Planting Soil are between 1 - 5 inches per hour. Turf soils are often higher, but drainage rates above 2 - 3 inches per hour will dry out very fast. In natural undisturbed soil a much lower drainage rate, as low as 1/8th inch per hour can still support good plant growth. Wetland plants can grow on top of perched water layers or even within seasonal perched water layers, but could become unstable in high wind events.

B. Biological Amendment: Amendments such as Mycorrhizal additives, compost tea or other products intended to change the soil biology.

C. Compacted soil: soil where the density of the soil is greater that the threshold for root limiting, and further defined in this specification.

D. Compost: well decomposed stable organic material as defined by the US Composting Council and further defined in this specification.

E. Drainage: The rate at which soil water moves through the soil transitioning the soil from saturated condition to field capacity. Most often expressed as saturated hydraulic conductivity (Ksat; units are inches per hour).

F. End of Warranty Acceptance: The date when the Owner's Representative accepts that the plants and work in this section meet all the requirements of the warranty. It is intended

that the materials and workmanship warranty for Planting, Planting Soil, and Irrigation (if applicable) work run concurrent with each other, and further defined in this specification.

G. Existing Soil: Mineral soil existing at the locations of proposed planting after the majority of the construction within and around the planting site is completed and just prior to the start of work to prepare the planting area for soil modification and/or planting, and further defined in this specification.

H. Fertilizer: amendment used for the purpose of adjusting soil nutrient composition and balance.

I. Fine grading: The final grading of the soil to achieve exact contours and positive drainage, often accomplished by hand rakes or drag rakes other suitable devices, and further defined in this specification, and further defined in this specification.

J. Finished grade: surface or elevation of Planting Soil after final grading and 12 months of settlement of the soil, and further defined in this specification.

K. Graded soil: Soil where the A horizon has been stripped and relocated or re-spread; cuts and fills deeper than 12 inches, and further defined in this specification.

L. Installed soil: Planting soil and existing site soil that is spread and or graded to form a planting soil, and further defined in this specification.

M. Minor disturbance: Minor grading as part of agricultural work that only adjusts the A horizon soil, minor surface compaction in the top 6 inches of the soil, applications of fertilizers, installation of utility pipes smaller than 18 inches in diameter thru the soil zone.

N. Native Soil: Soil native to the site of the planting.

O. Owner’s Representative: The person or entity, appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Owner’s Representative may appoint other persons to review and approve any aspects of the work.

P. Ped: a clump or clod of soil held together by a combination of clay, organic matter, and fungal hyphae, retaining the original structure of the harvested soil.

Q. Planting Soil: Native Soil and Compost blended in accordance with this specification.

R. Poor drainage: Soil drainage that is slower than that to which the plants can adapt. This is a wide range of metrics, but generally if the soil is turning grey in color it is reasonable to either plant moisture adaptive plants at smaller sizes that are young in age with shallow root balls or look at options to improve the drainage

S. Scarify: Loosening and roughening the surface of soil and sub soil prior to adding additional soil on top, and further defined in this specification.

T. Soil Fracturing: Deep loosening the soil to the depths specified by using a back hoe, and further defined in this specification.

U. Soil Horizons: as defined in the USDA National Soil Survey Handbook http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242.

V. Soil Ripping: Loosening the soil by dragging a ripping shank or chisel thru the soil to the depths and spacing specified, and further defined in this specification.

W. Soil Tilling: Loosening the surface of the soil to the depths specified with a rotary tine tilling machine, roto tiller, (or spade tiller), and further defined in this specification.

X. Soil trenching: Cutting narrow trenches thru the soil at the depths and spacing specified to loosen the soil profile, and further defined in this specification.

Y. Subgrade: surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing Planting Soil.

Z. Substantial Completion Acceptance: The date at the end of the Planting, Planting Soil, and Irrigation installation (if applicable) where the Owner's Representative accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project, and further defined in this specification.

AA. Topsoil: naturally produced and harvested soil from the A horizon or upper layers or the soil as further defined in this specification.

BB. Undisturbed soil: Soils with the original A horizon intact that have not been graded or compacted. Soils that have been farmed, subjected to fire or logged but not graded, and natural forested land will be considered as undisturbed.

1.11 SUBMITTALS

A. See the contract General Conditions for policy and procedures related to submittals.

B. Submit all product submittals eight weeks prior to the start of the soil work.

C. Product data and certificates: For each type of manufactured product, submit data and certificates that the product meets the specification requirements, signed by the product manufacturer, and complying with the following:
   1. Submit manufacturers or supplier's product data and literature certified analysis for standard products and bulk materials, complying with testing requirements and referenced standards and specific requested testing.
      a. For each Compost product submit the following analysis by a recognized laboratory:
         1) pH
         2) Salt concentration (electrical conductivity)
         3) Moisture content %, wet weight basis

4) Particle size % passing a selected mesh size, dry weight basis
5) Stability carbon dioxide evolution rate mg CO2-C per g OM per day
6) Solvita maturity test
7) Physical contaminants (inerts) %, dry weight basis
8) US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels Chemical Contaminants mg/kg (ppm)

D. Samples: Submit samples of each product and material, where required by Part 2 of the specification, to the Owner's Representative for approval. Label samples to indicate product, characteristics, and locations in the work. Samples will be reviewed for appearance only.
1. Submit samples a minimum of 8 weeks prior to the anticipated date of the start of soil installation.
2. Samples of all Compost and Native Soil shall be submitted at the same time as the particle size and physical analysis of that material.

E. Soil testing for Native Soil.
1. Native Soil: Submit soil test analysis report for each sample of Native Soil from an approved soil-testing laboratory and where indicated in Part 2 of the specification as follows:
a. All soil testing will be at the expense of the Contractor.
2. Submit all testing required by California Code of regulation Title 23 waters, Division 2 Department of Water resources Chapter 2.7 Model Water Efficient Landscape Ordinance, 492.5 Soil Management Report.
3. Provide a particle size analysis (% dry weight) and USDA soil texture analysis. Soil testing of Planting Soil Mixes shall also include USDA gradation (percentage) of gravel, coarse sand, medium sand, and fine sand in addition to silt and clay.
4. Provide the following other soil properties:
a. pH and buffer pH.
b. Percent organic content by oven dried weight.
c. Nutrient levels by parts per million including: phosphorus, potassium, magnesium, manganese, iron, zinc and calcium. Nutrient test shall include the testing laboratory recommendations for supplemental additions to the soil for optimum growth of the plantings specified.
d. Soluble salt by electrical conductivity of a 1:2 soil water sample measured in Milliohm per cm.
e. Cation Exchange Capacity (CEC).

1.12 OBSERVATION OF THE WORK

A. The Owner's Representative may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.
1. The Owner's Representative may utilize the Contractor's penetrometer and moisture meter at any time to check soil compaction and moisture.

B. The Owner's Representative shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Owner's Representative shall be afforded sufficient time to schedule visit to the site. Failure of the Owner's Representative to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.
   1. EXISTING SOIL CONDITIONS REVIEW: Prior to the start of any soil modification that will utilize or modify the existing Native Soil.

1.13 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction meeting with the Owner's Representative at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.14 QUALITY ASSURANCE

A. Installer Qualifications: The installer shall be a firm having at least 5 years of experience of a scope similar to that required for the work, including the preparation, mixing and installation of soil mixes to support planting. The installer of the work in Section: Planting, shall be the same firm installing the work in this section.
   1. The bidders list for work under this section shall be approved by the Owner's Representative.
   2. Installer Field Supervision: When any Planting Soil work is in progress, installer shall maintain, on site, an experienced full-time supervisor who can communicate clearly with the Owner's Representative.
   3. Installer's field supervisor shall have a minimum of five years experience as a field supervisor installing soil, shall be trained and proficient in the use of field surveying equipment to establish grades and can communicate clearly with the Owner's Representative.
   4. The installer's crew shall be experienced in the installation of Planting Soil, plantings, and irrigation (where applicable) and interpretation of planting plans, soil installation plans, and irrigation plans (where applicable).
   5. Submit references of past projects and employee training certifications that support that the Contractors meet all of the above installer qualifications and applicable licensures.

B. Soil testing laboratory qualifications: an independent laboratory, with the experience and capability to conduct the testing indicated and that specializes in USDA agricultural soil testing, Planting Soil Mixes, and the types of tests to be performed. Geotechnical engineering testing labs shall not be used.

1.15 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and subsurface conditions, and to notify the Owner's Representative, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Owner's Representative in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Owner's Representative of such conditions, they shall remain responsible for plant material under the warrantee clause of the specifications.
2. This specification requires that all Planting Soil work be completed and accepted prior to the installation of any plants.

1.16 SOIL COMPACTION – GENERAL REQUIREMENTS

A. Uncompact soil by digging or tilling to a depth of 12". Use equipment that will not compact surround planting area soils.

1.17 DELIVERY, STORAGE, AND HANDLING

A. Weather: Do not mix, deliver, place or grade soils when frozen or with moisture above field capacity.

B. Protect soil and soil stockpiles, including the stockpiles at the soil blender's yard, from wind, rain and washing that can erode soil or separate fines and coarse material, and contamination by chemicals, dust and debris that may be detrimental to plants or soil drainage. Cover stockpiles with plastic sheeting or fabric at the end of each workday.

C. All manufactured packaged products and material shall be delivered to the site in unopened containers and stored in a dry enclosed space suitable for the material and meeting all environmental regulations. Biological additives shall be protected from extreme cold and heat. All products shall be freshly manufactured and dated for the year in which the products are to be used.

D. Deliver all chemical amendments in original, unopened containers with original labels intact and legible, which state the guaranteed chemical analysis. Store all chemicals in a weather protected enclosure.

E. Bulk material: Coordinate delivery and storage with Owner's Representative and confine materials to neat piles in areas acceptable to Owner's Representative.

1.18 EXCAVATING AND GRADING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid damage. Hand excavate as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Notification of the USA NORTH 811, www.811Express.com, is required for all planting areas. The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the

1.

PART 2 - PRODUCTS

2.1 COMPOST

A. Compost: Blended and ground leaf, wood and other plant based material, composted for a minimum of 9 months and at temperatures sufficient to break down all woody fibers, seeds and leaf structures, free of live weed seeds, toxic material at levels that are harmful to plants or humans, including trash and debris. Source material shall be yard waste trimmings blended with other plant or manure based material designed to produce Compost high in fungal material.
   1. Compost shall be commercially prepared Compost and meet US Compost Council STA/TMECC criteria or as modified in this section for "Compost as a Landscape Backfill Mix Component". http://compostingcouncil.org/admin/wp-content/plugins/wp-pdfupload/pdf/191/LandscapeArch_Specs.pdf

B. Compost shall comply with the following parameters:
   1. pH: 5.5 - 8.0.
   2. Soil salt (electrical conductivity): maximum 5 dS/m (mmhos/cm).
   3. Moisture content %, wet weight basis: 30 – 60.
   4. Particle size, dry weight basis: 98% pass through 3/4 inch screen or smear.
   5. Stability carbon dioxide evolution rate: mg CO2-C/ g OM/ day < 2.
   6. Solvita maturity test: > 6.
   7. Physical contaminants (inerts), %, dry weight basis: <1%.
   8. Chemical contaminants, mg/kg (ppm): meet or exceed US EPA Class A standard, 40CFR § 503.13, Tables 1 and 3 levels.
   9. Biological contaminants select pathogens fecal coliform bacteria, or salmonella, meet or exceed US EPA Class A standard, 40 CFR § 503.32(a) level requirements.

C. Provide a two gallon sample with manufacturer's literature and material certification that the product meets the requirements.

2.2 NATIVE SOIL (Acceptable for planting with minimum modifications)

A. General definition of existing soil: Surface soil in the areas designated on the soils plan as existing soil, that is not altered, compacted to root limiting density, graded or contaminated before or during the construction process and considered acceptable for planting and long term health of the plants specified either as it exists or with only minor modification.
   1. Contractor shall obtain an agricultural soil analysis of the native soil to determine soil suitability. While it is assumed the soil is adequate for installation of native plants, this test should be provided prior to proceeding with soil modification and planting.

B. Protect existing soil from compaction, contamination, and degradation during the construction process.

C. Unless otherwise instructed, remove all existing plants, root thatch, and non-soil debris from the surface of the soil using equipment that does not increase compaction of soil to root limiting levels.

D. Modifications:
   1. Till surface soil to six inches or greater
   2. Remove existing turf thatch, ground cover plants and weeds.
   3. Mix Native Soil with Compost at a ratio of 50-50 unless otherwise indicated by Native Soils agricultural test.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Prior to installation of Planting Soil, examine site to confirm that existing conditions are satisfactory for the work of this section to proceed.
   1. Confirm that the subgrade is at the proper elevation and compacted as required. Where underdrains are part of the project plans and specifications, subgrade elevations shall slope toward the under drain lines as shown on the drawings.
   2. Confirm that surface all areas to be filled with Planting Soil are free of construction debris, refuse, compressible or biodegradable materials, stones greater than 2 inches diameter, soil crusting films of silt or clay that reduces or stops drainage from the Planting Soil into the subsoil; and/or standing water. Remove unsuitable material from the site.
   3. Confirm that no adverse drainage conditions are present.
   4. Confirm that no conditions are present which are detrimental to plant growth.
   5. Confirm that utility work has been completed per the drawings.
   6. Confirm that irrigation work, if included in the project, and which is shown to be installed below prepared soil levels, has been completed.

B. If unsatisfactory conditions are encountered, notify the Owner’s Representative immediately to determine corrective action before proceeding.

3.2 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that are in conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Owner’s Representative of any conflicts encountered.

3.3 GRADE AND ELEVATION CONTROL

A. Provide grade and elevation control during installation of Planting Soil. Utilize grade stakes, surveying equipment, and other means and methods to assure that grades and contours conform to the grades indicated on the plans.

3.4 SITE PREPARATION

A. Excavate to the proposed subgrade. Maintain all required angles of repose of the adjacent materials as shown on the drawings or as required by this specification. Do not over excavate compacted subgrades of adjacent pavement or structures. Maintain a supporting 1:1 side slope of compacted subgrade material along the edges of all paving and structures where the bottom of the paving or structure is above the bottom elevation of the excavated planting area.

B. Remove all construction debris and material including any construction materials from the subgrade.

C. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope approximately parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.

D. In areas where Planting Soil is to be spread, confirm subgrade has been scarified.

E. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use 1/2 inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
   1. At the end of each working day, clean up any soil or dirt spilled on any paved surface.
   2. Any damage to the paving or site features or work shall be repaired at the Contractor's expense.

3.5 SOIL MOISTURE

A. Volumetric soil moisture level, in both the Planting Soil and the root balls of all plants, prior to, during and after planting shall be above permanent wilt point and below field capacity for each type of soil texture within the following ranges.

Soil texture	Permanent wilting point	Field capacity
Sand, Loamy sand, Sandy loam	5-8%	12-18%
Loam, Sandy clay, Sandy clay loam	14-25%	27-36%
Clay loam, Silt loam	11-22%	31-36%
Silty clay, Silty clay loam	22-27%	38-41%

B. The Contractor shall confirm the soil moisture levels with a moisture meter (Digital Soil Moisture Meter, DSMM500 by General Specialty Tools and Instruments, or approved equivalent). If moisture is found to be too low, the planting holes shall be filled with water and allowed to drain before starting any planting operations. If the moisture is too high, suspend planting operations until the soil moisture drains to below field capacity.

3.6 PLANTING SOIL INSTALLATION

A. Prior to installing any Planting Soil, the Owner's Representative shall approve the condition of the subgrade and the previously installed subgrade preparation and the installation of subsurface drainage.

B. In large planting bed areas, all equipment utilized to install or grade Planting Soil shall be wide track or balloon tire machines rated with a ground pressure of 4 psi or less. All grading and soil delivery equipment shall have buckets equipped with 6 inch long teeth to scarify any soil that becomes compacted.
   1. In areas of soil installation above existing subsoil, scarify the subgrade material prior to installing Planting Soil.
      a. Scarify the subsoil of the subgrade to a depth of 3 – 6 inches with the teeth of the back hoe or loader bucket, tiller or other suitable device.
      b. Immediately install the Planting Soil. Protect the loosened area from traffic. DO NOT allow the loosened subgrade to become compacted.
      c. In the event that the loosened area becomes overly compacted, loosen the area again prior to installing the Planting Soil.
   2. Where plans specify planting of individual plant containers, hand held equipment may be used. Contractor to ensure surrounding soils are not compacted by activity around planting holes.

C. Install the Planting Soil in 6-12 inch lifts to the required depths. Apply compacting forces to each lift as required to attain the required compaction. Scarify the top of each lift prior to adding more Planting Soil by dragging the teeth of a loader bucket or backhoe across the soil surface to roughen the surface.

D. Phase work such that equipment to deliver or grade soil does not have to operate over previously installed Planting Soil. Work in rows of lifts the width of the extension of the bucket on the loader. Install all lifts in one row before proceeding to the next. Work out from the furthest part of each bed from the soil delivery point to the edge of the each bed area.

E. Where possible place large trees first and fill Planting Soil around the root ball.

F. Installing soil with soil or mulch blowers or soil slingers shall not be permitted due to the over mixing and soil ped breakdown cause by this type of equipment.

G. Where travel over installed soil is unavoidable, limit paths of traffic to reduce the impact of compaction in Planting Soil. Each time equipment passes over the installed soil it shall

reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil. Comply with the paragraph “Compaction Reduction” (section 3.9) in the event that soil becomes over compacted.

H. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the compost material. The Contractor shall install the Planting Soil at a higher level to anticipate this reduction of Planting Soil volume. A minimum settlement of approximately 10 - 15% of the soil depth is expected. All grade increases are assumed to be as measured prior to addition of surface Compost till layer, mulch, or sod.

3.7 FINE GRADING

A. The Owner’s Representative shall approve all rough grading prior to the installation of Compost, fine grading, planting, and mulching.

B. Grade the finish surface of all planted areas to meet the grades shown on the drawings, allowing the finished grades to remain higher (10 – 15% of depth of soil modification) than the grades on the grading plan, as defined in paragraph Planting Soil Installation, to anticipate settlement over the first year.

C. Utilize hand equipment, small garden tractors with rakes, or small garden tractors with buckets with teeth for fine grading to keep surface rough without further compaction. Do not use the flat bottom of a loader bucket to fine grade, as it will cause the finished grade to become overly smooth and or slightly compressed.

D. Provide for positive drainage from all areas toward the existing inlets, drainage structures and or the edges of planting beds. Adjust grades as directed to reflect actual constructed field conditions of paving, wall and inlet elevations. Notify the Owner’s Representative in the event that conditions make it impossible to achieve positive drainage.

E. Provide smooth, rounded transitions between slopes of different gradients and direction. Modify the grade so that the finish grade before adding mulch and after settlement is one or two inches below all paving surfaces or as directed by the drawings.

F. Fill all dips and remove any bumps in the overall plane of the slope. The tolerance for dips and bumps in shrub and ground cover planting areas shall be a 2 inch deviation from the plane in 10 feet. The tolerance for dips and bumps in lawn areas shall be a 1 inch deviation from the plane in 10 feet.

3.8 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.

1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Owner's Representative seals are to remain on the trees and removed at the end of the warranty period.
   1. Make all repairs to grades, ruts, and damage to the work or other work at the site.
   2. Remove and dispose of all excess Planting Soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.9 PLANTING SOIL AND MODIFIED EXISTING SOIL PROTECTION

A. The Contractor shall protect installed and/or modified Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair or replace damaged Planting Soil immediately.

B. Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Owner's Representative. Planting Soil shall be loosened or replaced at no expense to the Owner.
   1. Till and restore grades to all soil that has been driven over or compacted during the installation of plants.
   2. Where modified existing soil has become contaminated and needs to be replaced, provide imported soil that is of similar composition, depth and density as the soil that was removed.

3.10 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers.
   1. Maintain protection during installation until the date of plant acceptance (see specifications section – Planting). Treat, repair or replace damaged work immediately.
   2. Provide temporary erosion control as needed to stop soil erosion until the site is stabilized with mulch, plantings or turf.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Owner's Representative shall determine when such cleaning, replacement or repair is satisfactory. Damage to existing trees shall be assessed by a certified arborist.

3.11 SUBSTANTIAL COMPLETION ACCEPTANCE

A. Upon written notice from the Contractor, the Owners Representative shall review the work and make a determination if the work is substantially complete.

B. The date of substantial completion of the planting soil shall be the date when the Owner's Representative accepts that all work in Planting, Planting Soil, and Irrigation installation sections is complete.

3.12 FINAL ACCEPTANCE / SOIL SETTLEMENT

A. At the end of the plant warrantee and maintenance period, (see Specification section - Planting) the Owner's Representative shall observe the soil installation work and establish that all provisions of the contract are complete and the work is satisfactory.
   1. Restore any soil settlement and or erosion areas to the grades shown on the drawings. When restoring soil grades remove plants and mulch and add soil before restoring the planting. Do not add soil over the root balls of plants or on top of mulch.

B. Failure to pass acceptance: If the work fails to pass final acceptance, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owner's Representative.

END OF SECTION

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SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: All labor, materials, equipment, tools, accessories, transportation, and services as required for the furnishing and planting of trees, shrubs, and ground covers, protection of the work, and cleaning up as shown on the drawings and herein specified.

B. References
1. Standardized Plant Names, second edition, and secondly, A Checklist of Woody Ornamental Plants of California, Manual 32, University of California.
2. AAN's American Standard for Nursery Stock.
3. Federal, State and County laws requiring inspection for plant disease and insect control.

C. Related Sections
1. Drawings and general provisions of contract, including general and supplementary conditions and Division I specifications, apply to work of this section.
   a. Review Site Preparation notes on Landscape Sheet L-002 (notes 47-56) which describe plant salvage, and propagation of local genotype plants.

1.2 PRICE AND PAYMENT PROCEDURES

A. Refer to Section 01 29 00, Payment Procedures.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Schedule
1. Submit a proposed planting schedule to the Engineer for approval at least thirty (30) days prior to start of work under this section.
2. After above approval, no modification shall be made to this schedule without written authorization by Engineer.

1.4 SUBMITTALS

A. Certificates: All plant materials shall meet the specifications of Federal, State, and County laws requiring inspection for plant diseases and insect infestations. Inspection certifications required by law shall accompany each shipment, invoice, or order for stock, and when such plants arrive at the site of the work, the certificate of inspection shall be filed with the Engineer.

B. Materials Lists
1. Within forty five (45) days after award of the Contract, submit to Engineer a complete list of materials proposed to be furnished and installed demonstrating conformance with the requirements specified.

2. Submittal to include invoices identifying sizes and quantities and the names and addresses of all plant material suppliers and growers.

1.5 QUALITY ASSURANCE

A. Plants not meeting the specified sizes and quantities at time of inspection are subject to rejection and replacement.

B. Reviews: The Contractor shall specifically request the following reviews prior to progressing with the work:
1. Plant material approval.
2. Plant layout.
3. Finish grade.
4. Substantial completion.
5. Final completion.

C. Nomenclature and Labels: Plant botanical names shall conform to Standardized Plant Names, second edition, and secondly, A Checklist of Woody Ornamental Plants of California, Manual 32, University of California. All plants of each clone, species, and cultivar shall be delivered to the site labeled with their full botanical names. Every plant species shall be labeled with no less than one label for every ten plants of a species.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials: All materials required to complete the work under this contract shall be furnished by the Contractor.

B. Delivery and Acceptance Requirements
1. The Contractor shall notify the Section of Engineer at least two (2) days prior to the delivery date of each shipment of plant materials.
2. Any plants delivered to the job site, which are found to be not true to name or unsuitable in growth or conditions, shall be removed from the site and replaced with acceptable plants.
3. All plants shall be of the genus, species, cultivar, size, age, and condition as specified herein and as shown on the Plans.
4. Under no condition will there be any substitution of plants or sizes for those listed on the accompanying plans, except with the written consent of the Engineer.
5. Inspection of all plant material for acceptance shall be made at the project site at time of delivery. All plant material shall be approved by the Engineer prior to installation. Any and all rejected plant material shall be marked as such and removed from the project site immediately.

C. Storage and Handling
1. Plant materials shall be protected and maintained in good condition. Bare root and balled materials shall be watered regularly and placed in a cool area, protected from sun and wind.

D. Substitutions

1. Substitutions of plant materials will not be permitted unless authorized in writing by Engineer.
2. If proof is submitted that any plant specified is not obtainable, a proposal will be considered for use of the nearest equivalent size or variety with corresponding adjustment of Contract price.
3. Such proof shall be substantiated and submitted in writing to the Engineer at least 30 days prior to start of work under this section.
4. These provisions shall not relieve Contractor of the responsibility of obtaining specified materials in advance if special growing conditions or other arrangements must be made in order to supply specified materials.

1.7 SITE CONDITIONS

A. Planting Conditions
   1. Boxed or container material may be installed at any time.
   2. Air Temperature
      a. Do not install plant materials during freezing weather or when the ground is frozen.
      b. Protect plants from desiccation in hot, dry conditions by keeping moist, or use an anti-desiccant.

1.8 WARRANTY

A. Final Guarantee: Contractor shall provide guarantee

B. General: Contractor shall warrant that all plants installed under this Contract will be healthy and in flourishing condition of active growth on year from date of Final Acceptance.

C. Plant Replacements
   1. Replace, without cost to Tribe, and as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition, during and at the end of the Warranty Period. Plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size and color. Replacements shall closely match adjacent specimens of the same species and shall be subject to all requirements of this specification.
   2. Rejected plants may be retained in place or be required to be removed at the discretion of the Tribe.
   3. Contractor shall not be held responsible for failures due to neglect by the Tribe or vandalism during Warranty Period. Report such conditions to the Tribe in writing.
   4. Warranty shall not include damage or loss of plant materials caused by fires, floods, freezing rains, lightning storms, winds over seventy-five (75) MPH, or winter kill caused by extreme cold and severe winter conditions not typical of the project site.
   5. Plant replacement during the warranty period shall be limited to one replacement unless the prior plant installation did not meet the requirements of these specifications.

D. A final inspection will be held in presence of Contractor and Tribe at the end of the one-year period. It shall be the Contractor's responsibility to notify the Tribe fourteen (14) days prior to the anticipated meeting.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Description
1. Tagging: All plants shall be true to name, and one of each bundle or lot shall be tagged with the name and size of the plant in accordance with the standards of practice recommended by the AAN.
2. Plants shall be as specified in the Plant List on the Plans and shall be healthy, vigorous stock, free of insects and disease.
3. Unless otherwise indicated, plants material shall be of local genotype native species, sourced from the Klamath-Trinity watersheds within 50 miles of the site. Any substitutions must also conform to this requirement.
4. Use only plant materials that are first class representations of the genus, species, and cultivars specified and that conform to all State and local laws governing the sale, transportation, and inspection of plant materials.
5. Only healthy and shapely plants of the size and type indicated and only plants with a normal plant and root structure will be acceptable.
6. All plants shall be nursery grown stock and shall have been grown in the specified containers for not less than six (6) months but shall not have been overgrown in the containers so as to become root-bound. They shall have straight, single trunks, unless otherwise specified on the plans.
7. No pruning shall be undertaken before planting.
8. Plants specified to be multi-trunk shall have at least three main leaders from the base.
9. Any and all plants that have any encircling roots (not root-bound) shall have root balls lightly slashed on a minimum of three (3) sides to stop encircling root growth.
10. All plants shall be free from disfiguring knots and sunscald injuries, abrasions, abrasion of bark, or other objectionable disfigurements. Tree trunks shall be sturdy and well "hardened off".

2.2 SOIL AMENDMENTS

A. As specified in Section 329100, Planting Preparation.

2.3 MULCH

A. As specified in Section 329100, Planting Preparation.

2.4 ACCESSORIES

A. Guying Materials for trees less than four inch (4") diameter.
1. Polypropylene Weave
a. Manufacturer: DeepRoot Arbor Tie, or approved equal.

B. Tree Stakes
   1. Two stakes per tree.
   2. Eight to ten foot (8’-10’) lengths depending on tree height.
   3. Two inch by two inch (2” x 2”) Lodge Pole Pine Stakes, pressure treated with Chemonite.

2.5 SOURCE QUALITY CONTROL

A. Damaged Plants
   1. Plants shall not be pruned before delivery.
   2. Trees which have damaged or crooked leaders, or multiple leaders, unless specified, will be rejected.
   3. Trees with abrasions of the bark, sunscalds, disfiguring knots, or fresh cuts of limbs over three fourths inch (3/4 inch) which have not completely callused, will be rejected.
   4. Trees with asymmetrical canopies, skirted canopies (excessively high branching) and topped or lollipop pruned in the nursery will be rejected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Preinstallation Testing: The Contractor is required to conduct an irrigation coverage test prior to the installation of any planting material, including seeded turf or sod.

B. The coverage test shall take place in the presence of the Engineer.

C. The Contractor shall add any irrigation heads as necessary to obtain the proper irrigation coverage as directed by the Engineer at the Contractor’s own expense.

D. The Contractor shall notify the Engineer a minimum of forty eight (48) hours prior to the coverage test.

3.2 PREPARATION

A. Protection of In-Place Conditions
   1. Surrounding areas, surfaces and appurtenances already in place shall be protected during installation of plants.

3.3 TREE AND SHRUB INSTALLATION

A. Location Staking: Each tree and shrub location shall be as indicated on the Plans and shall not be in conflict with any existing utilities, utility boxes, etc. Any and all plants improperly located shall be replanted in their proper location at no additional cost to the Tribe.
   1. Notify Engineer immediately of any discrepancy.

B. Excavate holes by auger, unless otherwise specified for particular situations. Before an augured hole is made, the top six inches (6") of amended soil shall be removed and stockpiled at one side of hole.

C. An augured hole of the appropriate size shall be made to a depth of the container. The size of the auger shall depend on the size of the plant container. The hole shall be broken in with a crowbar until it is twice the width of the container, leaving the sides rough with no "auger slick". Break up the bottom six inches (6") of soil prior to placing plant.

D. The plant shall then be set in an upright position in the center of the hole and the space around it backfilled with planting mix so that a minimum of four inches (4") of amended soil is around the sides of the root ball. Do not place organic matter beneath the plant's root ball. The plant shall be set so that the root crown is one half inch to three fourths inch (1/2" to 3/4") higher than average surrounding grade. Dispose of balance of borings around plant in a manner that water is shed away from the crown or trunk of plant.

E. When the backfill around the plant is approximately two-thirds (2/3) completed, the plant shall be thoroughly watered, after which the backfill shall be completed to the grade of the surrounding area.

F. Install planting packets within six inches to eight inches (6”- 8”) of the soil surface and as per the following schedule:
1. 1 gal. stock - 1 packet
2. 2 or 5 gal. stock - 3 packets
3. 15 gal. stock - 9 packets
4. 24 inch box stock or larger - 12 packets

G. No boxed, balled, or canned trees shall be planted if the ball is broken or cracked, either before or during the process of planting.

H. Tree Wrap: Protect all trees from sun scald with tree bark-wrap prior to staking. Remove prior to Final Acceptance.

I. Tree Staking: All trees shall be provided with two (2) Lodge Pole Pine Stakes, pressure treated with Chemonite (See Plans for Tree Planting Detail). Tree stakes shall not be driven into the rootball.
1. Fifteen (15) gallons trees or smaller: two inches (2") diameter x ten feet (10') long stake, six feet (6') above ground.
2. Twenty four (24) inches box trees or larger: three inches (3") diameter x twelve feet (12') long stake, eight feet (8') above ground, with three one inch by four inches (1" x 4") wood cross ties.
3. The tree ties shall be pieces of corded rubber placed in one place just below the main fork or branches.

J. Soil Berm: In all planting areas (excluding turf), each plant shall have a soil berm constructed around it to retain water. The soil berm shall be at least four inches (4") high and shall have a minimum diameter of two feet (2') for shrubs and three feet (3') for trees.

K. Edging: Each tree in turf areas shall have the turf removed in a ring from the tree base diameter as follows:
1. Twenty four inches (24") diameter to five (5) gallon trees.

3.4 Thirty inches (30") diameter to fifteen (15) gallon and larger trees.

A. Pruning: Pruning shall be limited to a minimum necessary for removal of injured twigs and branches, with cuts over one-half (1/2) inch in diameter painted with a tree wound compound.

B. Watering: Immediately after planting, each tree or shrub shall be thoroughly watered, and the areas between soil berms shall be raked smooth.

3.5 GROUND COVERS

A. Spacing: The spacing of all ground cover plants shall be as indicated on the Plans and in the Plant List.

B. Groundcovers of the same species shall be clustered in groups of three to five and staggered to create a naturalistic effect. They shall be placed around the shrubs (to within one (1) foot) and trees (to within eighteen (18) inches).

3.6 PLUG PLANTING

A. Spacing: Plugs of the same species shall be clustered in groups of three to five and staggered to create a naturalistic effect.

3.7 SEED

A. Note 54 of Landscape Sheet L-002 shall apply to the application of all seed.

3.8 WEED CONTROL

A. During site preparation and topsoil salvage, apply interim weed management practices described in Note 56 of Landscape Sheet L-002. Plan for 3 to 6 months of thermosterilization.
1.

3.9 MULCH

A. Refer to Section 32 91 00, Planting Preparation.

3.10 SITE QUALITY CONTROL

A. Site Tests and Inspections
1. Inspection for Starting of Operation and Maintenance Period: Upon completion of the irrigation, turf, planting, and hydroseeding work, when a satisfactory stand of turf (between 2 to 3 inches (2” to 3”) high) has been established, and after the first cutting, the Contractor shall notify the Project Engineer that the project is ready for

maintenance. The Project Engineer shall then schedule a pre-maintenance walk-through inspection for the project and shall notify the Contractor and various Tribal representatives as to the time and date.

2. Upon inspection, if the Project Engineer finds the irrigation, turf, planting, and hydroseeding work complete and in compliance with the plans and specifications, the Tribe shall authorize the start of the operation and maintenance period. Written notice will be given the Contractor to inform him as to the starting date of the maintenance period.

3.11 CLEANING

A. Waste Management

1. After all planting operations have been completed, the Contractor shall remove all trash, empty plant containers, tools, and equipment used in this work, or any other debris accumulated by the work, from the site of the work, and all scars, ruts, or other marks in the area caused by this work shall be repaired at the Contractor's expense, and the ground left in a neat and orderly condition throughout the site of the work.

END OF SECTION

SECTION 33 10 00 - WATER SERVICES

PART 1 GENERAL

1.1SECTION INCLUDES

A. Pipe and fittings for domestic water lateral and service lines.

1.2MEASUREMENT

A. Water Lateral: includes all labor, materials, and equipment necessary to install lateral water lines from existing water facilities to new locations as described and depicted in the plan sets. This is for both domestic and fire suppression use. Measurement and payment to be per linear foot of installed water lateral as per the bid schedule.
B. Water Service: includes all labor, materials, and equipment necessary to install water service facilities including connection to new lateral, installation of meters and pressure regulating valves, pipeline, hose bibs, control valves, and stub-outs for future connection to buildings. Measurement and payment for water services shall be per service as per the bid schedule.
C. Fire sprinkler includes double check valve for connection to fire sprinkler service as show on the plans.

1.3RELATED SECTIONS

A. Division 31.
B. Section 033000: Concrete.

1.4REFERENCES

A. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
B. ASTM C900 - Poly (VinylChloride) (PVC)
C. ASTM D2466 – Poly (VinylChloride) (PVC) Plastic Pipe (SDR-PR)
D. AWWA B300 - Standard for Hypochlorites.
E. AWWA B301 - Standard for Liquid Chlorine.
F. AWWA C651 - Standards for Disinfecting Water Mains.

1.5SUBMITTALS

A. Product and manufacturer data.
B. Test Reports: Indicate results compared to specified requirements.

1.6PROJECT RECORD DOCUMENTS

A. Disinfection report:
    1. Type and form of disinfectant used.
    2. Date and time of disinfectant injection start and time of completion.
    3. Test locations.
    4. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
    5. Date and time of flushing start and completion.

6. Disinfectant residual after flushing in ppm for each outlet tested.

B. Bacteriological report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of EPA.
   8. Copies of all reports shall be supplied to the Engineer within 48 hours of test completion.

1.7QUALITY ASSURANCE

A. Perform work in accordance with AWWA C651.
B. Submit name of EPA certified laboratory.
C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1WATER PIPE

A. Polyethylene Pipe: ASTM D2239, ASTM C900, IPS size, for 200 PSI pressure rating and below per engineering civil plans.
B. Joints: Non-Flare Compression equal to Ford Pack Joints.
C. PVC Pressure Pipe, Schedule 40: ASTM D1785, IPS size, for 200 PSI pressure rating.
D. Fittings: PVC, Schedule 40, ASTM D2466

2.2DOUBLE CHECK AND BACK FLOW PREVENTOR

A. Manufacturer:
   1. Watts ES-LF709L 4” Double Check Valve Assembly.
   2. Substitutions: Will be permitted

2.3SADDLES

A. Manufacturers:

   1. Georg Fischer – GF – Electro-fusion Full Pressure Branch Saddle 6”, DR11
   2. Substitutions: Will be permitted.

2.4CORPORATION STOPS

A. Manufacturers:
   1. Clow Wedge Gate Valve C509, Model F-6112 – 6” and 4”
   2. James Jones Co., Model J1936
   3. Substitutions: Will be permitted.

2.5COPPERSETTERS

A. Manufacturers:
   1. Ford Model VH72
   2. Substitutions: Will be permitted.

2.6CURB BOXES

A. Manufacturer: McDonald, Minneapolis Pattern - with foot piece, 5½-inch (substitutions permitted).
B.

2.7WATER METERS

A. Manufacturer: Seametrics WMX 101 4" Water Meter (substitutions permitted per approval).

2.8WATER BOXES

A. Christy Model N30 Box and N40 with Lid marked "WATER" (substitutions permitted).

2.9PRESSURE REDUCING VALVE

A. Manufacturer: Flowmatic 6" C101/B Pressure Reducing Valve. Pressure setting at valve outlet set at 90psi.

2.10 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, and AWWA B301, Liquid Chlorine.

PART 3 EXECUTION

3.1INSTALLATION - WATER SERVICE LINE

A. Coordinate with the public utility for connection of new water facilities to existing water distribution system. Public utility to make connection of new facilities to existing facilities. Contractor to install all other components of the new water system.
B. Excavate pipe trench according to Section 312300. Hand trim trench where necessary.
C. Establish elevations of buried piping for minimum of 36 inches of cover.
D. Connect the service line to the house plumbing with fittings or adapters manufactured for the conditions encountered to provide a strong, durable, watertight connection. Provide a gate valve and hose bib with vacuum breaker.
E. Set water meter and box in accordance with the drawings and the requirements of the public utility.
F. Backfill and compact according to Section 312300.

3.2DISINFECTION AND BACTERIOLOGICAL TESTING

A. Examination
   1. Verify that piping system has been cleaned, inspected, and pressure tested.

2. Perform scheduling and disinfecting activity with start-up, testing, adjusting, and demonstration procedures, including coordination with related systems.

B. Execution
   1. Provide and attach required equipment to perform the work of this Section.
   2. Inject treatment disinfectant into piping system.
   3. Maintain disinfectant in system for 24 hours.
   4. Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

C. Pressure Test for Water Main
   1. Notify Engineer forty-eight (48) hours prior to pressure testing.
   2. Provide required equipment to perform pressure test. Pressure gages used in testing shall be graduated in with no more than 5 PSI increments.
   3. Pressure test PVC pipe 2-inches or greater in diameter for 2 hours based on the test section working pressure at the lowest point of elevation.

AVERAGE WORKING PRESSURE OF TEST SECTION	TEST PRESSURE
Less than 65 psi	100 psi
65 to 95 psi	140 psi
Greater than 95 psi	195 psi

4. Leakage rates are total leakage allowed for a two hour test per 50 pipe joints as follows:

Pipe Size	100 psi	140 psi	195 psi
2 inch	0.27 gal	0.32 gal	0.38 gal
4 inch	0.54 gal	0.64 gal	0.75 gal
6 inch	0.81 gal	0.96 gal	1.13 gal

5. Repair leaks and re-test if leakage is above acceptable rates.
6. Leakage rates shall be adjusted proportionally for pipeline lengths greater than or less than 50 pipe joints.
7. The number of pipe joints being tested shall be calculated as the length of pipeline being tested divided by the standard pipe length used on the job, with no allowances for joints caused by the use of couplings or for joints at fittings.

END OF SECTION 33 10 00

SECTION 33 13 00 -DISINFECTION AND BACTERIOLOGICAL TESTING OF WATER MAIN SYSTEM

PART 1 GENERAL

1.1SECTION INCLUDES
- A. Disinfection of water mains.
- B. Testing and reporting results.

1.2MEASURMENT
- A. Payment for disinfection and bacteriological testing of water system shall be incidental to the installation of the water main and services.

1.3RELATED SECTIONS
- A. 312300 Excavation and Fill
- B. 331100 Water Utility Distribution
- C. 331000 Water Services

1.4REFERENCES
- A. AWWA B300 - Standard for Hypochlorites.
- B. AWWA B301 - Standard for Liquid Chlorine.
- C. AWWA C651 - Standards for Disinfecting Water Mains.
- D. AWWA C652-02: Standards for Disinfection of Reservoirs

1.5SUBMITTALS FOR INFORMATION
- A. Test Reports: Indicate results compared to specified requirements.

1.6PROJECT RECORD DOCUMENTS
- A. Disinfection report:
  1. Type and form of disinfectant used.
  2. Date and time of disinfectant injection start and time of completion.
  3. Test locations.
  4. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
  5. Date and time of flushing start and completion.
  6. Disinfectant residual after flushing in ppm for each outlet tested.
- B. Bacteriological report:
  1. Date issued, project name, and testing laboratory name, address, and telephone number.
  2. Time and date of water sample collection.
  3. Name of person collecting samples.
  4. Test locations.
  5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
  6. Coliform bacteria test results for each outlet tested.
  7. Certification that water conforms, or fails to conform, to bacterial standards of EPA.
  8. Copies of all reports shall be supplied to the Engineer within 48 hours of test completion.

1.7QUALITY ASSURANCE
- A. Perform work in accordance with AWWA C651.

B. Submit name of EPA certified laboratory.
C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS
A. Chemicals: AWWA B300 Hypochlorite, and
B. AWWA B301 Liquid Chlorine.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that piping system has been cleaned, inspected, and pressure tested.
B. Perform scheduling and disinfecting activity with start-up, testing, adjusting, and demonstration procedures, including coordination with related systems.

3.2 EXECUTION
A. Provide and attach required equipment to perform the work of this Section.
B. Inject treatment disinfectant into piping system.
C. Maintain disinfectant in system for 24 hours.
D. Flush, circulate, and clean until required cleanliness is achieved; use domestic water.

3.3 PRESSURE TEST FOR WATER MAIN
A. Notify Inspector 48 hours prior to pressure testing.
B. Provide required equipment to perform pressure test. Pressure gages used in testing shall be graduated in with no more than 5 PSI increments.
C. Pressure test PVC pipe 2-inches or greater in diameter for 2 hours based on the test section working pressure at the lowest point of elevation.

AVERAGE WORKING PRESSURE OF TEST SECTION	TEST PRESSURE
Less than or equal to 65 psi	100 psi
66 to 95 psi	150 psi
96 to 133 psi	200 psi
Greater than 133 psi	Per Engineer

D. Leakage rates are total leakage allowed for a two hour test per 50 pipe joints as follows:

Pipe Size (inch)	100 (psi)	150 (psi)	200 (psi)

2	0.27 gal	0.32 gal	0.38 gal
4	0.54 gal	0.64 gal	0.75 gal
6	0.81 gal	0.96 gal	1.13 gal
8	1.08 gal	1.28 gal	1.51 gal

E. Repair leaks and re-test if leakage is above acceptable rates.
F. Leakage rates shall be adjusted proportionally for pipeline lengths greater than or less than 50 pipe joints.
G. The number of pipe joints being tested shall be calculated as the length of pipeline being tested divided by the standard pipe length used on the job, with no allowances for joints caused by the use of couplings or for joints at fittings.

END OF SECTION 33 13 00

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SECTION 33 30 00 - ONSITE WASTEWATER TREATMENT SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section includes supply and installation of all materials necessary for installation of onsite wastewater treatment systems as shown on the project plans. Included in these items are septic tank, pipes, pumps, control systems, and leach trenches.
B. This section includes location and verification of existing septic systems that are within the project area.

1.2 MEASUREMENT

A. Onsite wastewater disposal systems shall be paid per the bid schedule Section 004100. Two unit shall include the septic tank, pump chamber tank, pump and control systems (with visual and audible alarm), and the remaining unit shall include supply manifold, leachfield, and all other miscellaneous piping and appurtenance.
B. Verification of the existence of any septic systems within the work area shall be performed by the Contractor. Components of existing systems in direct conflict with proposed new facilities shall be relocated to a suitable location. Payment for relocation of existing wastewater systems shall be per unit price provided by the contractor in the bid schedule.

1.3 RELATED SECTIONS

A. Division 31.

1.4 REFERENCES

A. ANSI/ASTM D3034 - Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
B. ASTM D2235 – Standard Specifications for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
C. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe and Sewers and Other Gravity Flow Applications.
D. ASTM D2661 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
E. ASTM D2680 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.
F. ASTM D2751 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
G. ASTM D3138 – Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non Pressure Piping Components.
H. ASTM D3965 – Standard Classification and Basis for Specifications for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings.
I. ASTM F628 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core.

J. ASTM F1668 – Standard Guide for Construction Procedures for Buried Plastic Pipe.

1.5 DEFINITIONS

A. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.

1.6 PROJECT RECORD DOCUMENTS

A. Record location of all tanks, filters, and lines. Copies of all records shall be supplied to the Engineer for inclusion in as-builts.

1.7 REGULATORY REQUIREMENTS

A. Conform to the local authorities for materials and installation of the work of this section.
B. Comply with Title 22 of the California Environmental Health Code for horizontal and vertical separation of water and sewer mains.

1.8 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated.

PART 2 PRODUCTS

2.1 SEPTIC TANKS

A. Septic Tanks: Shall be of standard construction with an interior baffle (two chamber minimum). Tanks may be constructed of either concrete or fiberglass in strict accordance with requirements of the Uniform Plumbing Code (UPC). Septic tank capacity and pump chamber capacity shall be as per engineering civil plan.

2.2 BUILDING TO TANK CONDUIT

A. 4” Diameter Polyvinyl Chloride (PVC) SDR-26.

2.3 SUPPLY TRANSPORTATION AND MANIFOLD LINES

A. Diameter Polyvinyl Chloride (PVC) solid core pipe, per engineering civil plan layout.

2.4 LEACH LINES

A. 1.25” Diameter Polyvinyl chloride (PVC) pressurized pipe with orifice spacing and size per engineering civil plan details.
B. Geotextile: Non-woven geotextile or 15 lbs building felt.
C. Drain Rock: 1 ½” to 2” minus washed rock.

2.5 SEPTIC PUMPS

A. Orenco PF 5005 HH Effluent Pump, **and** Orenco PF 5007 HH Effluent Pump.

2.6 CONTROL PANEL

A. Orenco MVP-1 Simplex Control Panel with surge arrestor, pump run light, and power lite. No IR Relays. Install per manufacturer recommendations.

2.7 DISTRUBUTION VALVE

A. Orenco V6402A distribution valve per engineering civil plan. Install per manufacturer recommendations.

2.8 SPETIC FIELD INFILTRATORS

A. The contractor shall install septic field infiltrators in accordance with the approved design plans, manufacturer specifications, and all applicable regulations. Infiltrators shall be placed on a properly prepared and leveled bed, ensuring uniform support and alignment. Care shall be taken to prevent damage or displacement during backfilling, which shall be performed in lifts using approved materials to avoid excessive compaction. The contractor shall ensure proper connections to distribution piping and verify that system components remain free of debris. Any deviations from the approved design shall be reviewed and approved by the project engineer before implementation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that area is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

3.2 PREPARATION

A. Remove large stones or other hard matter which could damage pipe and tanks or impede consistent backfilling or compaction.
B. Prior to the system testing, remove all sand, debris, and other foreign materials from the portion to be tested. If flushing is necessary, dispose of water used in this process.

3.3 BEDDING

A. Excavate pipe trench or open excavation in accordance with Section 312300 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
B. Place bedding material at trench or excavation bottom, level materials in continuous layer not exceeding four (4) inches compacted depth, compact to 95 percent as measured per Cal Test 216.
C. Maintain optimum moisture content of bedding material to attain required compaction density as measured per ASTM D3017.

3.4 INSTALLATION – TANKS

A. Install tanks such that they are placed level, and allow gravity feed to the system components.
B. Backfill around tanks to a minimum compacted thickness of six (6) inches compacted to 95 percent

relative compaction as measured per Cal Test 216.

C. Refer to Section 312300 for trenching, backfilling and compaction requirements. Do not displace or damage tank or pipe when compacting.
D. Tanks must be hydrostatically tested for leaks by filling with water to the flow-line out elevation level and maintaining water level for a minimum of twenty-four (24) hours without significant loss of fluid. Tanks incapable of maintaining sufficient static water level shall be replaced at the Contractor's expense without additional cost to the Owner.

3.5 INSTALLATION – SUPPLY MANIFOLD

A. Deflection in sewer mains refers to the reduction in vertical inside diameter. Deflection testing may not be required in all cases, however the Engineer reserves the right to require the Contractor to perform random deflection tests between successive manholes and cleanouts.
B. Acceptable methods of deflection testing include use of television, photography, properly sized go-no-go mandrels and deflectometer.
C. The maximum allowable deflection for PVC & ABS pipe shall be five percent or per the material manufacturer whichever is stricter.

3.6 ALIGNMENT TESTING

A. Alignment refers to the deviation of a sewer main from true line or grade. Alignment will be tested by lamping between manholes. A light will be flashed between ends of line by means of a flashlight or reflected light. Any deviation from true line or grade causing less than a full lamped circle shall be cause for rejection. A full lamp circle is when a full circle of light may be seen from any position around the pipe perimeter.
B. Any ponding of water in the sewer line will be cause for rejection. Rejected sewer lines must be replaced. Replacement will be at the expense of the contractor and at no additional expense to the Owner.

3.7 LEACH FIELD PRESSURE (SQUIRT) TESTING

A. Prior to the installation of leach field infiltrators, the contractor shall perform a squirt test to verify that the pressurized leach field operates at the required pressure settings. Adjustments to valve settings shall be made as necessary to ensure equalized and acceptable zone pressures. The contractor shall notify the engineering representative before conducting the test and shall submit a detailed test report to the project owner for review and approval.

3.8 FIELD QUALITY CONTROL

A. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest at Contractor's expense.
B. Request inspection prior to and immediately after placing bedding.

3.9 PROTECTION

A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is complete.

END OF SECTION 33 30 00

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SECTION 33 40 00 - STORMWATER FACILITIES

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes Polyethylene stormwater pipe and drop inlets used for transfer of stormwater as well as vegetated bio-swales.

1.2 MEASUREMENT & PAYMENT

A. Polyethylene Drainage Pipe: Paid by the bid schedule. Includes trench excavation, supply and placement of bedding material, hand trimming, pipe, fittings, hydrostatic testing, backfilling, as-builts, site cleanup, and all appurtenances not otherwise specified in the bid schedule.

B. Drop Inlets: paid by the bid schedule, includes excavation, supply and installation of bedding material, connection to drainage pipe, grouting, backfilling, and all other appurtenances not otherwise specified on the bid schedule.

C. Vegetated Bio-swale: Paid by the bid schedule. Includes all excavation, shaping, lining, seeding, and all other aspects and pertinent components and practices needed to completely establish such facilities in the locations, sizing, and to grades provided.

1.3 RELATED SECTIONS

A. Section 022100: Surveys and Construction Staking

B. Division 31: Earthwork

C. Division 32: Exterior Improvements

1.4 REFERENCES

A. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

B. ASTM D3035 - Polyethylene Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter

C. ASTM D3350 - Polyethylene Plastics and Fittings Materials.

D. AASHTO M294 - Corrugated Polyethylene Pipe, 12" diameter and larger.

E. AASHTO M306 - Drainage, Sewer, Utility, and Related Castings.

1.5 QUALITY ASSURANCE

A. Pipe: Install in strict conformance with the manufacturer’s recommended procedures and with worker health and safety in mind.

B. Drop Inlets: Install in strict conformance with the manufacturer's recommended procedures and with worker health and safety in mind.

1.6 Delivery, Storage, and Handling

A. Deliver, store, and protect products to site.

1.7 SUBMITTALS

A. Submit manufacturer's product data, installation guide, shop drawings, and standards for specified materials and equipment for piping, jointing material, drop inlets, frames, and covers as one package. Approval by Engineer must be obtained prior to installation.

B. Submit televised scoping inspection of installed storm drain pipes for Engineer review and approval.

C. Submit as-built of installed storm drain facility following construction and prior to request for final payment for applicable items.

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE

A. Manufacturers: *Hancor, ADS,* or approved equal.

B. Polyethylene Pipe: AASHTO M294, TYPE S

1. Fittings: Bell and Spigot with rubber gasket, ADS Pro Link Ultra, WT Pipe, of Bell-Bell Couplers. Fittings shall be rotational or blow molded.

2. Joints: ASTM M252, Fabricated fittings shall be welded on the interior and exterior at all junction. Coupling Joints shall be corrugated to match the index in the pipe corrugations and in a width no less than three-quarters of the nominal pipe diameter. All couplings shall be manufactured to lap equally to a distance on each jointed pipe, to no less than the diameter of the pipe and shall provide a positive means of closure.

3. Pipe: ADS N12 or approved equal meeting ASTM F2648. Smooth interior wall, annular or helical exterior corrugations.

4. Manning's "n" value equal to 0.012.

5. Material Properties: Material for pipe production shall be an engineered compound of virgin and recycled high density polyethylene conforming with the minimum requirements of cell classification 435420C (ESCR Test Condition B), as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%.

2.2 DROP INLETS

A. Manufacturer: NDS or approved equal (for landscape areas and concrete walkways)

1. NDS 9” Square Catch Basin, Model 900BLKit w/ Sand color grate (for landscape zones), or approved equal.
2. NDS Spee-D 10’x4.75”x3.75” Deep, channel drain. Model 400-10MTL w/ Grate part #254.

B. Manufacturer: Hilfiker, or Jensen Precast Concrete (for road location, amphitheater, and rain garden), or approved equal.

1. Drainage Inlet, Concrete. 12x12, and 24x24, or approved equal/alternate.
2. Drainage Inlet Grate: HS-20 Rated (for road or driving surface locations only), galvanized steel corresponding to specific drainage inlets.
3. Curb: Type B1 Caltrans A87A.

2.3 VEGETATED BIOSWALE (if applicable)

A. Topsoil: per Section 320513.

B. Vegetation: per Section 329219.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall verify final grades and elevations of all inlets prior to installation.

3.2 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02200 (Excavating, Trenching and Backfilling). Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Backfill around sides and to top of pipe with bedding material and tamp in place.

3.4 INSTALLATION: POLYETHYLENE PIPE

A. Route pipe in straight line.

B. Install pipe to allow for expansion and contraction without stressing pipe or joints.

C. Establish elevations of buried piping to ensure not less than 24 inches of cover.

D. Backfill per Section 02300: Earthwork.

E. Installation shall be in accordance with ASTM D2321 and manufacturer's published installation guidelines.

3.5 TELEVISING STORM DRAINS

A. New storm drains twelve inch (12") in diameter to thirty-six inch (36") in diameter shall be inspected by closed circuit television (CCTV) after completion of trench backfill and finished grading but prior to the placement of pavement or permanent trench resurfacing, to determine the existence and extent of any obstructions, structural deficiencies, or sags. Storm drains less than fifty feet (50') in length for a single run do not require televised inspection.

B. The Contractor shall perform televising. The Engineer reserves the right to re-televise any new storm drain work after placement of pavement or permanent trench resurfacing, but before acceptance by the Engineer, to determine the existence and extent of any foreign material or obstructions such as, but not necessarily limited to, cement grout, wood, rocks, sand, concrete, or pieces of pipe, and any structural deficiencies or sags precipitated by the permanent resurfacing operations or other Contract Work. The Contractor shall notify the Engineer a minimum of two (2) working days in advance of the anticipated date of televising.

C. Five (5) working days shall be allowed for the Engineer to review each individual video recording of each and every storm drain documented on that particular recording. In the event that any deficiencies or sags are discovered by the Engineer either by the Contractor's televising or the Engineer's re-televising, three (3) working days shall be allowed for the Engineer to determine whether the deficiencies or sags are repairable in place. If the Engineer determines that the deficiencies or sags are not repairable in place, the affected portion(s) shall be reconstructed in accordance with these Specifications.

D. The Contractor shall not be entitled to any additional working days due to delays resulting from the correction of any deficiencies or sags, either repairable or non-repairable in place, as determined by televised inspections.

3.6 DROP INLET INSTALLATION

A. Excavate and set drop inlet on solid bearing, provide Class II aggregate base foundation compacted to a minimum of 95% relative compaction per ASTM D2922 as needed. Set basin in place and level prior to backfilling.

B. Adjust to design alignment and elevations provided.

C. Install F477 gasket into last corrugation of pipe for insertion into drain basin receiver.

D. Install outlet pipe(s). Seat outlet piping to full depth of basin receiver.

E. Backfill per Section 02300 (Earthwork).

F. Adjust finish grate elevation to meet levels of plan set. Basin grate elevation can be adjusted by either cutting basin to lower, or inserting manufacturer approved riser rings to elevate.

END OF SECTION 33 40 00

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SECTION 33 42 00 - DRAINGAGE FACILITIES

PART 1. GENERAL

1.1. SECTION INCLUDES

A. This section includes drainage pipe and drainage facilities to be installed.

1.2. MEASUREMENT

A. Measurement and payment to be per Section 004100 Bid Schedule.

1.3. RELATED SECTIONS

A. Division 31

1.4. REFERENCES

A. ASTM D1785 - Poly (VinylChloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
B. ASTM D2241 - Poly (VinylChloride) (PVC) Plastic Pipe (SDR-PR).
C. ASTM D2466 - Poly (VinylChloride) (PVC) Plastic Pipe Fittings, Schedule 40.
D. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
E. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

1.5. QUALITY ASSURANCE

A. Pipe: Perform Work in accordance with manufacturer's recommended procedures.
B. Drop Inlets: Construct per the dimensions shown on the project drawings.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site.

PART 2. PRODUCTS

2.1. HDPE PIPE

A. Manufacturers: Hancor or equal
B. HDPE Pipe: AASHTO M294, TYPE S
    1. Fittings: Bell and Spigot with rubber gasket, ADS Pro Link Ultra, WT Pipe, of Bell-Bell Couplers
    2. Joints: ASTM M252, Fabricated fittings shall be welded on the interior and exterior at all junction
    3. Pipe: Smooth interior wall, corrugated polyethylene pipe
    4. Pipe: ADS N-12 approved or equal

PART 3. EXECUTION

3.1. EXAMINATION

A. Contractor shall verify final grades and elevations of all inlets prior to installation.

3.2. PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

3.3. BEDDING

A. Excavate pipe trench in accordance with Section 02300 (Earthwork). Hand trim excavation for accurate placement of pipe to elevations indicated.
B. Backfill around sides and to top of pipe with bedding material and tamp in place.

3.4. INSTALLATION – HDPE PIPE

A. Install in accordance with State of California, Department of Transportation, Standard Specifications July 2010, Section 64.
B. Route pipe in straight line
C. Install pipe to allow for expansion and contraction without stressing pipe or joints.
D. Establish elevations of buried piping to ensure not less than 24 inches of cover.

END OF SECTION 33 42 00

SECTION 33 70 00 - ELECTRIC DISTRIBUTION

PART 1. GENERAL

THIS SECTION IS TO BE PROVIDED BY PACIFIC GAS & ELECTRIC

PART 2. PRODUCTS

PART 3. EXECUTION

END OF SECTION 33 70 00

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Geotechnical Investigation Report

Proposed Yurok Wellness Center
Rube Ranch Road
Weitchpec, California

Prepared for:

PYATOK Architects

September 2024

023079

Phone: (707) 441-8855 **Email:** info@shn-engr.com
Web: shn-engr.com • 812 W. Wabash Avenue, Eureka, CA 95501-2138

Phone: (707) 441-8855 **Email:** info@shn-engr.com **Web:** shn-engr.com
812 W. Wabash Avenue, Eureka, CA 95501-2138

Reference: 023079

September 4, 2024

PYATOK Architects, Inc.
1611 Telegraph Avenue, Suite 200
Oakland, CA 94612

Subject: Geotechnical Investigation Report, Proposed Yurok Wellness Center, Rube Ranch Road, Weitchpec, California

This report presents the results of our geotechnical investigation for the planned Yurok Regional Wellness Center and In-Patient Treatment Center on Humboldt County Assessor's parcel number (APN) 531-082-002. The purpose of our investigation was to explore the subsurface and site conditions in the areas of the proposed developments and provide recommendations for the design and construction of the project. The attached report is intended to comply with criteria presented in Section 1803, "Chapter 18: Geotechnical Investigations," of the 2022 California Building Code (CBC).

If you have any questions regarding this investigation or report, please call us at (707) 441-8855.

Respectfully,

SHN

John H. Dailey, GE
Sr. Geotechnical Engineer

Jason Buck, CEG
Sr. Engineering Geologist

JHD/JPB/ART:ame

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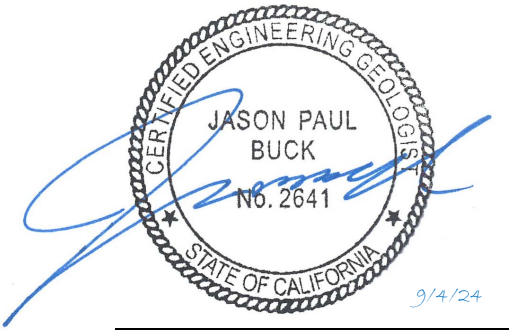
Geotechnical Investigation Report

Proposed Yurok Wellness Center, Rube Ranch Road, Weitchpec, California

Prepared for:
PYATOK Architects, Inc.



Jason Buck, CEG 2641
Sr. Engineering Geologist

John H. Dailey, GE 256
Sr. Geotechnical Engineer

Prepared by:

812 W. Wabash Ave.
Eureka, CA 95501-2138
(707) 441-8855

September 2024

QA/QC: GAV
Reference: 023079

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Abbreviations and Acronyms

Units of Measure

Term	Definition
H:V	horizontal to vertical
I.D.	inside diameter
O.D.	outside diameter
pcf	pounds per cubic foot
psf	pounds per square foot
psi	pounds per square inch
µm	micrometers

Additional Terms

Term	Definition
ABS	acrylonitrile butadiene styrene
APN	Assessor's parcel number
ASCE	American Society of Civil Engineers
ASTM	ASTM-International
Caltrans	California Department of Transportation
CBC	California Building Code
CDMG	California Department of Conservation, Division of Mines and Geology
CGS	California Geological Survey
CSZ	Cascadia subduction zone
GEOR	Geotechnical Engineer-of-Record
LiDAR	light detecting and range
MCE	Maximum Considered Earthquake
MCE_R	Maximum Considered Earthquake Spectral Acceleration
MCS	Modified California Sampler
MRfz	Mad River fault zone
MW	maximum moment magnitude
OSHA	Occupational Safety and Health Administration
PGA_M	site modified peak ground acceleration
PVC	polyvinyl chloride
SDC	Seismic Design Category
SDR	standard dimension ratio
SE	sand equivalent
SEI	Structural Engineering Institute
TCVE	Trinity Valley Consulting Engineers
USGS	United States Geological Survey

1.0 Introduction

This report presents the results of SHN's geotechnical investigation and analyses for the proposed Yurok Tribe Regional Wellness Center on Humboldt County Assessor's parcel number (APN) 531-082-002 (site coordinates: 41.21923°, -123.76494°). The site is located along the Klamath River, just west of the town of Weitchpec in northern California (Figure 1).

Our understanding of the project is based on preliminary site plans provided to us by Pyatok Architects, Inc. (2024) and on preliminary site layout and grading plans by Trinity Valley Consulting Engineers (TCVE, 2024).

We understand that the proposed developments include the construction of three two-story buildings called "West House," "Commons," and "East House;" a stepped concrete amphitheater, gathering space, and adjacent parking areas; and a 30,000-gallon water tank, which is also proposed but was not included in our investigation scope. The proposed site and phasing plans are shown as Figures 2 and 3, respectively. The plans incorporate the use of cantilevered retaining walls as the proposed site developments will require multiple cut slopes and cut graded benches to create level building pads. A profile view of the planned developments is presented in Figure 5.

The purpose of our investigation was to evaluate the surface and subsurface conditions at the site in order to develop geotechnical criteria for design and construction of the project. Our scope of work included:

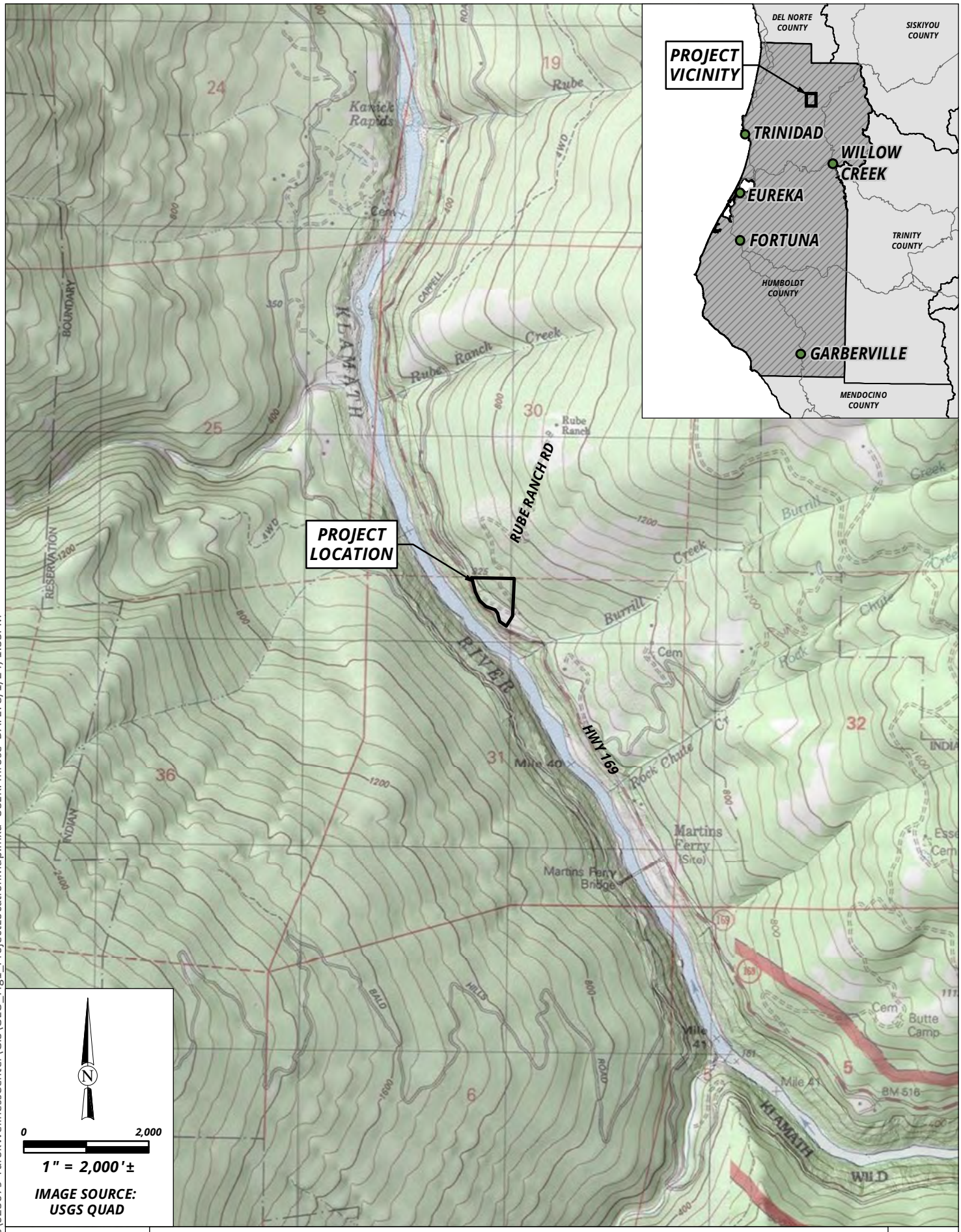
- reviewing available information for the site, including geologic mapping and literature, and geotechnical studies conducted near the subject property;
- performing an initial site visit to review the existing conditions;
- general assessment of the geologic setting in order to provide context for the subsurface materials at the site;
- overseeing the excavation of exploratory soil test pits in the planned project area;
- assessment of earthquake-related geologic/geotechnical hazards;
- laboratory testing of select soil samples collected from the test pits;
- development of geotechnical criteria for design and construction of the project; and
- preparation of this report.

2.0 Geotechnical Investigation

The purpose of SHN's geotechnical field investigation was to evaluate subsurface soil/rock conditions, to provide foundation design and site development criteria for the project, and to identify construction considerations related to development of the site.

2.1 Field Exploration

The geotechnical field investigation consisted of a site reconnaissance by SHN's senior engineering geologist, followed by a subsurface investigation consisting of five exploratory test pits. The locations of the test pits are shown relative to the site plans and existing conditions in Figures 2 through 5.



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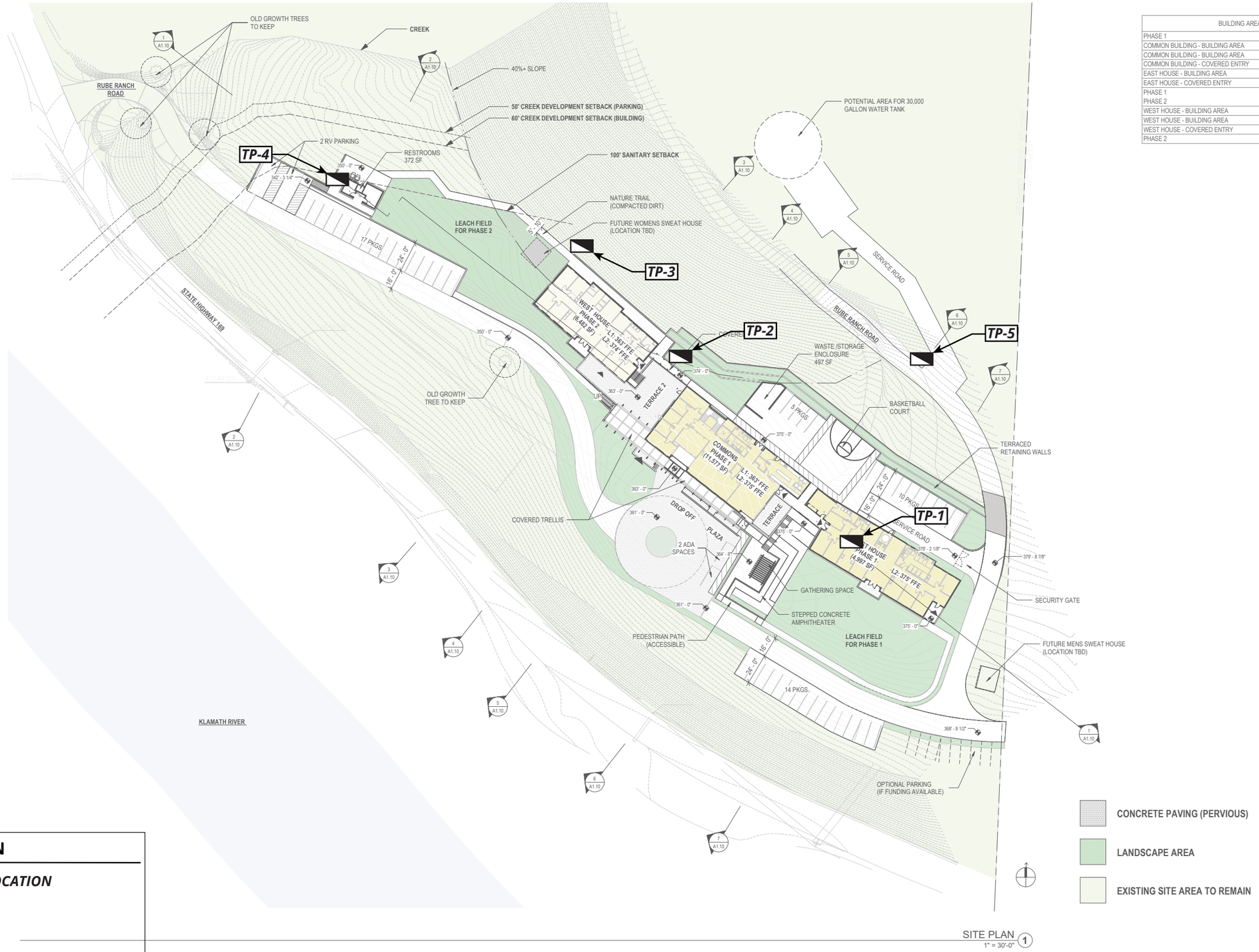
Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Weitchpec, CA

Project Location Map

August 2024 - 023079

Figure 1



SITE PLAN 1
1" = 30'-0"

BUILDING AREA		
PHASE 1		
COMMON BUILDING - BUILDING AREA	LEVEL 1	5693.59 SF
COMMON BUILDING - BUILDING AREA	LEVEL 2	5484.88 SF
COMMON BUILDING - COVERED ENTRY	LEVEL 1	95.59 SF
EAST HOUSE - BUILDING AREA	LEVEL 2	4997.74 SF
EAST HOUSE - COVERED ENTRY	LEVEL 2	153.52 SF
PHASE 1		16425.32 SF
PHASE 2		
WEST HOUSE - BUILDING AREA	LEVEL 1	2638.06 SF
WEST HOUSE - BUILDING AREA	LEVEL 2	3844.20 SF
WEST HOUSE - COVERED ENTRY	LEVEL 1	90.83 SF
PHASE 2		6573.09 SF

EXPLANATION

TEST PIT LOCATION

PHOTO SOURCE: PYATOK, 2024

1" = 30'±

Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Weitchpec, CA

Proposed Site Plan with Test Pit Locations
August 2024 - 023079

Figure 2

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BUILDING AREA		
PHASE 1		
COMMON BUILDING - BUILDING AREA	LEVEL 1	5693.59 SF
COMMON BUILDING - BUILDING AREA	LEVEL 2	5484.88 SF
COMMON BUILDING - COVERED ENTRY	LEVEL 1	95.59 SF
EAST HOUSE - BUILDING AREA	LEVEL 2	4997.74 SF
EAST HOUSE - COVERED ENTRY	LEVEL 2	153.52 SF
PHASE 1		16425.32 SF
PHASE 2		
WEST HOUSE - BUILDING AREA	LEVEL 1	2638.06 SF
WEST HOUSE - BUILDING AREA	LEVEL 2	3844.20 SF
WEST HOUSE - COVERED ENTRY	LEVEL 1	90.83 SF
PHASE 2		6573.09 SF

PHASE 1

PHASE 1 - ROAD WORK
APPROX 33,378 SF
(TRANSPORTATION FUND)

PHASE 1 - BUILDING AREA
APPROX 16,425 SF

PHASE 1 - SITE WORK
APPROX 43,676 SF

PHASE 2

PHASE 2 - BUILDING AREA
APPROX 6,573 SF

PHASE 2 - SITE WORK
APPROX 12,309 SF

PROJECT PHASING PLAN (1)
1" = 30'-0"

EXPLANATION

TEST PIT LOCATION

1" = 30'±

PHOTO SOURCE:
PYATOK, 2024

Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Weitchpec, CA

Project Phasing Plan with Test Pit Locations
August 2024 - 023079

Figure 3

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EXISTING GRADING & DRAINAGE PLAN

(E)EARTHWORK QUANTITIES:

CUT (CY):	529.0
FILL (CY):	529.0

NOTE:
CUT AND FILL QUANTITIES ONSITE TO BE PERMANENT

EXPLANATION

TEST PIT LOCATION

PHOTO SOURCE: TVCE, 2024 1" = 40'±

TVCE
67 WALNUT WAY
PO BOX 1567
WILLOW CREEK, CA 95573
P:(530)629-3000
F:(530)629-3011

PRELIMINARY
NOT FOR
CONSTRUCTION

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

EXISTING GRADING & DRAINAGE PLAN
HUMBOLDT, CALIFORNIA

DATE OF ISSUE: May 24
SCALE: AS SHOWN
PROJECT NO: 1603
DRAWING NO: C02.1

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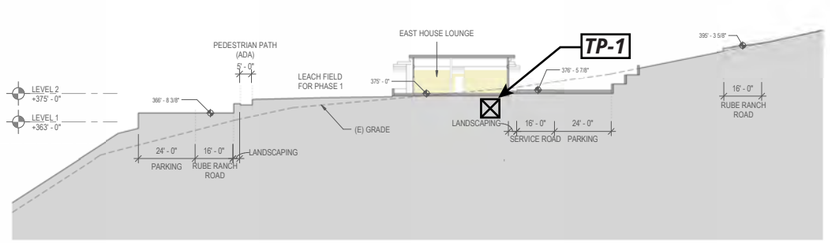
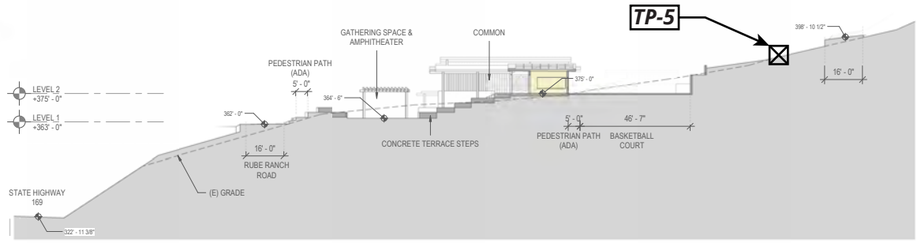
Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Weitchpec, CA

Existing Grading with Test Pit Locations
August 2024 - 023079

Figure 4



SITE SECTION @ EAST HOUSE LOUNGE (7)
1" = 20'-0"



SITE SECTION @ GATHERING SPACE (6)
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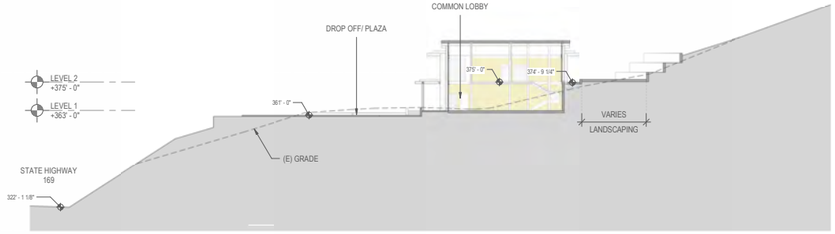

SITE SECTION @ COMMON LOBBY (5)
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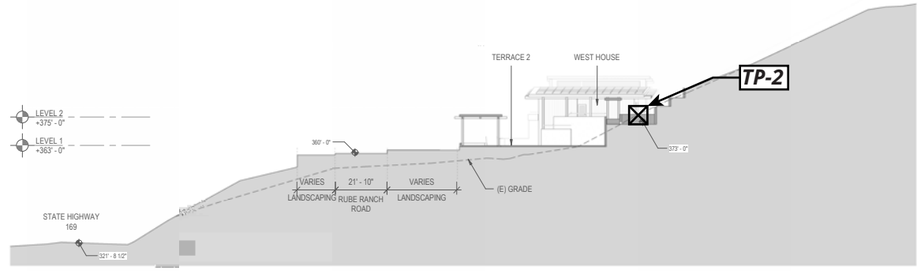

SITE SECTION @ TERRACE 2 (4)
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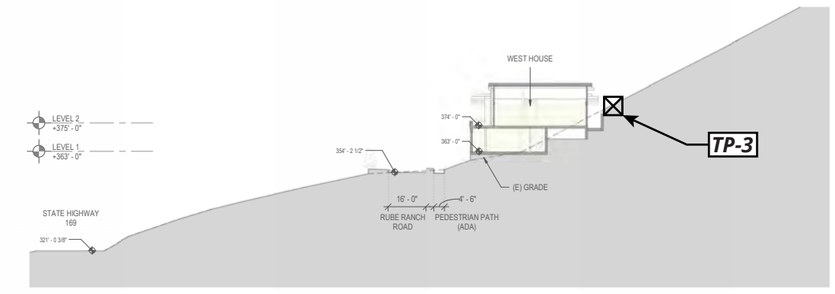
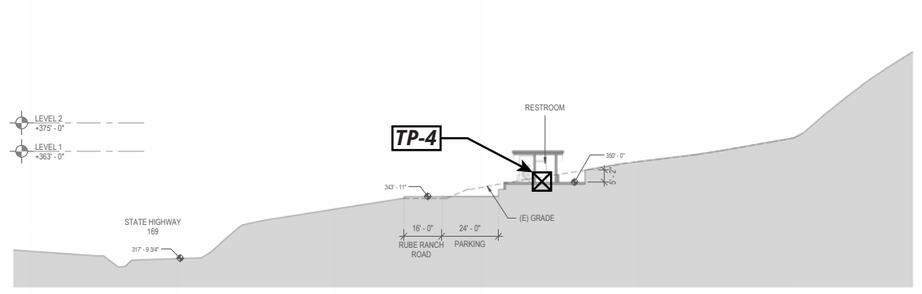
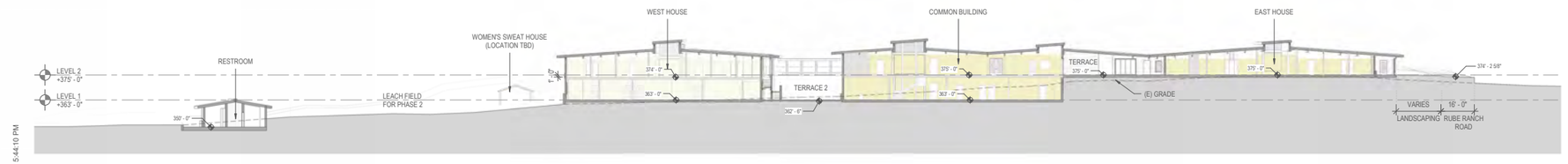


SITE SECTION @ WEST HOUSE LOUNGE (3)
1" = 20'-0"



SITE SECTION PARKING & RESTROOM (2)
1" = 20'-0"



SITE SECTION @ ALL BUILDINGS (1)
1" = 20'-0"

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EXPLANATION

TEST PIT LOCATION

PHOTO SOURCE:
PYATOK, 2024

PYATOK
360 22ND ST, SUITE 600
OAKLAND, CA 94612
T. 510.465.7010 | F. 510.465.8575
www.pyatok.com

7 DIRECTIONS
architects / planners
3502 FREMONT AVE N, SUITE 4
SEATTLE, WA 98103
T. 206.785.9080
7directionsarchitects.com

YUROK TRIBE
190 Klamath Blvd
Klamath, CA 95548

WAH-SEKW WON
Rube Ranch Road
Weitchpec, CA

STAMP:

ISSUE SCHEDULE
SD PRICING 05/24/2024

REVISION SCHEDULE
NO. | ISSUE | DATE

JOB NUMBER: 2307
DRAWN BY: Author
CHECKED BY: Checker
ISSUE DATE: 05/24/24
SCALE: 1" = 20'-0"
TITLE: **SITE SECTIONS**

SHEET: **A1.10**

PRELIMINARY - Not for Construction -

© 2019 PYATOK ARCHITECTURE & URBAN DESIGN

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Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Weitchpec, CA

Approximate Test Pit Locations on Site Sections
August 2024 - 023079

Figure 5

The five exploratory test pits (TP-1 through TP-5) were excavated under the supervision of SHN's field geologist on April 10, 2024, utilizing a mini excavator provided and operated by PDM, Inc. of Hoopa, California. The test pits were located to characterize the subsurface materials across the project area, as conceptual site plans were not finalized at the time of our field investigation. The test pits were excavated to maximum depths ranging from approximately 5 to 8 feet below existing grade.

In-place soil samples were collected using a hand-driven, 2.5-inch inside diameter (I.D.), 3.0-inch outside diameter (O.D.), Modified California Sampler (MCS) containing steel liners; bulk soil samples were collected from the test pit walls and from the excavated spoils.

2.2 Laboratory Testing

Selected soil samples were tested in SHN's soils testing laboratory in Eureka, California, to determine index properties and strength characteristics of the subsurface materials. Samples were tested for in-place moisture content and dry density, liquid limit and plasticity index, unconfined compressive strength, percent fines, and compaction criteria. Results of the tests are provided at the corresponding sample locations on the test pit logs (Appendix 1) and included as Appendix 2.

3.0 Site Conditions

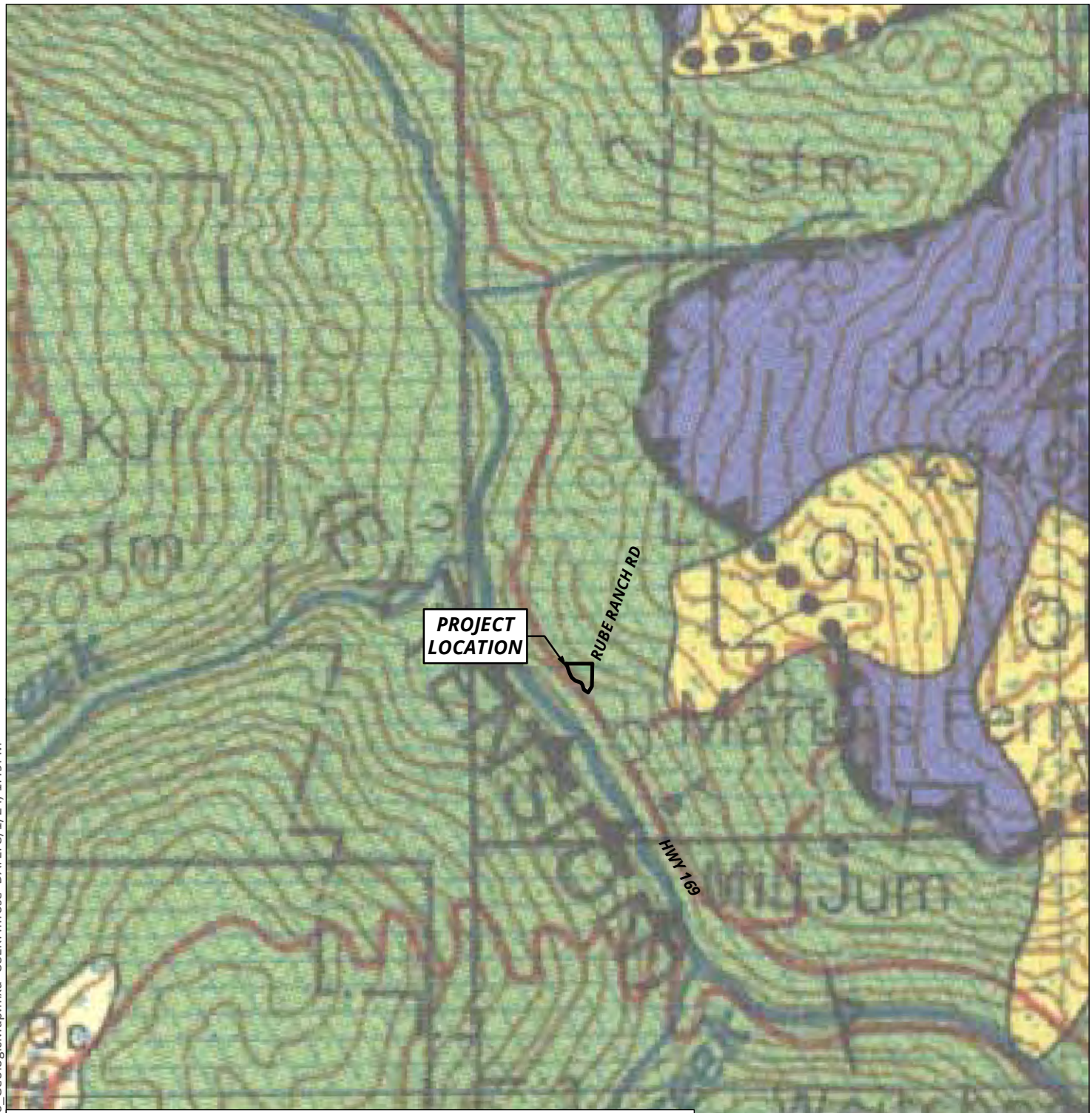
The following sections describe the project site, surface, and subsurface conditions encountered at the time of our investigation.

3.1 Site Description

The proposed Wellness Center site is located west of Weitchpec, approximately 1 mile north of Martin's Ferry Bridge along Highway 169 and the Klamath River, accessed from Rube Ranch Road. Figure 4 shows the existing site grades and site features. The planned buildings are situated on a natural mid-slope bench above the Klamath River, at elevations ranging from approximately 365 feet to 370 feet. The bench is moderately sloping down to the southwest at gradients ranging from 18 percent to 25 percent and is bordered to the north by a very steep slope (up to a 67 percent grade) leading up to Rube Ranch Road. Portions of the planned building footprints will be constructed on cut-graded benches near the base of the steeply sloping areas and will require retaining walls up to about 12 feet tall.

Most of the site within the planned building footprints have been cleared of brush and trees. Portions of the ground surface were disturbed at the time of our investigation from previous grubbing of the thick brush and some trees. Select old-growth trees will be retained in the western portion of the project, outside the footprint of any buildings.

The site is mostly undeveloped except for Rube Ranch Road, which passes through the property, and other minor improvements, including a remnant concrete slab foundation and a short fence. The extent of grading and historic use on the property appears to have been relatively minimal. Historic fill was present in one of our test pits (TP-1), which is described in Section 3.3.1.



EXPLANATION

Qls — Landslide deposits

KJf (ss, ch) — Franciscan Complex* *(ss-sandstone, shale, conglomerate; ch-chert; gs-greenstone and locally chert; mg-metagraywacke; sfm-South Fork Mountain Schist; rc-schist of Redwood Creek; ♦ -blueschist blocks)*
*Horizontal pattern denotes melange terrane

Jum — Ultramafic rocks—partially to completely serpentinized

N

0 5,000

1" = 5,000'±

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Yurok Tribe
Geotechnical Investigation Report
Rube Ranch Road, Witchepec, CA

Geologic Map
Wagner and Saucedo, 1987
August 2024 - 023079

Figure 6

3.2 Geologic Setting

The project site is located in a mountainous region of interior northern Humboldt County near the boundary of the Coast Range and Klamath Mountains geomorphic province. As shown in Figure 6, basement rock underlying the region is Cretaceous age sandstone of the Franciscan Complex (Wagner and Saucedo, 1987). More recent mapping has refined the geologic setting of the site as within the Eastern Belt of the Franciscan Complex, with bedrock near the confluence of the Klamath and Trinity Rivers (just east of the project) consisting of the South Fork Mountain Schist (Irwin, 1966). Bedrock exposures observed during our previous subsurface investigations in the project vicinity reveal the presence of thinly foliated metamorphic rock and is consistent with test pits exposures at the proposed Wellness Center site.

The nearest fault to the site is the South Fork Mountain fault, a regional bedrock thrust fault separating the two sub-units of the Eastern belt of the Franciscan Complex, located approximately 4 miles to the west of the proposed Wellness Center. The fault is not considered active by the State of California.

The Trinidad fault, the northern-most fault in the Mad River Fault Zone (MRfz), is considered to have experienced surface displacement within the Holocene (Bryant and Hart, 2007) and is capable of producing up to a MW 7.5 earthquake (Petersen and others, 2008). The nearest fault trace and Alquist-Priolo zone boundary associated with the MRfz is located approximately 20 miles southwest of the project site.

Large to small scale landslides are common throughout the surrounding region. Wagner and Saucedo (1987; Figure 6) show landscape-scale landslides to the north and east of the site. The closest mapped landslide is approximately ½ mile east on the adjacent ridge. Previous studies nearby have identified small landslides and shallow debris slides on the hillslopes along Highway 169 near the project.

3.3 Subsurface Soil and Groundwater Conditions

3.3.1 Fill Materials

Fill materials were encountered in TP-1 to a depth of 1 foot below the ground surface. Fill consists of silt with buried construction debris including polyvinyl chloride [PVC] pipe). We did not observe fill in our other test pits across the project area. Fill is likely to be encountered beneath any existing site improvements such as the concrete slab or fencepole footings. Additionally, side-cast or engineered fills associated with construction of the existing road may be present on the site; however, we did not observe any in our test pits at the locations shown in Figure 2.

3.3.2 Soil and Bedrock

In-place and undisturbed earth materials encountered in our test pits within the limits of the proposed project were composed of thinly foliated metamorphic bedrock and overlying residual soil. The bedrock materials are moderately soft, laminated, and intensely fractured with weak field strength. Occasional large boulders (up to 3 feet in diameter) with high field strength were present above and below the ground surface. The unconfined compressive strength of the in-place bedrock based on pocket penetrometer field testing ranges from 2.5 to 4.5 tons per square foot. Laboratory unconfined compressive strength testing near the top of the weathered bedrock profile at a depth of 4 feet in TP-1 (within the planned footprint of the East Building) resulted in a value of 945 pounds per square foot. The bedrock materials were generally excavatable with a mini excavator using moderate effort.

Overlying the bedrock is soft to medium stiff residual soil derived from the in-place weathering of the underlying metamorphic bedrock. The residual soils generally consist of weakly cemented sandy silt with gravel. Laboratory testing of the residual soils indicates a low expansion potential. The soils are intensely root-disturbed and fine to medium roots are common near the footprints of the planned buildings.

3.3.3 Groundwater

No groundwater or soil mottling was encountered to a depth of at least 8 feet below the ground surface. Due to the site's elevated location adjacent to a drainage above the Klamath River, we do not expect groundwater to be encountered during excavation and grading at the site.

3.4 Geologic Hazards

3.4.1 Seismicity

The site is located in a tectonically active region. Seismicity in this region is attributed primarily to the Cascadia subduction zone (CSZ). The CSZ is a regional scale megathrust fault extending 750 miles along the coast of California, approximately 50 miles offshore of the Stone Lagoon area. Rupture of the entire CSZ can produce earthquakes with a maximum moment magnitude (MW) 9.0 (CDMG/USGS, 1996).

The effects of ground shaking to the proposed development in the event of a CSZ earthquake will be minimized provided the new structures are designed and constructed in conformance with current building codes and engineering standards. Ground acceleration parameters related to seismic design of the proposed structure are provided below.

3.4.2 Surface Fault Rupture

The nearest fault to the site is the South Fork Mountain fault, a regional bedrock thrust fault separating the two sub-units of the Eastern belt of the Franciscan Complex and located approximately 4 miles to the west of the proposed Wellness Center. The fault is not considered active by the State of California. The nearest mapped active fault occurs within the MRfz, approximately 20 miles southwest of the proposed project. There is no apparent surface fault rupture hazard associated with the project.

3.4.3 Soil Liquefaction Potential

Liquefaction refers to a condition where strong earthquake ground motion results in the development of excess pore pressures in loose, saturated soils and subsequent loss of strength in the deposit of soil affected. Recently deposited sediments (such as geologically young Holocene age) composed of non-cemented granular materials are most susceptible. Clay-rich soils from the opposite end of the spectrum are not susceptible to liquefaction. The subsurface materials observed at the site are predominantly composed of decomposed bedrock. Based on the densities of the materials, we judge the liquefaction potential at this site to be very low.

3.4.4 Slope Stability

The site is located in relatively steep, mountainous terrain and is therefore subject to potential landslide hazards. The proposed project site is situated at the lower elevations of a moderately steep slope that descends approximately 3,000 feet from the ridgeline to the Klamath River. Review of field geomorphic

conditions and light detecting and range (LiDAR) imagery suggests the site has not been subject to landsliding. Large-scale landslides mapped to the northeast (Wagner and Saucedo, 1987; Figure 6) are associated with older underlying bedrock more prone to landsliding than bedrock beneath the proposed project. The very steep slope above the project site was obscured by vegetation during our site visits but did not exhibit apparent evidence of recent mass wasting or instability; therefore, we conclude that there is a low potential for landsliding to impact the proposed developments at the site.

3.5 Seismic Design Parameters

Based on the results of our subsurface exploration and our understanding of the regional geologic setting, we interpret the geologic subsurface conditions within the upper 100 feet at the project site to be Site Class C consisting of "very dense soil and soft rock" in accordance with Table 20.3-1 in American Society of Civil Engineers (ASCE) 7-16 (2017). On this basis, the mapped and design spectral response accelerations were determined using the ASCE Hazard Tool website (accessed July 2024) in conjunction with the site class and the project site coordinates (41.219047°, -123.764581°). Calculated values for ASCE / Structural Engineering Institute (SEI) 7-16 are presented in Table 1.

Table 1. ASCE[a] 7-16 Spectral Acceleration Parameters

Parameter	0.2 Second	1 Second
Maximum Considered Earthquake Spectral Acceleration (MCE_R)	S_S = 1.653	S_1 = 0.777
Site Class	C	
Site amplification factor	F_a = 1.2	F_v = 1.4
Site-modified spectral acceleration	S_{MS} = 1.983	S_{M1} = 1.088
Numeric seismic design value	S_{DS} = 1.322	S_{D1} = 0.725
Seismic Design Category (SDC)	E	
MCE_G peak ground acceleration (PGA)	0.779	
Site amplification factor at PGA (F_{PGA})	1.2	
Site modified peak ground acceleration (PGA_M)	1.231	

a. ASCE: American Society of Civil Engineers

4.0 Geotechnical Discussion and Conclusions

Based on our review and observations during the field exploration program, it is our opinion that the site soils/rock, exclusive of the non-engineered fill and topsoil, are suitable for supporting the proposed structures on conventional shallow foundations. All shallow foundations shall be constructed on compacted structural fill placed on a prepared subgrade.

Based on the current site grades, removal of about 1 to 2 feet of fill and/or topsoil will be required in the building areas to reach suitably firm soil/rock. In areas where pervious concrete paving is planned (shown in gray on Figure 2), removal of about 1 to 2 feet of topsoil will be required across the site to reach suitably firm soil prior to placement of the pavement structural section.

The soils encountered in our exploratory test pits can be excavated with conventional excavation equipment, such as excavators and/or dozers. Bedrock may be encountered within the upper 5 feet of the

ground surface, but we expect that it will generally be excavatable to the depths required for construction of the project.

The site is in a seismically active area and is likely to experience strong seismic ground shaking during the design life of the proposed structures. The intensity of ground shaking from earthquakes will depend on several factors, including the distance from the site to the earthquake focus, the magnitude and duration of the earthquake, and the response of the underlying soil. At a minimum, it will be necessary to design and construct the proposed structures in accordance with the earthquake-resistant provisions of the most recent building codes.

All geotechnical-related work should be performed in accordance with the recommendations of the Geotechnical Engineer-of-Record (GEOR) during construction. Where the recommendations of this report and the cited sections of Title 24 are in conflict, the Owner and Architect should request clarification from the GEOR. The recommendations in this report should not be waived without the consent of the GEOR for the project. The following subsections present recommendations for the geotechnical-related work.

5.0 Recommendations

5.1 Earthwork and General Site Preparation

Site preparation includes demolition/removal of existing surface and subsurface improvements, and removal of debris, organics, organic topsoil, loose soil and/or soft bedrock, and any other unsuitable material. Site preparation operations should extend at least 5 feet beyond the limits of improvements. We anticipate that stripping to a depth of about 2 to 4 inches will be required to remove the organics and topsoil. Deeper stripping may be locally required to remove concentrations of vegetation, such as brush and tree roots. Where the removal of large tress is required, it will be necessary to remove all major root systems, then fill the excavations with properly placed engineered fill compacted to at least 90 percent relative compaction[1]. The cleared vegetation and debris should be removed from the site, but the strippings can be stockpiled for reuse in landscape areas.

Any vegetation and organic topsoil with more than 2 percent organic material by dry weight should be removed. The Geotechnical Engineer should observe and approve the prepared site prior to any excavation, subgrade preparation, and placement of fill or improvements.

All areas to receive engineered fill should be stripped of loose and/or soft surface soils and vegetation and benched into firm soil/rock. If zones of weak or saturated soils are encountered during site preparation, they should be removed by further excavation to expose firm natural soil/rock and replaced with engineered fill.

Non-engineered fill that may be present within the limits of grading should be identified and excavated to expose firm natural ground. This includes backfill in SHN test pits located within areas to be graded, and/or where structures are planned. In areas intended to support new buildings, retaining walls and engineered

[1] Relative compaction refers to the in-place dry density of a soil expressed as a percentage of the maximum dry density of the same soil, as determined by the ASTM D1557 compaction test procedure. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

fill, and for a distance of at least 5 feet beyond the limits of these improvements, topsoil and loose native soils should be excavated to expose firm, undisturbed native soil. The resulting surface created by removal of non-engineered fill and loose soils should be checked by the Geotechnical Engineer or qualified representative to determine whether further excavation is required to remove any loose or unsuitable materials. The approved surface may then be brought to pad grade with placement of engineered fill.

Fill placed in swales and drainage channels should be benched into firm soils along the bottom and sides to provide a firm level surface on which to place new engineered fill. In areas where proposed structures will be supported on spread footings and are located partially on cut and partially on fill, the cut portion should be over-excavated and replaced as engineered fill in order to provide at least 12 inches of engineered fill below all of the footings to provide uniform support for the entire foundation.

We understand that cut slopes up to 12 feet high will be excavated to create level building pads on which the new buildings will be constructed. Where cut slopes of lesser height are proposed, we recommend that the depth of soil removal be deep enough so that all existing non-engineered fill materials, organic-rich topsoil, and root wads and tree roots greater than 2 inches in diameter are removed. Cut and fill slopes should be placed no steeper than 1½ to 1 and 2 to 1 (horizontal to vertical), respectively. Higher or steeper slopes should be reviewed by this office for stability.

Site grading during and shortly after the rainy season is typically difficult and/or uneconomical. Onsite soils will have moisture contents well above optimum and will require greater than normal spreading, mixing and/or aeration to achieve a near-optimum moisture content suitable for required compaction.

The contractor shall be responsible for the stability of all temporary excavations and should comply with applicable Occupational Safety and Health Administration (OSHA) regulations (California Construction Safety Orders, Title 8). The Contractor should periodically monitor all open cuts for evidence of incipient stability failures.

5.2 Subgrade Protection

The near-surface soils throughout the site consist of a mix of slightly cohesive fine-grained soil and non-cohesive granular coarse grain soils, both of which may become highly disturbed following grubbing and clearing of the site. We expect that both light and heavy rubber-tired construction equipment will have difficulty operating on disturbed fine-grained soils that become wet. Soils that have been disturbed during site preparation activities, or unsuitable areas identified during proof-rolling or probing, should be removed to firm ground and replaced with stabilization material and compacted engineered fill.

Protection of the subgrade is the responsibility of the contractor. Track-mounted excavating equipment will likely be required should the contractor choose to perform construction during wet-weather conditions. The contractor should be responsible for constructing all-weather access roads and staging areas if they are necessary. The thickness of the haul roads to access the site from Highway 169 for construction and staging areas will depend on the amount and type of construction traffic. The materials used for haul roads or site access drives should be stabilization material consisting of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- to 6-inch minus material with less than 5 percent passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. A minimum 6- to 12-inch-thick mat of stabilization material should be used for light staging areas. The stabilization material for haul roads and areas with repeated heavy construction traffic will likely need to be

increased to between 12- to 18-inches. The actual thickness of haul roads and staging areas should be based on the contractor's approach to site work and the amount and type of construction traffic and is the contractor's responsibility.

5.3 Excavations and Temporary Shoring

The contractor shall be responsible for the stability of all temporary excavations. Excavations should be made in accordance with and should comply with applicable Occupational Safety and Health Administration (OSHA) specifications and regulations. The contractor should periodically monitor all open cuts for evidence of incipient stability failures.

Excavations deeper than 4 feet below ground surface (or shallower if excavations appear unsafe) should be laid back to a safe slope inclination or supported by an appropriate shoring system. It should be noted that the contractor is solely responsible for site safety and safe working conditions during construction. A temporary or permanent shoring system should be installed in a configuration that will allow vertical side slopes for deep excavations where laying back the excavation is impractical.

Excavated soils should be placed a minimum of 20 feet away from the edges of all below-grade excavations to reduce surcharge loads on the temporary cut slopes. If shoring systems are used, the effects of the soil stockpile on the shoring system should be considered during design if the soils are placed in the area between the top of the excavation and a 1H:1V (horizontal to vertical) projection from the toe of the excavation, to reduce the potential of a shoring failure.

Similarly, heavy equipment should be operated in a safe manner and should be kept an adequate distance from unshored or unbraced excavation sidewalls to prevent a cut slope stability hazard. If shoring is used, surcharge loads from heavy equipment should be considered in the design calculations to prevent a surcharge failure during construction. For an unshored excavation, a heavy equipment exclusionary zone should be established based on soil type, depth of excavation, presence of groundwater, and configuration of the open cut. As a general guideline, heavy equipment should be excluded from a zone located between the top of the excavation and a 1H:1V projection from the bottom toe of the adjacent excavation sidewall.

5.4 Engineered Fill and Compaction Specifications

Fill placed in areas to support proposed foundations should meet the requirements for select engineered fill. Select engineered fill should have less than 2 percent by dry weight of vegetation and deleterious material and should meet the gradation requirements presented in Table 2.

Table 2. Fill Gradation Criteria

Sieve Designation	Percent Passing by Dry Weight
3-inch (50 mm)[a]	100
2½-inch (37.5 mm)	85 minimum
¾-inch (19 mm)	70 minimum
No. 4 (4.75 mm)	60 minimum
No. 200 (75 µm)[b]	5 minimum, 30 maximum

a. mm: millimeters
b. µm: micrometers

Fine-grained soil with a liquid limit greater than 40 and a plasticity index greater than 15 should not be used as select engineered fill. If clayey soils do not meet the plasticity requirements, mixing of the clayey soils with sandier soils may be required. Crushing and/or removal of rock particles greater than 3 inches in size will be required. Select engineered fill should have a low corrosion potential, which is defined as a minimum resistivity of 2,000 ohms centimeter (ohms-cm) and maximum sulfate and chloride concentrations of 250 parts per million (ppm). In addition, we do not recommend using river-run material as select engineered fill; crushed, angular material is preferred with at least 50 percent of the material (as determined by the material's dry weight) containing a minimum of two fractured faces.

Engineered fill should be placed in loose lifts not exceeding 8 inches in thickness and compacted to a minimum of 90 percent relative compaction. The Geotechnical Engineer should approve all fill prior to placement.

A qualified field technician should be present to observe fill placement and perform field density tests in accordance with ASTM-International (ASTM) D 6938 at random locations throughout each lift to verify that the specified compaction is being achieved.

Samples of proposed import fill materials should be submitted to SHN for approval at least three business days prior to use at the site.

5.5 Utility Trenches

Based on the test pits completed for this investigation, we expect conventional excavation equipment can be used to complete any open-trench installations. Groundwater was not encountered within the upper 8 feet of the ground surface during our investigation. However, if utilities are installed during extended periods of prolonged or heavy precipitation, localized zones of seepage could be encountered, which will increase the risk of sloughing or caving of sidewalls. The method of excavation and support of excavation sidewalls are the responsibility of the contractor and subject to applicable state and federal OSHA regulations regarding excavation and trench safety standards.

New utility trenches excavated parallel to spread footing foundations should be set back from the footings such that the trench bottoms lie outside a projected hypothetical 1.5H:1V line extending downward from the footing bottom.

Unless concrete bedding is required around utilities, bedding should consist of sand having a sand equivalent (SE) of at least 30. The bedding should extend from 6 inches below to 1 foot above the conduit or pipe. Sand bedding should not be jetted or ponded into place and should be mechanically compacted to a minimum of 90 percent relative compaction.

In areas to support improvements such as slabs and pavements and adjacent to structure foundations, backfill placed above the bedding in utility trenches (including culvert and sprinkler lines) should be properly placed and adequately compacted to minimize settlement and provide a stable subgrade. If possible, the trench backfill should be compacted following rough grading but prior to final grading and compaction. Onsite inorganic soils meeting the requirements for engineered fill may be used as trench backfill. Backfill consisting of onsite soils should be placed in layers not exceeding 8 inches in loose thickness, water-conditioned, and compacted to at least 90 percent relative compaction as described for engineered fill. Trench backfill need only be compacted to 85 percent relative compaction in landscape

areas or in areas more than 5 feet beyond the limits of buildings, pavements, concrete slabs-on-grade, sidewalks, or other flatwork. The upper 6 inches of trench backfill under pavements should be surface compacted to at least 95 percent relative compaction.

Where utility trenches cross underneath buildings, we recommend that a plug be placed within the trench backfill to minimize the normally granular backfill from acting as a conduit for water to enter beneath the building. The plug should be constructed using a sand cement slurry (minimum 28-day compressive strength of 500 pounds per square inch [psi]) or relatively impermeable native soil for pipe bedding or backfill. We recommend that the plug extend a distance of at least 3 feet in each direction from the point where the utility enters the building perimeter.

Utility trenches on slopes should have trench breakers (also known as trench plugs) placed in the trenches to reduce trench erosion and the volume and velocity of subsurface trench water at the bottom of the slope. The spacing of trench breakers should be approximately 100 feet for slopes steeper than 30 percent and about every 200 feet for flatter slopes.

5.6 Finished Grading and Site Drainage

Surface drainage should be planned to prevent ponding and enable water to drain away from foundations, slabs-on-grade, edges of pavements and tops of slopes and retaining walls, and towards suitable collection or discharge facilities. Surface drainage should be designed to capture runoff from upslope of proposed structures. A positive surface drainage of at least 4 percent is recommended within 10 feet of all building foundations and retaining walls in unpaved areas. In paved areas, a positive surface drainage of at least 2 percent is recommended to allow for rapid removal of surface water. Roof drainage systems should be planned to direct rainwater away from building foundations and retaining walls.

A concrete-lined interceptor drainage ditch (that is, V-ditch) at least 30 inches wide and 12 inches deep should be used along the top of retaining walls and cuts where the tributary drainage area above slopes towards the wall or cut. Slope drainage and terracing should also be provided for cut and fill slopes steeper than 3H:1V, as indicated in California Building Code (CBC) Appendix Chapter 13.

Concentrated water should not be discharged onto bare ground or slopes but should be carried in pipes or lined channels to suitable disposal points. Because onsite soils generally have a moderate potential for erosion, we recommend that approved temporary and permanent erosion control measures be implemented to limit erosion and comply with applicable County of Humboldt regulations. Soils on graded slopes should be fertilized, mulched, and planted as soon as possible after grading with erosion resistant vegetation. These plants should be watered lightly at appropriate intervals until growth is established; drip irrigation systems are recommended.

The use of water-intensive landscaping around the perimeter of structures should be avoided to reduce the amount of water introduced to the subgrade. Irrigation of landscaping around structures should be limited to drip or bubbler-type systems. Trees with large roots should also be avoided since they can dry out the soil beneath foundations and cause settlement. The purpose of these recommendations is to avoid large differential moisture changes adjacent to foundations, which have been known to cause large differential movement over short horizontal distances in expansive soils, resulting in cracking of slabs and architectural damage.

5.7 Foundations

5.7.1 Conventional Spread Footings

Shallow spread footings may be used to support the proposed developments and should be founded in engineered fill or firm native soils or rock. All footings should be bottomed a minimum of 18 inches below the lowest adjacent finished grade. Footings meeting the foregoing requirements may be designed for the following bearing pressures:

Dead plus long-term live load	2,500 pounds per square foot (psf)
All loads, including wind and seismic	3,750 psf

All new footing excavations or slab-on-ground subgrade should be maintained in a wetted condition prior to pouring concrete to avoid soil shrinkage.

Provided all new foundations are constructed in accordance with these recommendations, we estimate that total post-construction settlement will be 0.5 inches or less under static conditions; the differential settlement will be about half of the total settlement.

The resistance to lateral loadings may be calculated using a friction factor of 0.30 between the bottom of the footings and the native soil. Where the footings were poured neat and the adjacent ground surface paved or covered with concrete slabs, a passive resistance of 300 pcf equivalent fluid weight may be developed between the footings and the adjacent soil. Where the adjacent ground surface is not paved, the upper 1 foot should be neglected in determining the available passive resistance.

Where footings are located on or near slopes exceeding 3H:1V (horizontal to vertical), the footing embedment should be deepened, if necessary, to provide a minimum horizontal distance between the bottom of the footing and the descending slope face of 10 feet in native soil or compacted fill.

5.7.2 Concrete Slabs-on-Grade

Concrete slabs-on-grade are anticipated for the building's interior floors, concrete walkways, and outdoor courtyards. Slabs-on-grade should be designed and reinforced in accordance with their anticipated use and loading as determined by the project civil or structural engineer.

- All concrete slabs-on-grade should have a minimum thickness of 4 inches. Interior floor slabs should be reinforced at a minimum with No. 3 rebar spaced at 24 inches in each direction. Exterior slabs-on-grade should be reinforced with a minimum of 6x6 welded wire sheeting placed in the center of the slabs.
- Interior slabs should be supported on at least 4 inches of 5/8-inch maximum clean crushed rock to serve as a capillary break. If more than 12 inches of crushed rock is used beneath interior floor slabs, this capillary break layer should be placed in lifts and be nominally compacted during placement using a vibratory plate compactor.
- Exterior slabs-on-grade should be supported on at least 4 inches of crushed aggregate that is placed and compacted in accordance with the recommendations for engineered fill presented in Section 5.4.

To limit water vapor transmission upward through interior floor slabs, the slab-on-grade should be underlain with a high-quality impermeable membrane vapor barrier/vapor retarder placed on the capillary break material. We recommend vapor barriers be a minimum of 10 mils thick. The vapor barrier shall be in accordance with ASTM E-1745, "Standard Specifications for Vapor Barrier Retarders used in Contact with Soil or Granular Fill under Concrete Slabs." The membrane should be placed in accordance with the manufacturer's recommendations. The membrane should be overlapped at least 12 inches and taped at the joints. Concrete may be placed directly on the vapor barrier, or as is common practice, the membrane may be covered with a few inches of sand to protect the membrane during construction. If used, the sand should be wetted immediately prior to concrete placement to aid in concrete curing. Whether or not a sand layer is used, the membrane should be protected from tearing or puncture during construction. A thin (approximately 1-inch thick) protective layer of sand should be placed and compacted over the capillary break material prior to installation of the vapor retarder to reduce the possibility of puncture.

Where dampness or water vapor transmission through the slab is not objectionable, such as for exterior slabs-on-grade, the vapor barrier and capillary break material may be omitted, and the slab may be constructed directly on the prepared subgrade or on a layer of compacted aggregate base. The subgrade should be moist and free of desiccation cracks at the time the slab is cast.

5.8 Retaining Walls

Retaining walls should be designed to resist static earth pressures, seismic earth pressures, and surcharge pressures according to the recommendations that follow. Retaining wall backfill should be placed and compacted according to the recommendations above in the "Engineered Fill" section, and drainage should be provided behind walls.

At-rest earth pressures should be used for design of the retaining walls where the wall top is restrained such that the deflections required to develop active soil pressures cannot occur and are undesirable. Active earth pressures may be used for design of unrestrained retaining walls, if any, where the top of the wall is free to translate or rotate. To develop active earth pressures, the walls should be capable of deflecting by at least 0.004H (where H is the height of the wall). Cantilever walls retaining firm native earth materials or engineered fill may be designed for active or at-rest lateral earth pressures for various backfill slopes using the equivalent fluid unit weights presented in Table 3.

Table 3. Equivalent Fluid Unit Weight (pcf[a])

Backfill Slope	At-Rest Conditions	Active Conditions
Level	62	36
3H:1V[b]	81	46
2H:1V	89	55

a. pcf: pounds per cubic foot
b. H:V: horizontal to vertical ratio

Lateral earth pressures for backfill slopes other than those given above can be estimated by interpolation; backfill slopes should be inclined no steeper than 2H:1V. The lateral earth pressures should be applied to a plane extending vertically upward from the base of the heel of the retaining wall to the ground surface.

The lateral earth pressures given above apply where the wall backfill is fully drained, is not subject to traffic or other surcharge loads, and the backfill is not subject to heavy compaction equipment within a distance of one-third the height of the backfill. Lateral surcharge pressures are discussed later in this section.

If retaining wall backfill will be subject to passenger vehicle or light truck traffic loading within a distance of H/2 from the top of the wall (where H is the wall height), the wall should be designed to resist an additional uniform lateral pressure of 124 psf applied to the back of non-yielding walls (at-rest conditions), or 72 psf applied to the back of yielding walls (active conditions). Surcharge loads imposed by greater loads or unusual loads within a distance of H of the back of the wall should be considered on a case-by-case basis.

Surcharge loads on retaining walls resulting from proposed adjacent building foundations parallel to the proposed retaining wall can be approximated by the following expression:

$$\Delta p_h = (4p/\pi)(x^2z/R^4)$$

Where:
Δp_h = the lateral stress on the wall at depth z
p = magnitude of the footing load (lbs/ft)
x = centerline distance from the footing load to the wall
z = depth below surface
$R^4 = x^4 + z^4$ = the radius from the location on the wall where Δp is, measured to the footing load on the surface

Surcharge loads imposed by greater loads or unusual loads within a distance of H of the back of the wall should be considered on a case-by-case basis.

In addition to the active or at-rest lateral soil pressures, retaining walls should be designed to resist additional dynamic earth pressures during earthquake loading. The additional dynamic pressure increment may be calculated using an additional equivalent fluid pressure of 15 pcf for level backfill, 23 pcf for back slopes of 3H:1V, and 48 pcf for back slopes of 2H:1V. The dynamic pressure increment should be applied to the wall as a triangular distribution so the resultant force acts at a distance of 0.33H above the base of the wall (where H is the height of the wall). Under the combined effects of static and dynamic loading, a safety factor of 1.1 against sliding or overturning is acceptable. The dynamic component of the lateral earth pressure was calculated using the Mononabe-Okabe equation and, therefore, assumes that sufficient deformation of the wall will occur during seismic loading to develop active soil conditions.

A drainage system should be constructed on the backside of all restrained and unrestrained retaining walls as shown schematically in Appendix 3. The drainage system for backfilled walls should consist of a 4-inch-diameter perforated pipe surrounded by ½- to ¾-inch clean crushed permeable rock. All permeable material is to be completely separated from the surrounding soil by an engineering filter fabric such as Mirafi 140N or an equivalent. The section of permeable material should be at least 12 inches wide and should extend up the back of the wall to within about 18 inches of finished grade. The drainage material should be capped with compacted fine-grained soil, soil-cement, or other relatively impermeable material or barrier. The pipe should be PVC Schedule 40 or acrylonitrile butadiene styrene (ABS) with a standard dimension ratio (SDR) of 35 or better. Perforations in the drainpipe should be ¼ inch in diameter. The perforated pipe should be placed holes-down near the bottom of the section of permeable material and

should discharge by gravity to a suitable outlet. Accessible subdrain cleanouts should be provided and maintained on a regular basis.

Waterproofing or damp-proofing of retaining walls should be included in areas where wall and/or floor moisture would be undesirable (such as habitable space or where wall finishes could be impacted by moisture). The project architect or a waterproofing consultant should provide detailed recommendations for waterproofing or damp proofing, as necessary. Interior wall waterproofing should be designed and constructed to be integral with the floor slab waterproofing.

Backfill within 5 feet, measured horizontally behind new retaining wall structures should be compacted with relatively light, hand-operated compaction equipment to reduce the potential for the creation of relatively large compaction-induced stresses on the wall. If large or heavy compaction equipment is used, compaction-induced stresses could result in increased lateral earth pressures on retaining walls in addition to those presented in this report. In this case, the walls may need to be temporarily braced.

5.9 Asphalt Pavement Areas

Pavement construction should conform to the requirements of the California Department of Transportation (Caltrans) Standard Specifications, latest edition. Recommendations for both flexible pavements (asphalt concrete) and rigid pavements (Portland cement concrete) are provided below.

Recommended minimum pavement sections for standard flexible asphalt concrete are given below in Table 3 for various traffic loading conditions. The recommended pavement sections are based on a minimum R-Value of 50 for imported Class 2 aggregate base. Pavement sections for other traffic loading should be designed on a case-by-case basis.

Table 4. Minimum Pavement Sections, Standard Flexible Asphalt Concrete Pavement

Traffic Index	Asphalt Concrete Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
5 and below	2.5	6
6	3	6
7	3.5	8

Aggregate used for asphalt concrete surfacing should conform to the grading specified in Caltrans Standard Specifications Section 39 for 9.5 millimeters (mm) or 12.5 mm (⅜ inch or ½ inch, respectively) maximum, medium grading. Asphalt concrete surfacing should be placed in a single lift.

We recommend that rigid concrete pavements consist of at least 6 inches of Class 2 Aggregate Base beneath at least 6 inches of concrete. For durability and wear resistance, all Portland cement concrete pavements should have a minimum compressive strength of 4,000 psi. A modulus of subgrade reaction, k_v (30-inch circular plate) of 150 psi may be used for design of Portland cement concrete pavements.

Paved areas should be sloped and adequately drained to prevent surface water or subsurface seepage from saturating the pavement subgrade soil. All curbs surrounding landscape areas should be embedded at least 6 inches into the soil subgrade below the aggregate base section to minimize the migration of water beneath pavements.

Heavy construction traffic on new pavements or partial pavement sections (such as the base course over the prepared subgrade) will likely exceed the design loads and could potentially damage or shorten the pavement life. Therefore, we recommend construction traffic not be allowed on new pavements or that the contractor take appropriate precautions to protect the subgrade and pavement during construction.

If construction traffic is to be allowed on newly constructed road sections, an allowance for this additional traffic will need to be made in the design pavement section.

6.0 Additional Services

We suggest that communications be maintained during the design and construction phase between the client's contractors and SHN to optimize compatibility between the design and site conditions. We also recommend that SHN be retained during the construction phase to verify the implementation of our recommendations related to earthwork.

6.1 Plan and Specification Review

We have assumed, in preparing our recommendations, that SHN will be retained to review those portions of the plans and specifications, if prepared by others, that pertain to earthwork and foundations. The purpose of this review is to confirm that our earthwork and foundation recommendations have been properly interpreted and implemented during design. If we are not provided with this opportunity for review of the plans and specifications, our recommendations could be misinterpreted.

6.2 Construction-Phase Monitoring

It is important that a representative of SHN be retained to assess construction conformance with the intent of our recommendations and to perform the following tasks:

1. Verify the removal and/or recompaction of the soft soils and any other unsuitable material prior to the placement of structural fill.
2. Monitor subgrade preparation.
3. Observe and test placement of structural fill and backfill.
4. Observe foundation excavations and installation.

This construction-phase monitoring is important because it provides the stakeholders and SHN the opportunity to verify anticipated site conditions and recommend appropriate changes in design or construction procedures if site conditions encountered during construction vary from those described in this report. It also allows SHN to recommend appropriate changes in design or construction procedures if construction methods adversely affect the competence of onsite soils to support the structural improvements.

7.0 References

American Society of Civil Engineers (ASCE). (2024). ASCE Hazard Tool website. Accessed July 2024 at https://ascehazardtool.org/

American Society of Civil Engineers / Structural Engineering Institute (ASCE/SEI). (2017). "ASCE 7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures." Reston, VA:ASCE.

ASTM-International. (NR). Annual Books of ASTM Standards (Revision issued annually). Conshohocken, PA:ASTM-International.

Bryant, W.A. and E.W. Hart. (2007). Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act (with Index to Earthquake Fault Zones Maps): California Division of Mines and Geology Special Publication 42. NR:California Department of Conservation, CGS.

California Building Standards Commission. (2022). "2022 California Building Code." California Code of Regulations, Title 24, Part 2, Volume 2 of 2, based on the 2018 International Building Code. Sacramento, CA:California Building Standards Commission.

California Department of Conservation, Division of Mines and Geology/United States Geological Survey (CDMG/USGS). (1996). "Probabilistic Seismic Hazard Assessment for the State of California." DMG Open-File Report 96-08, USGS Open-File Report 96-706. Sacramento, CA:CDMG.

California Department of Transportation (Caltrans). (2018). "Standard Specifications." Sacramento, CA:Caltrans.

Irwin, W.P. (1966). "Geology of the Klamath Mountains Province". Geology of Northern California: CDMG 190, p. 19-37.

Petersen, M.D. and others. (2008). Documentation for the 2008 Update of the United States National Seismic Hazard Maps: U.S. Geological Survey Open-File Report 2008–1128, 61 p.

Pyatok Architects, Inc. (Mar 24, 2024). Preliminary site plans. NR:Pyatok Architects, Inc.

Trinity Valley Consulting Engineers (TCVE). (May 24, 2024). Preliminary site layout and grading plans. NR:TCVE.

U.S. Occupational Health and Safety Administration (OSHA). (NR). "OSHA Excavation and Trench Safety Standards 29 CFR Part 1926, Title 29—Labor, Subtitle B--Regulations Relating to Labor, Chapter XVII--Occupational Safety and Health Administration, Department of Labor, Part 1926--Safety and Health Regulations for Construction." Washington, D.C.:OSHA.

Wagner, D.L., and G.J. Saucedo. (1987). "Geologic Map of the Weed quadrangle." California Division of Mines and Geology Regional Geologic Map RGM-4A, scale 1:250,000.

Soil Test Pit Logs

1

TEST PIT NUMBER TP-1

CLIENT PYATOK Architects, Inc.
PROJECT NAME Yurok Wellness Center
PROJECT NUMBER 023079
PROJECT LOCATION Weitchpec, Humboldt County
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 375 ft NAVD88 **TEST PIT SIZE** 24" x 72"
EXCAVATION CONTRACTOR PDM Inc.
GROUNDWATER DEPTH
EXCAVATION METHOD Mini-excavator
▽ **AT TIME OF EXCAVATION** --- (No GW encountered)
LOGGED BY A. Troia **CHECKED BY** G. Vadurro
▼ **AT END OF EXCAVATION** ---
NOTES
▽ **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		(ML) SILT; medium stiff, dry to moist, olive gray (5Y 5/2); low plasticity and slightly cohesive; roots throughout; waste/debris from 0-1' (FILL).
1.0					374.0
			GW		(GW) WELL-GRADED GRAVEL with SAND and SILT; medium dense, dry, very dark greenish gray; non-plastic fines; contains slightly decomposed, angular, foliated metamorphic rock fragments with weak field strength; root-disturbed (RESIDUAL SOIL).
2.5	GB				372.5
					METAMORPHIC ROCK (Phyllite); moderately decomposed, very weak field strength, intensely fractured, foliated; consistency of stiff fine grained soil containing slightly decomposed, well-graded angular rock fragments in silty matrix, light olive brown, few fine roots.
	MC	MC = 13% DD = 106 pcf			Color change to greenish gray. **Unconfined Compression Test** Unconfined Compressive Strength = 945 psf Undrained shear strength = 473 psf
5.0					
					Becomes moist.
7.5					
8.0					367.0

Bottom of test pit at 8.0 feet.

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TEST PIT NUMBER TP-2

CLIENT PYATOK Architects, Inc.
PROJECT NAME Yurok Wellness Center
PROJECT NUMBER 023079
PROJECT LOCATION Weitchpec, Humboldt County
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 374 ft NAVD88 **TEST PIT SIZE** 24" x 72"
EXCAVATION CONTRACTOR PDM Inc.
GROUNDWATER DEPTH
EXCAVATION METHOD Mini-excavator
▽ **AT TIME OF EXCAVATION** --- (No GW encountered)
LOGGED BY A. Troia **CHECKED BY** G. Vadurro
▼ **AT END OF EXCAVATION** ---
NOTES
▽ **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		(ML) SANDY SILT with GRAVELS; soft, dry to moist, dark brown, non-plastic fines; contains well-graded, angular, foliated rock fragments with very weak field strength; abundant fine to medium roots (RESIDUAL SOIL).
2.0					372.0
2.5					METAMORPHIC ROCK (Phyllite); highly decomposed, very weak field strength foliated, intensely fractured; consistency of firm fine grained soil containing slightly decomposed, well-graded angular rock fragments in a silty matrix, olive brown to yellowish brown, moist.
	MC	MC = 12% DD = 117 pcf			Contains rock fragments with max. size of 12" supported by silty sand matrix.
5.0					Becomes hard.
7.0					367.0
					Bottom of test pit at 7.0 feet.

GENERAL BH / TP / WELL - GINT STD US.GDT - 8/29/24 13:41 - \\EUREKA\GEOGROUP\GINT\LIBRARY\BENTLEY\GINTCL\PROJECTS\PROJECT FILES\2023\023079-YUROKWELLNESSCENTER.GPJ

TEST PIT NUMBER TP-3

CLIENT PYATOK Architects, Inc.
PROJECT NAME Yurok Wellness Center
PROJECT NUMBER 023079
PROJECT LOCATION Weitchpec, Humboldt County
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 373 ft NAVD88 **TEST PIT SIZE** 24" x 72"
EXCAVATION CONTRACTOR PDM Inc.
GROUNDWATER DEPTH
EXCAVATION METHOD Mini-excavator
▽ **AT TIME OF EXCAVATION** --- (No GW encountered)
LOGGED BY A. Troia **CHECKED BY** G. Vadurro
▼ **AT END OF EXCAVATION** ---
NOTES
▽ **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0			ML		(ML) SANDY SILT; soft, dry to moist, dark brown; contains angular sand-size metaphorphic rock fragments; abundant roots (RESIDUAL SOIL).	
0.8						372.2
					METAMORPHIC ROCK (Phyllite); highly decomposed,very weak field strength, intensely fractured; consistency of firm to hard fine granular soil with foliated rock fragments, olive brown to yellowish brown.	
2.5	MC	MC = 18% DD = 101 pcf				
					Increase in silt content, low plasticity.	
	GB	LL = 32 PL = 26				
					Color change to dark greenish gray; becomes moderately weathered and moderately fractured.	
5.0					Increased excavation difficulty and penetration resistance.	368.0
5.0					Bottom of test pit at 5.0 feet.	

GENERAL BH / TP / WELL - GINT STD US.GDT - 8/29/24 13:41 - \\EUREKA\GEOGROUP\GINT\LIBRARY\BENTLEY\GINTCL\PROJECTS\PROJECT_FILES\2023\023079-YUROKWELLNESSCENTER.GPJ

TEST PIT NUMBER TP-4

CLIENT PYATOK Architects, Inc.
PROJECT NAME Yurok Wellness Center
PROJECT NUMBER 023079
PROJECT LOCATION Weitchpec, Humboldt County
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 352 ft NAVD88 **TEST PIT SIZE** 24" x 72"
EXCAVATION CONTRACTOR PDM Inc.
GROUNDWATER DEPTH
EXCAVATION METHOD Mini-excavator
▽ **AT TIME OF EXCAVATION** --- (No GW encountered)
LOGGED BY A. Troia **CHECKED BY** G. Vadurro
▼ **AT END OF EXCAVATION** ---
NOTES
▽ **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		(ML) SILT; medium stiff, dry to moist, dark brown, abundant fine to medium roots extending to 3' below ground surface (RESIDUAL SOIL/ NATIVE TOPSOIL).
2.0					350.0
2.5		PP = 3.0 tsf			METAMORPHIC ROCK (Phyllite); highly decomposed, very weak field strength, intensely fractured; consistency of stiff fine grained soil with angular rock fragments, olive to yellowish brown, moist with low plasticity fines; fine to medium roots from 2' to 3'.
	MC	MC = 15% DD = 108 pcf			Color change to greenish gray; becomes dense with weak to moderate field strength; predominantly composed of rock fragments with silt.
5.0					
6.5					345.5
					Bottom of test pit at 6.5 feet.

GENERAL BH / TP / WELL - GINT STD US.GDT - 8/29/24 13:41 - \\EUREKA\GEOGROUP\GINT\LIBRARY\BENTLEY\GINTCL\PROJECTS\PROJECT FILES\2023\023079-YUROKWELLNESSCENTER.GPJ

TEST PIT NUMBER TP-5

CLIENT PYATOK Architects, Inc.
PROJECT NAME Yurok Wellness Center
PROJECT NUMBER 023079
PROJECT LOCATION Weitchpec, Humboldt County
DATE STARTED 4/10/24 **COMPLETED** 4/10/24
GROUND ELEVATION 399 ft NAVD88 **TEST PIT SIZE** 24" x 72"
EXCAVATION CONTRACTOR PDM Inc.
GROUNDWATER DEPTH
EXCAVATION METHOD Mini-excavator
▽ **AT TIME OF EXCAVATION** --- (No GW encountered)
LOGGED BY A. Troia **CHECKED BY** G. Vadurro
▼ **AT END OF EXCAVATION** ---
NOTES
▽ **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			ML		(ML) SILT; soft, dry to moist, very dark brown; low plasticity; few angular rock fragments, max. size 1"; abundant fine roots (RESIDUAL SOIL).
2.5					Becomes medium stiff to stiff, moist, color change to yellowish brown.
3.0					396.0
	MC	MC = 12% DD = 122 pcf			METAMORPHIC ROCK (Phyllite); highly decomposed, weak field strength, intensely fractured; consistency of hard fine granular soil with angular rock fragments, yellowish brown to greenish gray.
	GB	Fines = 36%			
5.0					Color change to greenish gray; becomes moderately decomposed and moderately fractured.
7.5					
8.0					391.0
					Bottom of test pit at 8.0 feet.

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Laboratory Test Results

2

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DENSITY BY DRIVE- CYLINDER METHOD (ASTM D2937)

Project Name:	Yurok Wellness Center	Project Number:	023079
Performed By:	SC	Date:	6/26/2024
Checked By:	DJG	Date:	7/1/2024
Project Manager:	JB		

Lab Sample Number	24-661	24-663	24-665	24-666	
Boring Label	TP-2	TP-3	TP-4	TP-5	
Sample Depth (ft)	4-4.5'	2-2.5'	4-4.5'	3-3.5'	
Diameter of Cylinder, in	2.42	2.42	2.42	2.42	
Total Length of Cylinder, in.	6.00	6.00	6.00	6.00	
Length of Empty Cylinder A, in.	0.00	0.00	0.00	0.00	
Length of Empty Cylinder B, in.	0.39	1.07	0.36	0.30	
Length of Cylinder Filled, in	5.61	4.93	5.64	5.70	
Volume of Sample, in^3	25.80	22.68	25.94	26.22	
Volume of Sample, cc.	422.85	371.59	425.11	429.63	

Pan #	A6	A3	A11	A9	
Weight of Wet Soil and Pan	971.9	792.4	934.0	1027.4	
Weight of Dry Soil and Pan	877.3	686.4	821.5	925.8	
Weight of Water	94.6	106.0	112.5	101.6	
Weight of Pan	87.3	85.2	85.9	87.9	
Weight of Dry Soil	790.0	601.2	735.6	837.9	
Percent Moisture	12.0	17.6	15.3	12.1	
Dry Density, g/cc	1.87	1.62	1.73	1.95	
Dry Density, lb/ft^3	116.6	101.0	108.0	121.8	

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PERCENT PASSING # 200 SIEVE (ASTM - D1140)

Project Name:	Yurok Wellness Center	Project Number:	023079
Performed By:	JMA	Date:	7/1/2024
Checked By:	DJG	Date:	7/1/2024
Project Manager:	JB		

Lab Sample Number	24-667				
Boring Label	TP-5				
Sample Depth (ft)	4-5'				
Pan Number	a12				
Dry Weight of Soil & Pan	547.0				
Pan Weight	87.3				
Weight of Dry Soil	459.7				
Soil Weight Retained on #200&Pan	381.3				
Soil Weight Passing #200	165.7				
Percent Passing #200	36				

Lab Sample Number					
Boring Label					
Sample Depth					
Pan Number					
Dry Weight of Soil & Pan					
Pan Weight					
Weight of Dry Soil					
Soil Weight Retained on #200&Pan					
Soil Weight Passing #200					
Percent Passing #200					

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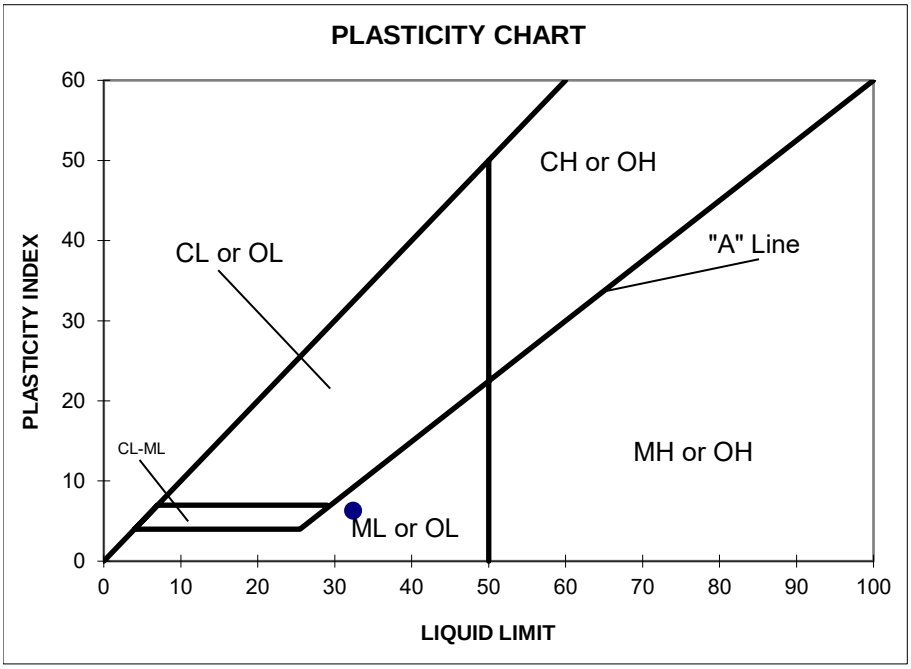
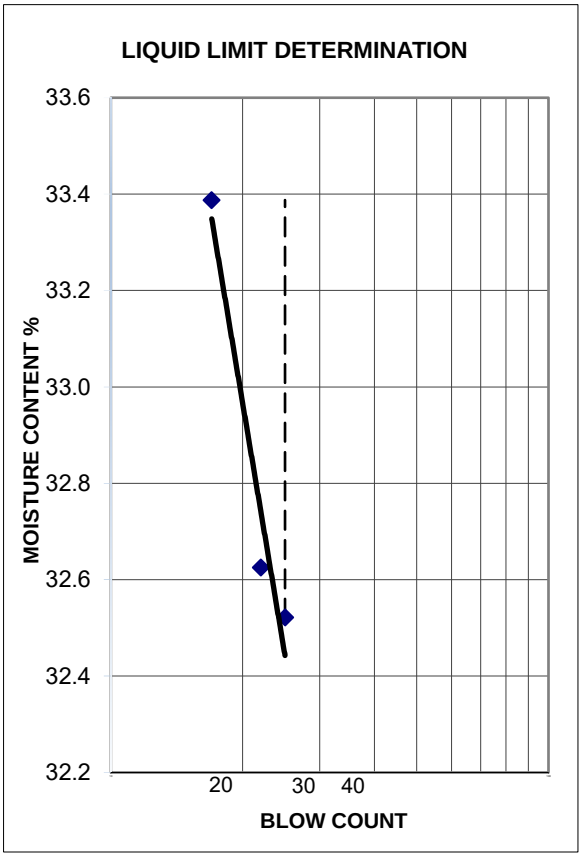
LIQUID LIMIT, PLASTIC LIMIT, and PLASTICITY INDEX (ASTM D4318)

PROJECT NAME:	**Yurok Wellness Center**			LAB SAMPLE ID:	**24-664**
PROJECT NUMBER:	**023079**	PERFORMED BY:	**SC**	DATE:	**7/1/2024**
SAMPLE ID:	**TP3 3.5-4'**	CHECKED BY:	**DJG**	DATE:	**7/1/2024**

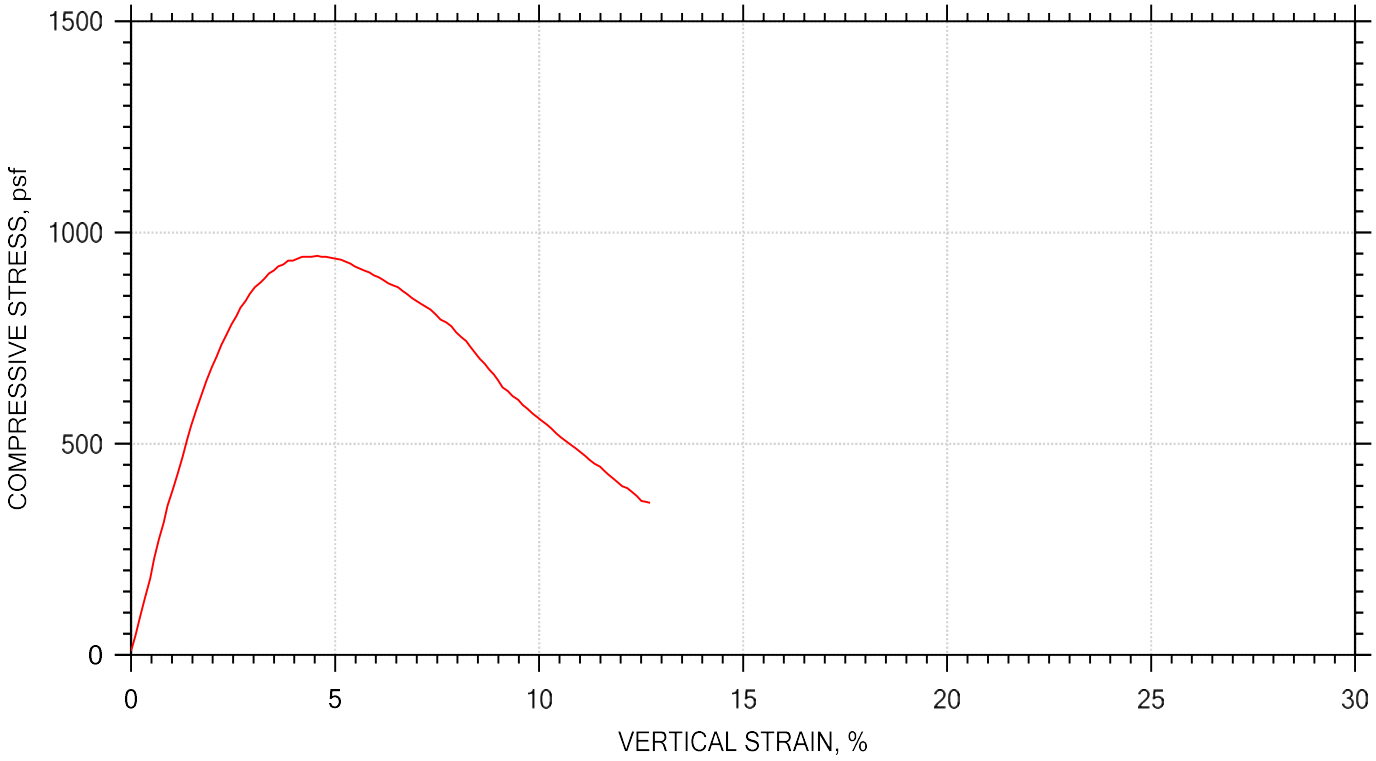
LINE NO.		TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 1	TRIAL NO. 2	TRIAL NO. 3
A	PAN #	17	18	9	8	7
B	PAN WT. (g)	20.22	20.13	28.58	28.97	28.83
C	WT. WET SOIL & PAN (g)	26.63	26.18	37.83	37.71	37.02
D	WT. DRY SOIL & PAN (g)	25.29	24.94	35.56	35.56	34.97
E	WT. WATER (C-D)	1.34	1.24	2.270	2.15	2.05
F	WT. DRY SOIL (D-B)	5.07	4.81	6.98	6.59	6.14
G	BLOW COUNT	--	--	25	22	17
H	MOISTURE CONTENT (E/F*100)	26.4	25.8	32.5	32.6	33.4

LIQUID LIMIT	**PLASTIC INDEX**	PLASTIC LIMIT
32	**6**	26





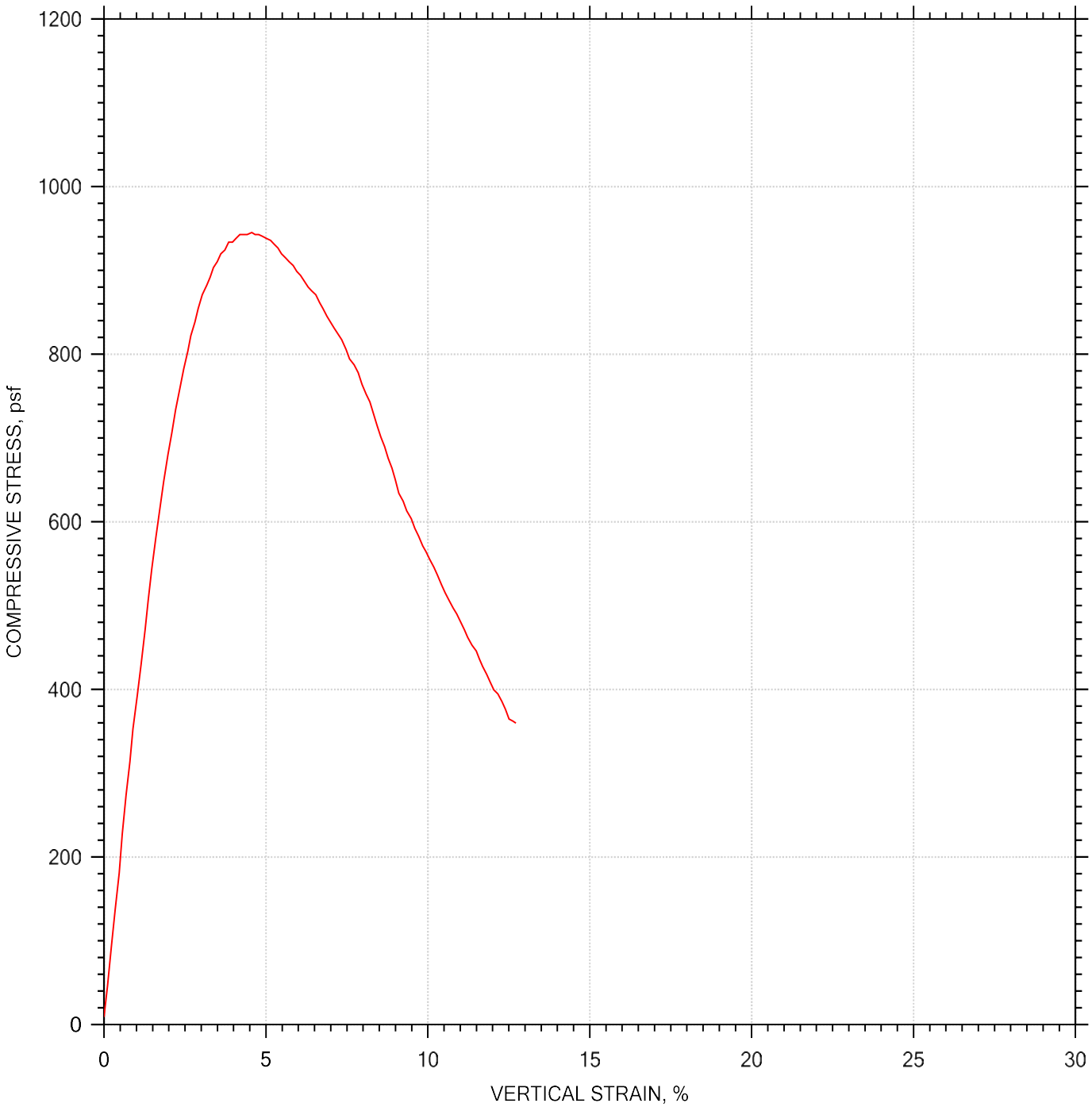
UNCONFINED COMPRESSION TEST REPORT



Symbol					
Test No.		24-660			
Initial	Diameter, in	2.42			
	Height, in	5.14			
	Water Content, %	12.76			
	Dry Density, pcf	105.8			
	Saturation, %	60.01			
	Void Ratio	0.564			
Unconfined Compressive Strength, psf		945.2			
Undrained Shear Strength, psf		472.6			
Time to Failure, min		3.9039			
Strain Rate, %/min		0.01			
Estimated Specific Gravity		2.65			
Liquid Limit		---			
Plastic Limit		---			
Plasticity Index		---			
Failure Sketch					

	Project: Yuork Wellness Cent	Location: Klamth	Project No.: 023079
	Boring No.: TP-1	Tested By: SC	Checked By: DJG
	Sample No.: 3	Test Date: 6/26/24	Elevation:
	Test No.: 24-660	Preparation: Undisturbed	Depth: 4-4.5'
	Description: Brown Clay With Gravel		
	Remarks:		

UNCONFINED COMPRESSION TEST REPORT



	Project: Yuork Wellness Cent	Location: Klamth	Project No.: 023079
	Boring No.: TP-1	Tested By: SC	Checked By: DJG
	Sample No.: 3	Test Date: 6/26/24	Elevation:
	Test No.: 24-660	Preparation: Undisturbed	Depth: 4-4.5'
	Description: Brown Clay With Gravel		
	Remarks:		

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812 W. Wabash Eureka, CA 95501-2138 Tel: 707/441-8855 FAX: 707/441-8877 E-mail: shninfo@shn-engr.com

COMPACTION TEST DATA SHEET

Job Name:	**Yurok Wellness Center**	Lab Sample Number:	**24-662**		
Job Number:	**023079**	Tested By:	**JMA**	Date Tested:	**7/1/24**
Sample ID:	**TP-2 5-6'**	Checked By:	**DJG**	Date Checked:	**7/1/24**
Sample Description:	**Gravelly SILT**				
Initial Gradation:	+ 3/4"= **16.3** %	+ 3/8"= **30.3** %	+ No.4= **43.2** %		
Moisture Correction	Gauge Number:	Correction Factor:			

TEST DATA

Mold + Wet Soil, lb	24.334	24.718	24.769	24.509	
Mold, lbs	14.019	14.019	14.019	14.019	
Moist Soil, lbs	10.315	10.699	10.750	10.490	
Factor (1/Vol.), cu. ft	13.33	13.33	13.33	13.33	
WET DENSITY, pcf	137.5	142.6	143.3	139.9	
Drying Dish No.	ss24	ss23	ss21	ss22	
Wet Soil and Dish*	2,892.8	2,921.7	2,830.6	2,878.1	
Dry Soil and Dish	2,763.3	2,738.1	2,618.0	2,611.1	
Moisture, g.	129.5	183.6	212.6	267.0	
DIsh, grams	308.6	312.3	299.1	314.9	
Dry Soil, g.	2,454.7	2,425.8	2,318.9	2,296.2	
MST. CONTENT, %	**5.3**	**7.6**	**9.2**	**11.6**	
DRY DENSITY, pcf	**130.6**	**132.6**	**131.3**	**125.3**	
% Moist. Added					

TEST METHOD

[ ] STANDARD ASTM D 698

5.5 lb hammer, 12" drop, 3 layers

[x] MODIFIED ASTM D 1557

10 lb hammer, 18" drop, 5 layers

[ ] Manual hammer [x] Mechanical hammer

ASTM	Soil	Mold, in.	Blows	Mold Wt.
C	ML	6	56	14.019

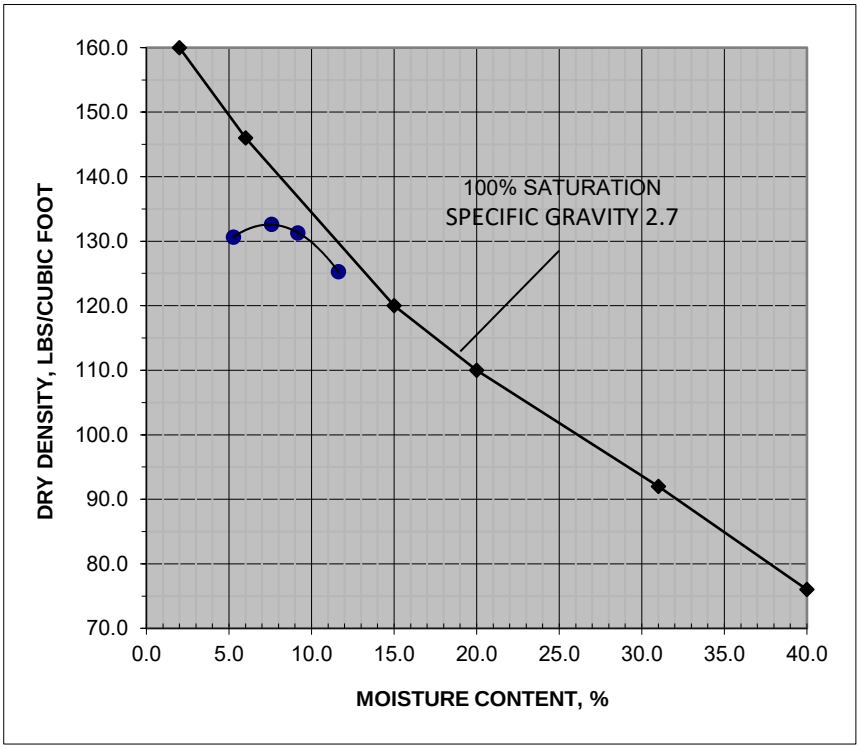
ASTM	*Moisture Sample	Grading	Mold Size/Material
A	100 g	Retained on No.4 ≤ 25%	4" Mold use passing No.4
B	500 g	No.4 ≥ 25% & 3/8" <25%	4" Mold use passing 3/8"
C	2500 g	3/8" ≥25% & 3/4" ≤30%	6" Mold use passing 3/4"

MAXIMUM DRY DENSITY (pcf)	**132.6**	**136.5** Rock Corr.
OPTIMUM MOISTURE CONTENT (%)	**7.6**	

INITIAL GRADATION

Total Weight (gm)	26186

Screen size	Wt. Screen	Wt. Cumulat
+ 3/4" screen	4259	4259
+ 3/8" screen	3664	7923
+ No.4 screen	3397	11320



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COMPACTION TEST DATA SHEET

Job Name:	**Yurok Wellness Center**	Lab Sample Number:	**24-668**		
Job Number:	**023079**	Tested By:	**JMA**	Date Tested:	**7/1/24**
Sample ID:	**TP1 1-4'**	Checked By:	**DJG**	Date Checked:	**7/1/24**
Sample Description:	**Gravelly SILT**				
Initial Gradation:	+ 3/4"= **8.6** %	+ 3/8"= **16.3** %	+ No.4= **26.5** %		
Moisture Correction	Gauge Number:	Correction Factor:			

TEST DATA

Mold + Wet Soil, lb	13.716	13.865	13.944	13.791	
Mold, lbs	9.229	9.229	9.229	9.229	
Moist Soil, lbs	4.487	4.636	4.715	4.562	
Factor (1/Vol.), cu. ft	30.00	30.00	30.00	30.00	
WET DENSITY, pcf	134.6	139.1	141.4	136.9	
Drying Dish No.	t2	t6	t4	t1	
Wet Soil and Dish*	739.3	685.5	771.2	625.6	
Dry Soil and Dish	698.8	638.6	705.1	566.0	
Moisture, g.	40.5	46.9	66.1	59.6	
DIsh, grams	112.2	110.0	114.7	114.5	
Dry Soil, g.	586.6	528.6	590.4	451.5	
MST. CONTENT, %	**6.9**	**8.9**	**11.2**	**13.2**	
DRY DENSITY, pcf	**125.9**	**127.7**	**127.2**	**120.9**	
% Moist. Added					

TEST METHOD

[ ] STANDARD ASTM D 698

5.5 lb hammer, 12" drop, 3 layers

[x] MODIFIED ASTM D 1557

10 lb hammer, 18" drop, 5 layers

[x] Manual hammer [ ] Mechanical hammer

ASTM	Soil	Mold, in.	Blows	Mold Wt.
B	ML	4	25	9.229

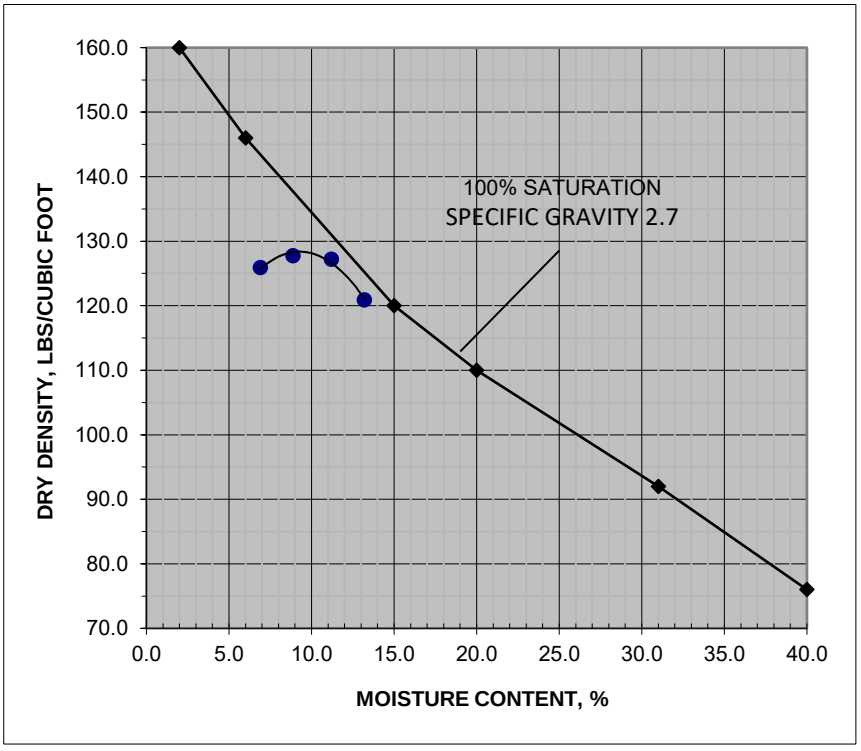
ASTM	*Moisture Sample	Grading	Mold Size/Material
A	100 g	Retained on No.4 ≤ 25%	4" Mold use passing No.4
B	500 g	No.4 ≥ 25% & 3/8" <25%	4" Mold use passing 3/8"
C	2500 g	3/8" ≥25% & 3/4" ≤30%	6" Mold use passing 3/4"

MAXIMUM DRY DENSITY (pcf)	**127.7**	**131.3** Rock Corr.
OPTIMUM MOISTURE CONTENT (%)	**8.9**	

INITIAL GRADATION

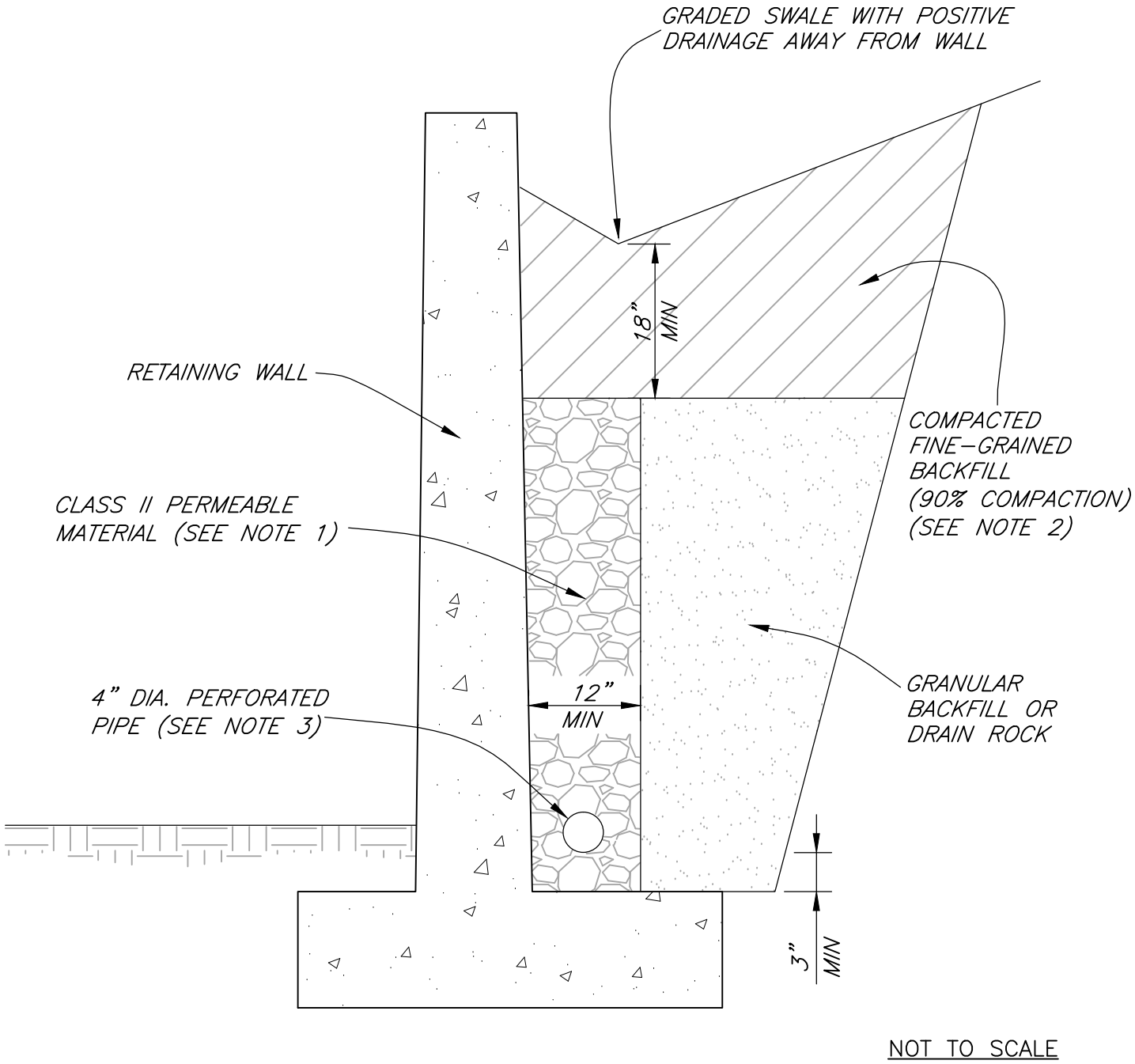
Total Weight (gm)	21483

Screen size	Wt. Screen	Wt. Cumulat
+ 3/4" screen	1843	1843
+ 3/8" screen	1652	3495
+ No.4 screen	2195	5690



Retaining Wall Drainage Details

3



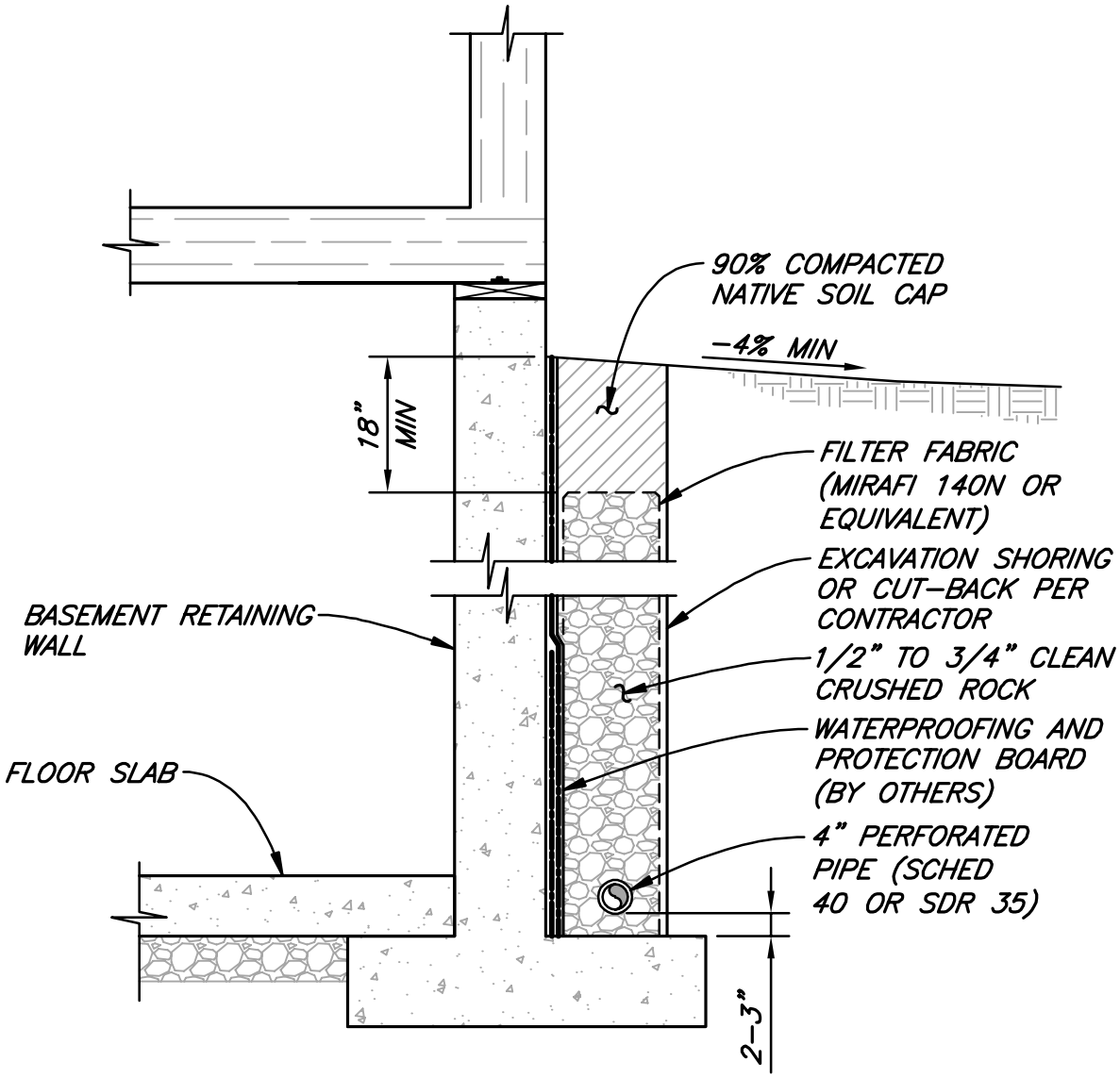
NOT TO SCALE

NOTES:

1. SPECIFICATIONS FOR CLASS II PERMEABLE MATERIAL ARE OUTLINED IN SECTION 68 OF THE 2015 CALTRANS STANDARD SPECIFICATIONS. ALTERNATIVELY, CLEAN COARSE GRAVEL OR DRAIN ROCK WRAPPED IN FILTER FABRIC (MIRAFI 140 OR EQUIVALENT) MAY BE USED.
2. ALTERNATIVELY, SOIL CEMENT OR OTHER RELATIVELY IMPERMEABLE MATERIAL OR BARRIER MAY BE USED.
3. PIPE SHOULD CONFORM TO THE REQUIREMENTS OF SECTION 68 OF THE 2015 CALTRANS STANDARD SPECIFICATIONS. PERFORATIONS SHOULD BE ¼ INCH IN DIAMETER AND PLACED DOWN, AND PIPE SHOULD BE SLOPED AT 1% MINIMUM TO DRAIN TO GRAVITY OUTLET. PIPE SHOULD BE PVC SCH 40 OR ABS WITH AN SDS OF 35 OR BETTER.
4. ACCESSIBLE SUBDRAIN CLEANOUTS SHOULD BE PROVIDED AND MAINTAINED ON A REGULAR BASIS.

Consulting Engineers & Geologists, Inc.	Geotechnical Investigation 334 Laura Lane Bayside, California	Retaining Wall Backfill and Drainage Detail SHN 016289
	November 2016 | 016289_Details	Figure 5

\\Willitssvr\Projects\CAD-FILES\Eureka\2016\016289-ShraibatiGeo\Dwgs , SAVED: 11/23/2016 10:48 AM SHEATH, PLOTTED: 11/23/2016 11:04 AM, SAM R. HEATH



NOTE:

THIS DIAGRAM IS PROVIDED SOLELY TO SCHEMATICALLY DEPICT THE RECOMMENDATIONS PRESENTED IN THIS REPORT FOR BASEMENT FLOOR AND BASEMENT RETAINING WALL SUBDRAINAGE. REFERENCE TO THE BASEMENT SLAB AND WALL, FRAMING, WATERPROOFING, AND EXTENT OF EXCAVATION ARE ONLY SHOWN FOR CLARITY.

NOT TO SCALE

Eureka, CA | Redding, CA | Willits, CA | Fort Bragg, CA | Coos Bay, OR | Klamath Falls, OR

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD	NRCC-PRF-E
Nonresidential Performance Compliance Method	(Page 1 of 29)
Project Name: Yurok-Wellness Center	Date Prepared: 2026-03-26

A. General Information					
1	Project Name	Yurok-Wellness Center			
2	Run Title				
3	Project Location	Rube Ranch Road			
4	City	Weitchpec	5	Standards Version	Compliance 2022
6	Zip code	95546	7	Compliance Software (version)	CBECC 2022.3.2 (1369)
8	Climate Zone	2	9	Building Orientation (deg)	210
10	Building Type(s)	• Hotel/Motel	11	Weather File	UKIAH_STYP20.epw
12	Project Scope	• New envelope and mechanical	13	Number of Dwelling Units	0
14	Total Conditioned Floor Area in Scope (ft^2)	23320.5	15	Total # of hotel/motel rooms	31
16	Total Unconditioned Floor Area (ft^2)	2152	17	Fuel Type	None
18	Nonresidential Conditioned Floor Area	17926.5	19	Total # of Stories (Habitable Above Grade)	2
20	Residential Conditioned Floor Area	5394			

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD	NRCC-PRF-E
Nonresidential Performance Compliance Method	**(Page 2 of 29)**

B. PROJECT SUMMARY

Table B shows which building components are included in the performance calculation. If indicated as not included, the project must show compliance prescriptively if within the permit application.

Building Components Complying via Performance						Building Components Complying Prescriptively	
Envelope (See Table G)	Nonres	Performance	Solar Thermal Water Heating (See Table I3)	☐	Performance	The following building components are ONLY eligible for prescriptive compliance and should be documented on the NRCC form listed if within the scope of the permit application (i.e. compliance will not be shown on the NRCC-PRF-E).	
	MultiFam	Not Included		☒	Not Included		
Mechanical (See Table H)	Nonres	Performance	Covered Process: Commercial Kitchens (see Table J)	☒	Performance	Indoor Lighting (Unconditioned) 140.6 & 170.2(e)	NRCC-LTI-E is required
	MultiFam	Not Included		☐	Not Included	Outdoor Lighting 140.7 & 170.2(e)	NRCC-LTO-E is required
Domestic Hot Water (See Table I)	Nonres	Performance	Covered Process: Laboratory Exhaust (see Table J)	☐	Performance	Sign Lighting 140.8 & 170.2(e)	NRCC-LTS-E is required
	MultiFam	Not Included		☒	Not Included	**Building Components Complying with Mandatory Measures**	
Lighting (Indoor Conditioned, see Table K)	Nonres	Not Included	Photovoltaics (see Table F)	☐	Performance	Electrical power systems, commissioning, solar ready, elevator and escalator requirements are mandatory and should be documented on the NRCC form listed if applicable (i.e. compliance will not be shown on the NRCC-PRF-E.)	
	MultiFam	Not Included		☒	Not Included	Electrical Power Distribution 110.11	NRCC-ELC-E is required
			Battery (see Table F)	☐	Performance	Commissioning 120.8	NRCC-CXR-E is required
				☒	Not Included	Solar and Battery 110.10	NRCC-SAB-E is required

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD	NRCC-PRF-E
Nonresidential Performance Compliance Method	(Page 3 of 29)

C1. COMPLIANCE SUMMARY

COMPLIES[3]

	Time Dependent Valuaton (TDV)		Source Energy Use
	Efficiency[1] (kBtu/ft^2 - yr)	Total[2] (kBtu/ft^2 - yr)	Total[2] (kBtu/ft^2 - yr)
Standard Design	596.16	596.16	66.94
Proposed Design	456.33	456.33	39.64
Compliance Margins	**139.83**	**139.83**	**27.3**
	Pass	**Pass**	**Pass**

[1] Efficiency measures include improvements like a better building envelope and more efficient equipment

[2] Compliance Totals include efficiency, photovoltaics and batteries

[3] New Construction, Complete Addition Scope: Building complies when all efficiency and total compliance margins are greater than or equal to zero and unmet load hour limits are not exceeded

Existing, Addition and Alteration Scope: Building complies when efficiency compliance margin is greater than or equal to zero and unmet load hour limits are not exceeded

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C2. TDV ENERGY COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS (Annual TDV Energy Use, kBtu/ft^2 - yr)

COMPLIES[2]

Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)[1]
Space Heating	226.55	33.65	192.9
Space Cooling	67.79	76.42	-8.63
Indoor Fans	161.58	226.05	-64.47
Heat Rejection	0	0	0
Pumps & Misc.	0	0	0
Domestic Hot Water	76.15	56.12	20.03
Indoor Lighting	64.09	64.09	0
Flexibility	---	---	---
EFFICIENCY COMPLIANCE TOTAL	**596.16**	**456.33**	**139.83 (23.5%)**
Photovoltaics	---	---	---
Batteries	---	---	---
TOTAL COMPLIANCE	**596.16**	**456.33**	**139.83 (23.5%)**

[1] *Notes: This number in parenthesis following the Compliance Margin in column 4, represents the Percent Better than Standard.*

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C3. TDV ENERGY RESULTS FOR NON-REGULATED COMPONENTS[1]

Non-Regulated Energy Component	Standard Design (TDV)	Proposed Design (TDV)	Compliance Margin (TDV)[1]
Receptacle	134.77	134.77	---
Process	69.44	69.44	---
Other Ltg	10.44	10.44	---
Process Motors	---	---	---
TOTAL (TOTAL COMPLIANCE + NON-REGULATED COMPONENTS)	**810.81**	**670.98**	**139.83 (17.2%)**

[1] *Notes: This table is not used for Energy Code Compliance.*

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C4. SOURCE ENERGY COMPLIANCE RESULTS FOR PERFORMANCE COMPONENTS (Annual SOURCE Energy Use, kBtu/ft^2 /yr)

COMPLIES[2]

Energy Component	Standard Design (SOURCE)	Proposed Design (SOURCE)	Compliance Margin (SOURCE)[1]
Space Heating	34.78	4.23	30.55
Space Cooling	3.09	3.96	-0.87
Indoor Fans	14.76	20.89	-6.13
Heat Rejection	0	0	0
Pumps & Misc.	0	0	0
Domestic Hot Water	8.84	5.09	3.75
Indoor Lighting	5.47	5.47	0
Flexibility	---	---	---
EFFICIENCY COMPLIANCE TOTAL	**66.94**	**39.64**	**27.3 (40.8%)**
Photovoltaics	---	---	---
Batteries	---	---	---
TOTAL COMPLIANCE	**66.94**	**39.64**	**27.3 (40.8%)**

[1] *Notes: This number in parenthesis following the Compliance Margin in column 4, represents the Percent Better than Standard.*

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C5. SOURCE ENERGY RESULTS FOR NON-REGULATED COMPONENTS[1]

Non-Regulated Energy Component	Standard Design (SOURCE)	Proposed Design (SOURCE)	Compliance Margin (SOURCE)[1]
Receptacle	11.46	11.46	---
Process	5.78	5.78	---
Other Ltg	0.97	0.97	---
Process Motors	---	---	---
TOTAL (TOTAL COMPLIANCE + NON-REGULATED COMPONENTS)	**85.15**	**57.85**	**27.3 (32.1%)**

[1] *Notes: This table is not used for Energy Code Compliance.*

C6. 'ABOVE CODE' QUALIFICATIONS

☐ This project is pursuing CalGreen Tier 1 ☐ This project is pursuing CalGreen Tier 2

C7. ENERGY USE SUMMARY

Energy Component	Standard Design Site (MWh)	Proposed Design Site (MWh)	Margin (MWh)	Standard Design Site (MBtu)	Proposed Design Site (MBtu)	Margin (MBtu)
Space Heating	3.3	27.8	-24.5	798.1	---	---
Space Cooling	44.7	52	-7.3	---	---	---
Indoor Fans	139.9	195.3	-55.4	---	---	---
Heat Rejection	---	---	---	---	---	---
Pumps & Misc.	---	---	---	---	---	---
Domestic Hot Water	42.6	49.2	-6.6	103.8	---	---
Indoor Lighting	56.2	56.2	0	---	---	---
Flexibility	---	---	---	---	---	---
EFFICIENCY TOTAL	**286.7**	**380.5**	**-93.8**	**901.9**	**0**	**901.9**
Photovoltaics	---	---	---	---	---	---
Batteries	---	---	---	---	---	---
ENERGY USE SUBTOTAL	**286.7**	**380.5**	**-93.8**	**901.9**	**0**	**901.9**
Receptacle	115.5	115.5	0	---	---	---
Process	59.5	59.5	0	---	---	---
Other Ltg	8.6	8.6	0	---	---	---
Process Motors	---	---	---	---	---	---
ENERGY USE TOTAL	**470.3**	**564.1**	**-93.8**	**901.9**	**0**	**901.9**

C8. ENERGY USE INTENSITY (EUI)

	Standard Design (kBtu/ft^2 / yr)	Proposed Design (kBtu/ft^2 / yr)	Margin (kBtu/ft^2 / yr)	Margin Percentage
GROSS EUI[1]	98.4	75.56	22.84	23.21
NET EUI[1]	98.4	75.56	22.84	23.21

[1] Notes: Gross EUI is Energy Use Total (not including PV)/Total Building Area. Net EUI is Energy Use Total (including PV)/Total Building Area.

D1. EXCEPTIONAL CONDITIONS

• The project uses the Simplified Geometry Performance Modeling Approach which is not capable of modeling daylighting controls and assumes the prescriptive Secondary Daylit Control requirements are met. PRESCRIPTIVE COMPLIANCE documentation (form NRCC-LTI-02-E) for the requirements of section 140.6(d) Automatic Daylighting Controls in Secondary Daylit Zones is required.
• The project includes windows which have been classified as clerestory windows. Please verify that clerestories are present, and that daylighting controls are present for these areas. Clerestory windows do not trigger mandatory daylighting control requirements, and may allow users to claim PAF credit for daylighting controls in areas illuminated by clerestories. .
• This project has spaces with higher ventilation rates than required because of other codes or accreditation standards being applied.
• Project is claiming Exception 1 to Section 140.10(b): No battery storage system is required if the installed PV system size is less than 15 percent of the size determined by Equation 140.10-A.
• PV/Battery Building Type has been modified from software defaults for one or more spaces. Review project's PV/Battery Building Type(s) with documentation author. Refer to Energy Code section 140.10 for Nonresidential or 170.2(g) for more information.

G1. ENVELOPE GENERAL INFORMATION (conditioned spaces only)

01	02	03	04
Opaque Surfaces & Orientation	**Total Gross Surface Area (ft^2)**	**Total Fenestration Area (ft^2)**	**Window to Wall Ratio (%)**
North-Facing[1]	3427.8	623.3	18.18

Notes
[1]North-Facing is oriented to within 45 degrees of true north, including 4500'00" east of north (NE), but excluding 4500'00" west of north (NW),
[2]East-Facing is oriented to within 45 degrees of true east, including 4500'00" south of east (SE), but excluding 4500'00" north of east (NE),
[3]South-Facing is oriented to within 45 degrees of true south, including 4500'00" west of south (SW), but excluding 4500'00" east of south (SE),
[4]West-Facing is oriented to within 45 degrees of true west, including 4500'00" north of west (NW), but excluding 4500'00" south of west (SW),

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G1. ENVELOPE GENERAL INFORMATION (conditioned spaces only)

01	02	03	04
Opaque Surfaces & Orientation	**Total Gross Surface Area (ft^2)**	**Total Fenestration Area (ft^2)**	**Window to Wall Ratio (%)**
East-Facing[2]	1821.7	393	21.57
South-Facing[3]	7007.5	2205.85	31.48
West-Facing[4]	1579.8	328.7	20.81
Total	**13836.8**	**3550.85**	**25.66**
Roof	14232.3	0	0

Notes

[1]North-Facing is oriented to within 45 degrees of true north, including 4500'00" east of north (NE), but excluding 4500'00" west of north (NW),

[2]East-Facing is oriented to within 45 degrees of true east, including 4500'00" south of east (SE), but excluding 4500'00" north of east (NE),

[3]South-Facing is oriented to within 45 degrees of true south, including 4500'00" west of south (SW), but excluding 4500'00" east of south (SE),

[4]West-Facing is oriented to within 45 degrees of true west, including 4500'00" north of west (NW), but excluding 4500'00" south of west (SW),

G4. NONRESIDENTIAL AIR BARRIER

01	02
Building Story Name	**Air Barrier**
East House Level2	Air barrier - not verified
West HouseLevel1	Air barrier - not verified
West HouseLevel2	Air barrier - not verified
Common Building BSMT Level1	Air barrier - not verified
Common Building Level2	Air barrier - not verified

G5. OPAQUE SURFACE ASSEMBLY SUMMARY

01	02	03	04	05	06		07	08	09	10
Surface Name	**Construction Type**	**Area (ft^2)**	**Framing Type**	**Cavity R-Value**	**Continuous R-Value**		**Units**	**Value**	**Description of Assembly Layers**	**Status[1]**
					Interior	**Exterior**				
Sloped Roof-Unvented	Roof	14,175.7	Wood	21	N/A	16	U-factor	0.0257	Metal Standing Seam - 1/16 in. Air - Roof - 3/4 in. Compliance Insulation R16.00 Gypsum Board - 5/8 in. Plywood - 3/4 in. Roof Rafters 2x6 24ioc R21 Gypsum Board - 5/8 in.	N
Slab	Underground Floor	15,255.4	N/A	0	N/A	N/A	F-factor	0.73	Slab Type =Unheated slab on grade Insulation Orientation =None Insulation R-Value =none	N
Wall_Exterior	Exterior Wall	15,183	Wood	21	N/A	N/A	U-factor	0.0533	Siding - Wood - bevel - 10 in. - lapped - 3/4 in. Air - Wall - 3/4 in. Vapor permeable felt - 1/8 in. Gypsum Board - 5/8 in. Plywood - 3/4 in. Ext Wall wood 2x6 16ioc R21 Gypsum Board - 5/8 in.	N
Wall type 1	Underground Wall	4,025.2	Metal	13	N/A	N/A	C-factor	0.17	Concrete - 100 lb/ft3 - 8 in. Air - Roof - 3/4 in. Metal Furred wall Gypsum Board - 5/8 in.	N

[1] *Status: N - New, A - Altered, E - Existing*

G5. OPAQUE SURFACE ASSEMBLY SUMMARY

01	02	03	04	05	06		07	08	09	10
Surface Name	Construction Type	Area (ft^2)	Framing Type	Cavity R-Value	Continuous R-Value		Units	Value	Description of Assembly Layers	Status[1]
					Interior	Exterior				
Roof Deck	Roof	214.6	Wood	21	N/A	21	U-factor	0.0224	Single Ply Roofing - 1/4 in. Gypsum Board - 5/8 in. Compliance Insulation R21.00 Plywood - 3/4 in. Roof Rafters 2x6 24ioc R21 Air - Roof - 3/4 in. Gypsum Board - 5/8 in. Gypsum Board - 5/8 in.	N
Floor-Interior	Interior Floor	10,215.7	Wood	30	N/A	N/A	U-factor	0.0343	Plywood - 3/4 in. Floor Joist TJI R30 Gypsum Board - 5/8 in.	N

[1] *Status: N - New, A - Altered, E - Existing*

G6A. OPAQUE DOOR SUMMARY (NONRESIDENTIAL)

01	02	03	04
Assembly Name	Area (ft^2)	Overall U-factor	Status[1]
ExtOpaqueDoorU05	122	0.5	N

[1] *Status: N - New, A - Altered, E - Existing*

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G7A. FENESTRATION ASSEMBLY SUMMARY (NONRESIDENTIAL)

01	02	03	04	05	06	07	08	09
Fenestration Assembly Name	**Fenestration Type/ Product Type / Frame Type**	**Certification Method[1]**	**Assembly Method**	**Area (ft^2)**	**Overall U-factor**	**Overall SHGC**	**Overall VT**	**Status[2]**
Alum-Thermal	Vertical fenestration Operable window N/A	NFRC	Manufactured	995.25	0.46	0.23	0.5	N
Storefront	Vertical fenestration Curtain Wall N/A	NFRC	Manufactured	1,974.9	0.47	0.25	0.5	N
Glazed Door	Vertical fenestration Glazed door N/A	NFRC	Manufactured	115.2	0.47	0.25	0.5	N
Alum-Thermal-GuestRm	Vertical fenestration Operable window N/A	NFRC	Manufactured	545	0.46	0.23	0.5	N

[1] Notes: Newly installed fenestration shall have a certified NFRC Label Certificate or use the CEC default tables found in Table 110.6-A and Table 110.6-B. Center of Glass (COG) values are for the glass-only, determined by the manufacturer, and are shown for ease of verification. Site-built fenestration values are calculated per Nonresidential Appendix NA6 and are used in the analysis.

[2] Status: N - New, A - Altered, E - Existing

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H1. DRY SYSTEM EQUIPMENT (FURNACES, AIR HANDLING UNITS, HEAT PUMPS, VRF, ECONOMIZERS ETC.)

01	02	03	04	05	06	07	08	09	10	11	12
			Heating				Cooling				
Equipment Name	Equipment Type	Qty	Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency	Economizer Type (if present)	Status[1]
HP-C04 Healthcare Wellness Entry	Single Zone Heat Pump (SZHP) Air System	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	No Economizer	N
HP-C05 C Healthcare Childwatch Offices	Single Zone Heat Pump (SZHP) Air System	1	37	0	HSPF2	8.5	34.2	EER2 SEER2	16 16	No Economizer	N
HP-C08 C Dining Hall	Single Zone Heat Pump (SZHP) Air System	1	46	0	HSPF2	8.5	45.5	EER2 SEER2	16 16	No Economizer	N
DOAS-1 C Kitchen	Package SZ VAV Heat Pump Air System	1	99	0	COP	6.7	98.8	EER	11.2	No Economizer	N
HP-C10 C Hallway Lobby Level2	Single Zone Heat Pump (SZHP) Air System	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	No Economizer	N
HP-C11 C Activity Room	Single Zone Heat Pump (SZHP) Air System	1	46	0	HSPF2	8.5	45.5	EER2 SEER2	16 16	No Economizer	N
HP-C12 C Classroom	Single Zone Heat Pump (SZHP) Air System	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	No Economizer	N
HP-C13 C L2 offices	Single Zone Heat Pump (SZHP) Air System	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	No Economizer	N

[1] *Status: N - New, A - Altered, E - Existing*

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H1. DRY SYSTEM EQUIPMENT (FURNACES, AIR HANDLING UNITS, HEAT PUMPS, VRF, ECONOMIZERS ETC.)

01	02	03	04	05	06	07	08	09	10	11	12
			Heating				Cooling				
Equipment Name	Equipment Type	Qty	Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency	Economizer Type (if present)	Status[1]
HP-C14 C Counseling	Single Zone Heat Pump (SZHP) Air System	1	18	0	HSPF2	8.2	18	EER2 SEER2	11.3 16	No Economizer	N
HP-C15 C L2 Staff Break	Single Zone Heat Pump (SZHP) Air System	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	No Economizer	N
East PHP E01 thru E11	Single Zone Heat Pump (SZHP) Air System	11	8.6	0	COP HSPF2	3.4 9.05	7.7	EER2 SEER2	10.55 13.7	No Economizer	N
ERV-E1 East Shower Med Obs	DOAS CV Air System	1	0	0	N/A	NA	0	N/A	NA	No Economizer	N
HP-E02 East Lounge Laundry	Single Zone Heat Pump (SZHP) Air System	1	37	0	HSPF2	8.5	34.2	EER2 SEER2	16 16	No Economizer	N
West PHP W01 thru W13	Single Zone Heat Pump (SZHP) Air System	13	8.6	0	COP HSPF2	3.4 9.05	7.7	EER2 SEER2	10.55 13.7	No Economizer	N
HP-W01 West AirSys	Single Zone Heat Pump (SZHP) Air System	1	37	0	HSPF2	8.5	34.2	EER2 SEER2	16 16	No Economizer	N
HP-W02 West L1 Meeting Rm	Single Zone Heat Pump (SZHP) Air System	1	37	0	HSPF2	8.5	34.2	EER2 SEER2	16 16	No Economizer	N
ERV-W1 West Shower Lounge	DOAS CV Air System	1	0	0	N/A	NA	0	N/A	NA	No Economizer	N

[1] *Status: N - New, A - Altered, E - Existing*

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H1. DRY SYSTEM EQUIPMENT (FURNACES, AIR HANDLING UNITS, HEAT PUMPS, VRF, ECONOMIZERS ETC.)

01	02	03	04	05	06	07	08	09	10	11	12
			Heating				Cooling				
Equipment Name	Equipment Type	Qty	Total Heating Output (kBtu/h)	Supp Heat Output (kBtu/h)	Efficiency Unit	Efficiency	Total Cooling Output (kBtu/h)	Efficiency Unit	Efficiency	Economizer Type (if present)	Status[1]
HP-W04 West L2 med Tech Triage	Single Zone Heat Pump (SZHP) Air System	1	37	0	HSPF2	8.5	34.2	EER2 SEER2	16 16	Fixed DB	N
HP-C09 Kitchen fan coil	Single Zone Heat Pump	1	60	0	HSPF2	8.2	60	EER2 SEER2	11.8 16	N/A	N
HP-E01	Single Zone Heat Pump	1	25	0	HSPF2	8.2	23	EER2 SEER2	11.8 16	N/A	N
HP-W03	Single Zone Heat Pump	1	48	0	HSPF2	8.2	48	EER2 SEER2	11.8 16	N/A	N

[1] *Status: N - New, A - Altered, E - Existing*

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H3. NONRESIDENTIAL / COMMON USE AREA FAN SYSTEMS SUMMARY

01	02	03	04	05	06	07	08	09	10	11	12	13
Name or Item Tag	Qty	Design OA CFM	Supply Fan				Return / Relief Fan					Status[1]
			CFM	Power	Power Units	Control	Fan Type	CFM	Power	Power Units	Control	
HP-C01 Healthcare	1	353.6	1,275	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C02 Healthcare	1	295.14	1,790	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C03 Healthcare	1	0	1,790	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C04 Healthcare Wellness Entry	1	294.3	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C05 C Healthcare Childwatch Offices	1	257.85	1,200	0.98	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C08 C Dining Hall	1	481.5	1,600	0.74	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
DOAS-1 C Kitchen	1	2400	2,400	0.6	W/cfm	VSD	N/A	N/A	N/A	N/A	N/A	N
HP-C10 C Hallway Lobby Level2	1	141	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C11 C Activity Room	1	334.55	1,600	0.74	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C12 C Classroom	1	191.65	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C13 C L2 offices	1	88.2	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C14 C Counseling	1	111.9	600	1.97	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C15 C L2 Staff Break	1	147.5	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
East PHP E01 thru E11	11	32.78	400	0.1	W/cfm	Constant Vol	N/A	400	0.1	W/cfm	Constant Vol	N
ERV-E1 East Shower Med Obs	1	43.35	700	0.6	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-E02 East Lounge Laundry	1	199.01	1,200	0.98	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
West PHP W01 thru W13	13	31.95	400	0.01	W/cfm	Constant Vol	N/A	400	0.1	W/cfm	Constant Vol	N

[1] *Status: N - New, A - Altered, E - Existing*

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H3. NONRESIDENTIAL / COMMON USE AREA FAN SYSTEMS SUMMARY

01	02	03	04	05	06	07	08	09	10	11	12	13
Name or Item Tag	Qty	Design OA CFM	Supply Fan				Return / Relief Fan					Status[1]
			CFM	Power	Power Units	Control	Fan Type	CFM	Power	Power Units	Control	
HP-W01 West AirSys	1	109.95	1,200	0.98	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-W02 West L1 Meeting Rm	1	310.4	893	1.32	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
ERV-W1 West Shower Lounge	1	200.43	201	0.98	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-W04 West L2 med Tech Triage	1	33.15	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-C09 Kitchen fan coil	1	0	2,000	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-E01	1	0	800	1.48	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
HP-W03	1	0	1,600	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N
EF-C01 Exhaust-Comm Kitchen	1	0	2,520	0.45	W/cfm	Constant Vol	N/A	N/A	N/A	N/A	N/A	N

[1] *Status: N - New, A - Altered, E - Existing*

H5. GENERAL EXHAUST FAN SUMMARY

01	02	03	04	05	06	07	08
System ID	**Zone Name**	**Qty**	**CFM**	**Power**	**Power Units**	**Continuous Operation?**	**Status[1]**
Exhaust-W L1 Z2 private bathrooms	TZ-W L1 Zone 1 TZ-W L1 Zone 2	6	80	1.23	WattsPerCFM	No	N
EF-C04 Exhaust C-west L1	TZ-C05 Child Watch Offices	1	50	1.92	WattsPerCFM	No	N
ERV-E01	TZ-E Zone 1	1	700	0.1	WattsPerCFM	No	N
ERV-W01	TZ-W L2 zone 3	1	201	1.02	WattsPerCFM	No	N
EF-C01 Exhaust-Comm Kitchen	TZ-C09 Comm Kitchen	1	2520	0.45	WattsPerCFM	No	N

[1] Status: N - New, A - Altered, E - Existing

H8. SYSTEM SPECIAL FEATURES

01	02	03	04
System Name	**Equipment Type**	**Interlocks per 140.4(n)[1]**	**Other Special Features and Controls**
HP-C04 Healthcare Wellness Entry	Single Zone Heat Pump (SZHP) Air System	N/A	DDC Controls Optimum Start
HP-C05 C Healthcare Childwatch Offices	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
HP-C08 C Dining Hall	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
DOAS-1 C Kitchen	Package SZ VAV Heat Pump Air System	N/A	Optimum Start
HP-C10 C Hallway Lobby Level2	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

[1] Yes = interlocks are provided, No = interlocks are not provided, NA means no operable openings.

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD **NRCC-PRF-E**

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H8. SYSTEM SPECIAL FEATURES

01	02	03	04
System Name	**Equipment Type**	**Interlocks per 140.4(n)[1]**	**Other Special Features and Controls**
HP-C11 C Activity Room	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
HP-C12 C Classroom	Single Zone Heat Pump (SZHP) Air System	N/A	DDC Controls Optimum Start
HP-C13 C L2 offices	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
HP-C14 C Counseling	Single Zone Heat Pump (SZHP) Air System	N/A	DDC Controls Optimum Start
HP-C15 C L2 Staff Break	Single Zone Heat Pump (SZHP) Air System	N/A	DDC Controls Optimum Start
East PHP E01 thru E11	Single Zone Heat Pump (SZHP) Air System	No	Heat Recovery
ERV-E1 East Shower Med Obs	DOAS CV Air System	N/A	DDC Controls Single Maximum Reheat Controls Heat Recovery
HP-E02 East Lounge Laundry	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
West PHP W01 thru W13	Single Zone Heat Pump (SZHP) Air System	No	Heat Recovery
HP-W01 West AirSys	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start
HP-W02 West L1 Meeting Rm	Single Zone Heat Pump (SZHP) Air System	N/A	DDC Controls Optimum Start
ERV-W1 West Shower Lounge	DOAS CV Air System	N/A	DDC Controls Single Maximum Reheat Controls Heat Recovery Optimum Start

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

[1] *Yes = interlocks are provided, No = interlocks are not provided, NA means no operable openings.*

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD **NRCC-PRF-E**

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H8. SYSTEM SPECIAL FEATURES

01	02	03	04
System Name	**Equipment Type**	**Interlocks per 140.4(n)[1]**	**Other Special Features and Controls**
HP-W04 West L2 med Tech Triage	Single Zone Heat Pump (SZHP) Air System	No	DDC Controls Optimum Start Fixed DB
HP-C09 Kitchen fan coil	Single Zone Heat Pump	Yes	N/A
HP-E01	Single Zone Heat Pump	No	N/A
HP-W03	Single Zone Heat Pump	No	N/A
NonResBaseHtPumpSHWSystem	Service Hot Water	N/A	Fixed Temperature Control

Notes: This table includes controls related to the performance path only. For projects using the prescriptive path, mandatory and prescriptive controls requirements are documented on the NRCC-MCH-E.

[1] Yes = interlocks are provided, No = interlocks are not provided, NA means no operable openings.

H9. NONRESIDENTIAL / COMMON USE AREA & HOTEL/MOTEL VENTILATION

01	02	03	04	05	06	07
Zone Name	**Mechanical Ventilation**				**Conditioned Area (sf)**	**DCV or Occupant Sensor Controls, or Both**
	Ventilation Function	**# of People**	**Supply OA CFM**	**Exhaust CFM**		
TZ-HC zone C01 OSHPD-3 ventilation	Misc - All others Office - Main entry lobbies	9.16	187.41	0	841.1	N/A
TZ-HC zone C02 OSHPD-3 ventilation	Office - Office space General - Corridors Exhaust - All other locker rooms	10.59	295.14	53.65	1903.4	N/A
TZ-HC zone C03 OSHPD-3 ventilation	Office - Reception areas Misc - All others Office - Office space General - Corridors	16.77	166.19	0	1107.9	N/A
TZ-C04 Wellness Entry Hall	Office - Main entry lobbies General - Corridors	18.06	294.3	0	807	N/A

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD **NRCC-PRF-E**

Nonresidential Performance Compliance Method **(Page 22 of 29)**

H9. NONRESIDENTIAL / COMMON USE AREA & HOTEL/MOTEL VENTILATION

01	02	03	04	05	06	07
Zone Name	Mechanical Ventilation				Conditioned Area (sf)	DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# of People	Supply OA CFM	Exhaust CFM		
TZ-C05 Child Watch Offices	General - Break rooms Office - Office space	14.55	257.85	50	886	N/A
TZ-C08 Dining Hall	Food Service - Cafeteria/fast-food dining	32.1	481.5	0	963	N/A
TZ-C09 Comm Kitchen	Food Service - Kitchen (cooking)	2	2400	2520	800	N/A
TZ-C10 L2 In-patient Lobby Hallway	General - Corridors	4.7	141	0	940	N/A
TZ-C11 Activity Rm	Education - Classrooms (ages 9-18) Office - Office space	19.88	334.55	0	1145.5	N/A
TZ-C12 Classroom	Education - Multiuse assembly	9.58	191.65	0	383.3	N/A
TZ-C13 Offices 208-210F z13	Office - Office space	2.94	88.2	0	588	N/A
TZ-C14 Counseling Hall offices	General - Corridors Office - Office space	3.73	111.9	0	746	N/A
TZ-C15 Staff Admin Off Break	General - Break rooms	9.83	147.5	0	295	N/A
TZ-E Zone 1	Exhaust - Shower rooms Office - Office space	6.58	43.35	700	802	N/A
TZ-E Zone 2 - lounge laundry	Misc - All others Lodging - Laundry rooms, central	41.41	199.01	0	1326.7	N/A
TZ-W L1 Zone 1	Misc - All others Exhaust - Shower rooms	26.04	109.95	240	1054	N/A

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H9. NONRESIDENTIAL / COMMON USE AREA & HOTEL/MOTEL VENTILATION

01	02	03	04	05	06	07
Zone Name	Mechanical Ventilation				Conditioned Area (sf)	DCV or Occupant Sensor Controls, or Both
	Ventilation Function	# of People	Supply OA CFM	Exhaust CFM		
TZ-W L1 Zone 2	Lodging - Multipurpose assembly Exhaust - Toilets, public General - Corridors Misc - All others	13.86	221.75	240	1062	N/A
TZ-W L2 zone 3	Misc - All others Exhaust - Shower rooms General - Corridors	41.11	200.43	201	1684.6	N/A
TZ-W L2 Zone 4	Office - Office space Lodging - Laundry rooms, central General - Corridors	2.96	88.65	0	591	N/A

H11. ZONAL SYSTEM AND TERMINAL UNIT SUMMARY

01	02	03	04	05	06	07	08	09	10	11	12
System ID	System Type	Qty	Rated Capacity (kBtuh)		Airflow (cfm)			Fan			VSD
			Heating	Cooling	Design	MIn.	Min. Ratio	Power	Power Units	Cycles	
TU HC FC-C01	Uncontrolled	1	N/A	N/A	1,275	N/A	0	N/A	N/A	N/A	☐
TU HC zone C02	Uncontrolled	1	N/A	N/A	1,790	N/A	0	N/A	N/A	N/A	☐
TU HC zone C03	Uncontrolled	1	N/A	N/A	1,790	N/A	0	N/A	N/A	N/A	☐
TU Entry HAll C04	Uncontrolled	1	N/A	N/A	800	N/A	0	N/A	N/A	N/A	☐
TU C05 Childwatch Offices	Uncontrolled	1	N/A	N/A	1,200	N/A	0	N/A	N/A	N/A	☐
TU C08 Dining	Uncontrolled	1	N/A	N/A	1,600	N/A	0	N/A	N/A	N/A	☐
DOAS-1 Kitchen	Variable Air Volume No Reheat Box	1	N/A	N/A	2,400	2,400	1	N/A	N/A	N/A	☐
TU Level 2 Hallway	Uncontrolled	1	N/A	N/A	800	N/A	0	N/A	N/A	N/A	☐

CERTIFICATE OF COMPLIANCE - NONRESIDENTIAL PERFORMANCE COMPLIANCE METHOD **NRCC-PRF-E**

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H11. ZONAL SYSTEM AND TERMINAL UNIT SUMMARY

01	02	03	04	05	06	07	08	09	10	11	12
System ID	System Type	Qty	Rated Capacity (kBtuh)		Airflow (cfm)			Fan			VSD
			Heating	Cooling	Design	MIn.	Min. Ratio	Power	Power Units	Cycles	
TU C11 Activity Room	Uncontrolled	1	N/A	N/A	1,600	N/A	0	N/A	N/A	N/A	☐
TU Classroom	Uncontrolled	1	N/A	N/A	800	N/A	0	N/A	N/A	N/A	☐
TU L2 Office 208-210F	Uncontrolled	1	N/A	N/A	800	N/A	0	N/A	N/A	N/A	☐
TU C14 Counseling	Uncontrolled	1	N/A	N/A	1,275	N/A	0	N/A	N/A	N/A	☐
TU C15 Staff Break	Uncontrolled	1	N/A	N/A	800	N/A	0	N/A	N/A	N/A	☐
TU-E Dorms 1-11	Uncontrolled	11	N/A	N/A	400	N/A	0	N/A	N/A	N/A	☐
TU EH Shower MedObs	Uncontrolled	1	N/A	N/A	700	N/A	0	N/A	N/A	N/A	☐
TU E02 Laundry Lounge	Uncontrolled	1	N/A	N/A	1,200	N/A	0	N/A	N/A	N/A	☐
TU-W L2 Dorms 1-9	Uncontrolled	13	N/A	N/A	400	N/A	0	N/A	N/A	N/A	☐
TU W L1 Private Transitional	Uncontrolled	13	N/A	N/A	400	N/A	0	N/A	N/A	N/A	☐
TU W01	Uncontrolled	1	N/A	N/A	1,200	N/A	0	N/A	N/A	N/A	☐
TU-W Meeting Room	Uncontrolled	1	N/A	N/A	893	N/A	0	N/A	N/A	N/A	☐
TU W Shower Lounge	Uncontrolled	1	N/A	N/A	201	N/A	0	N/A	N/A	N/A	☐
TU-W04 L2 med Tech Traige	Uncontrolled	1	N/A	N/A	600	N/A	0	N/A	N/A	N/A	☐
TU W Triage Rm	Uncontrolled	1	N/A	N/A	200	N/A	0	N/A	N/A	N/A	☐
HP-C09 Kitchen fan coil	Single Zone Heat Pump	1	60	60	2,000	N/A	N/A	0.45	W/cfm	Cycling	☐
HP-E01	Single Zone Heat Pump	1	25	23	800	N/A	N/A	1.48	W/cfm	Cycling	☐
HP-W03	Single Zone Heat Pump	1	48	48	1,600	N/A	N/A	0.45	W/cfm	Cycling	☐

H13. ENERGY RECOVERY SUMMARY

01	02	03	04	05	06	07	08	09	10
Equipment Name	Equipment Type	Equipment Type	Heating			Cooling			Status[1]
			Sensible	Latent	Total	Sensible	Latent	Total	
East PHP E01 thru E11	Single Zone Heat Pump (SZHP) Air System	AHRI	0.85	0.65	0.64	0.69	0.54	0.69	N
ERV-E1 East Shower Med Obs	DOAS CV Air System	AHRI	0.85	0.65	0.64	0.69	0.54	0.69	N
West PHP W01 thru W13	Single Zone Heat Pump (SZHP) Air System	AHRI	0.85	0.65	0.64	0.69	0.54	0.69	N
ERV-W1 West Shower Lounge	DOAS CV Air System	AHRI	0.85	0.65	0.64	0.69	0.54	0.69	N

[1] *Status: N - New, A - Altered, E - Existing*

I1. WATER HEATER EQUIPMENT SUMMARY

01	02	03	04	05	06	07	08	09	10	11	12	13	14
Name	Heater Element Type	Tank Type	Qty	Tank Vol (gal)	Rated Input	Rated Input Unit	Efficiency	Efficiency Unit	Tank Insulation R-value Int/Ext	Standby Loss Fraction	1st Hr. Rating or Flow Rate (gal)	Heat Pump Type	Tank Location or Ambient Condition
NonResBaseHtPumpWaterHeater	Electricity	Storage	3	260	12.3	kW	2.29	COP	N/A	0	N/A	Heat Pump Split Water Heater	N/A

I2. MULTI-FAMILY WATER HEATING SYSTEM DETAIL

01	02	03	04	05	06	07	08
System Name	Configuration	Type	Qty in System	Dwelling Unit Distribution Type	Water Heater Name	Solar Heating System	Is Compact Distribution
East House CHPWH Hotel/motel	Domestic Hot Water (DHW)	Central	1	Standard Distribution System	East House CHPWH Hotel/motel - heater	N/A	N/A
Wes House CHPWH Hotel/motel	Domestic Hot Water (DHW)	Central	1	Standard Distribution System	Wes House CHPWH Hotel/motel - heater	N/A	N/A

I3. MULTIFAMILY & HOTEL/MOTEL WATER HEATER EQUIPMENT SUMMARY - CHPWH

01	02	03	04	05	06	07	08
Name	Brand/Model	Number of Compressors	Primary Tank Volume (gal)	Tank Count	Tank R-value	Tank Location	Air Source
East House CHPWH Hotel/motel	Generic 45kW	1	260	1	16	Outside	Outside
Wes House CHPWH Hotel/motel	Generic 45kW	1	260	1	16	Outside	Outside

I5. RECIRCULATION LOOPS

01	02	03	04	05	06
Water Heating System Name	Number of Recirculation Loops	Loop Insulation Thickness (in)	Recirculation Loop Location	Recirculation Pump Power	Recirculation Pump Power Units
East House CHPWH Hotel/motel	1	1.5	Conditioned	48	Watts
Wes House CHPWH Hotel/motel	1	1.5	Conditioned	48	Watts

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J2. COMMERCIAL KITCHENS

01	02	03	04	05
Space Name	Exhaust Hood Style	Exhaust Hood Duty	Exhaust Length	Exhaust Flow Rate (cfm)
C Comm Kitchen	Wall-mounted Canopy	Heavy Duty	15	2,520

L. DECLARATION OF REQUIRED CERTIFICATES OF INSTALLATION

Selections made by Documentation Author indicate which Certificates of Installation must be submitted for the features to be recognized for compliance. These documents must be retained and provided to the building inspector during construction and can be found online

Building Component	Form/Title
Envelope	NRCI-ENV-E - Envelope (for all buildings)
Mechanical	NRCI-MCH-E - For all buildings with Mechanical Systems
Plumbing	NRCI-PLB-E - For all buildings with Plumbing Systems

M. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE

Selections made by Documentation Author indicate which Certificates of Acceptance must be submitted for the features to be recognized for compliance. These documents must be provided to the building inspector during construction. Lighting controls and mechanical NRCAs must be completed through an Acceptance Test Technician Certification Provider (ATTCP).

Building Component[1]	Form/Title & System Name(s)
Envelope	NRCA-ENV-02-F - NRFC label verification for fenestration
Envelope	NRCA-ENV-03-F. - Daylighting Design PAFs
Covered Process	NRCA-PRC-02-F Kitchen Exhaust
Mechanical	NRCA-MCH-02-A - Outdoor Air must be submitted for all newly installed HVAC units. Note: MCH-02-A can be performed in conjunction with MCH-07-A Supply Fan VFD Acceptance (if applicable) since testing activities overlap
	HP-C01 Healthcare, HP-C02 Healthcare, HP-C03 Healthcare, HP-C04 Healthcare Wellness Entry, HP-C05 C Healthcare Childwatch Offices, HP-C08 C Dining Hall, DOAS-1 C Kitchen, HP-C10 C Hallway Lobby Level2, HP-C11 C Activity Room, HP-C12 C Classroom, HP-C13 C L2 offices, HP-C14 C Counseling, HP-C15 C L2 Staff Break, East PHP E01 thru E11, ERV-E1 East Shower Med Obs, HP-E02 East Lounge Laundry, West PHP W01 thru W13, HP-W01 West AirSys, HP-W02 West L1 Meeting Rm, ERV-W1 West Shower Lounge and HP-W04 West L2 med Tech Triage.

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M. DECLARATION OF REQUIRED CERTIFICATES OF ACCEPTANCE

Selections made by Documentation Author indicate which Certificates of Acceptance must be submitted for the features to be recognized for compliance. These documents must be provided to the building inspector during construction. Lighting controls and mechanical NRCAs must be completed through an Acceptance Test Technician Certification Provider (ATTCP).

Building Component[1]	Form/Title & System Name(s)
Mechanical	NRCA-MCH-03-A - Constant Volume Single Zone HVAC
	HP-C04 Healthcare Wellness Entry, HP-C05 C Healthcare Childwatch Offices, HP-C08 C Dining Hall, HP-C10 C Hallway Lobby Level2, HP-C11 C Activity Room, HP-C12 C Classroom, HP-C13 C L2 offices, HP-C14 C Counseling, HP-C15 C L2 Staff Break, East PHP E01 thru E11, ERV-E1 East Shower Med Obs, HP-E02 East Lounge Laundry, West PHP W01 thru W13, HP-W01 West AirSys, ERV-W1 West Shower Lounge and HP-W04 West L2 med Tech Triage., HP-C09 Kitchen fan coil, HP-E01 and HP-W03.
Mechanical	NRCA-MCH-05-A - Air Economizer Controls
	HP-W04 West L2 med Tech Triage
Mechanical	NRCA-MCH-07-A Supply Fan Variable Flow Controls
	DOAS-1 C Kitchen
Mechanical	NRCA-MCH-11-A Automatic Demand Shed Controls
	ERV-E1 East Shower Med Obs, ERV-W1 West Shower Lounge, HP-W04 West L2 med Tech Triage, ERV-E01 and ERV-W01.
Mechanical	NRCA-MCH-13-A Automatic FDD for Air Handling Units and Zone Terminal Units Acceptance
	HP-W04 West L2 med Tech Triage
Mechanical	NRCA-MCH-19-A Occupancy Sensor Controls
	HP-C13 C L2 offices and HP-C14 C Counseling.

N. DECLARATION OF REQUIRED CERTIFICATES OF VERIFICATION

Selections made by Documentation Author indicate which Certificates of Verification must be submitted for the features to be recognized for compliance. These documents must be retained and provided to the building inspector during construction and can be found online

Building Component	Form/Title
Mechanical	NRCV-MCH-27 Indoor Air Quality & Mechanical Ventilation
Mechanical	NRCV-MCH-32 Local Mechanical Exhaust

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Documentation Author's Declaration Statement

1. I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Jennifer Love	Documentation Author Signature: Jennifer R Love
Company: Streamline Green	Signature Date: 3/25/2026
Address: 1355 Francisco St	CEA/HERS Certification Identification (if applicable): R22-16-40096
City/State/Zip: , Berkeley CA 94702	Phone: 510.387.1532

Responsible Person's Declaration statement

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Compliance is true and correct.
2. I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer)
3. The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
4. The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
5. I understand that a registered copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections, and I will take the necessary steps to accomplish this requirement.
6. I understand that a registered copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy, and I will take the necessary steps to accomplish these requirements.

Responsible Designer Name:	Responsible Designer Signature:	
Company:		
Address:	Date Signed:	
City/State/Zip: ,	License #:	
Phone:	Title:	Scope:

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03/27/2026

PROJECT:

Yurok Wellness Center

Weitchpec, CA

Bid Set

FROM:

NGAssociates Foodservice Consultants

11135 San Pablo Ave #1782

El Cerrito, California 94530

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NH2 (Sanitation Service Entrance) Series

Unheated
Model Lengths: 36”–144”
Insect Control (up to 7’)

atmosphere is everything

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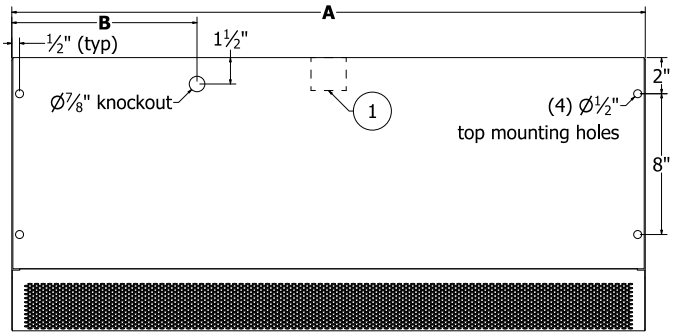
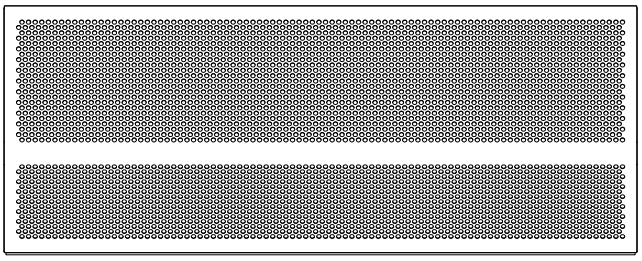
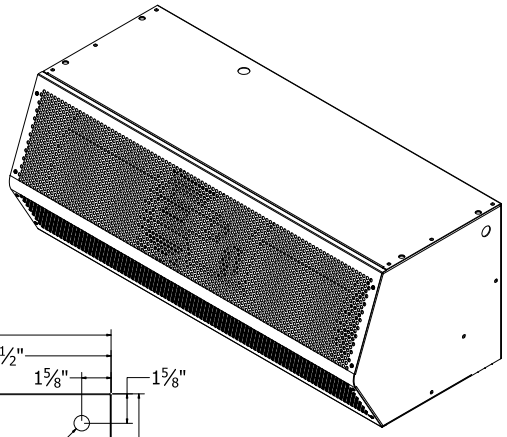
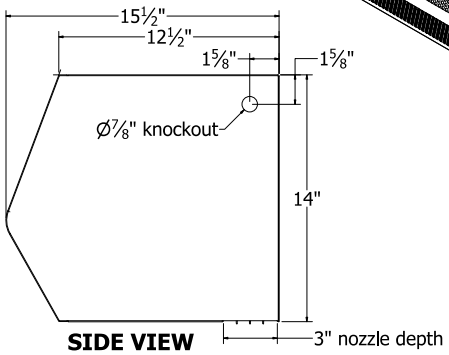


TOP VIEW

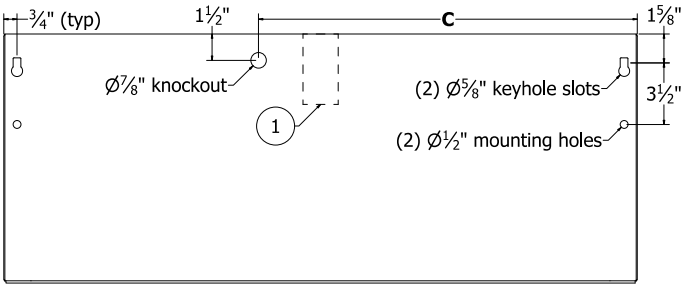


FRONT VIEW





SIDE VIEW



REAR VIEW

Notes:

1. Internal junction boxes provided for electrical wiring: (1) 2”x4” box for one-motor units, (1) 4”x4” box for two-motor units, (2) 4”x4” box for three-motor units.
2. Recommended service clearances are 2” to the left and right sides, 6” on top, and 18” in front of the unit.
3. Circuit protection (per NEC) to be installed by others.
4. To prevent accidental damage during operation, unit must be installed so that the bottom of the air curtain does not extend below the door header.
5. Unit can be fastened to wall on both ends without intermediate support.
6. Motor-Fan Assemblies (MFAs) are shipped loose to minimize freight damage.

Model Number	Mechanical Data						AMCA Certified Lab Data				
	Overall Length A (in)	Nozzle Length (in)	Top Knockout Location B (in)	Rear Knockout Location C (in)	Motor (hp)	Weight (lb)	Max Core Velocity at Nozzle (in)	Avg Velocity (fpm)	Volume (cfm)	Uniformity (%)	Power Rating (watt)
☐ NH236-1U*-TS	36	36	10 ½	21 ½	1	115	6000	2745	2059	90	1245
☐ NH242-1U*-TS	42	42	13 ½	24 ½	1	120	6051	2654	2322	93	1305
☐ NH248-1U*-TS	48	48	16 ½	27 ½	1	125	6144	2447	2447	88	1360
☐ NH272-2U*-TS	72	72	31 ½	40 ½	(2) 1	220	6000	2745	4118	90	2490
☐ NH284-2U*-TS	84	84	37 ½	46 ½	(2) 1	235	6051	2654	4644	93	2610
☐ NH296-2U*-TS	96	96	43 ½	52 ½	(2) 1	250	6144	2447	4894	88	2720
☐ NH2108-3U*-TS	108	108	31 ½	40 ½	(3) 1	330	6000	2745	6177	90	3735
☐ NH2120-3U*-TS	120	120	35 ½	44 ½	(3) 1	345	6060	2677	6693	93	3615
☐ NH2144-3U*-TS	144	144	43 ½	52 ½	(3) 1	375	6144	2447	7341	88	4080
The following model is not licensed to bear the AMCA seal											
☐ NH260-2U*-OB	60	60	22 ½	33 ½	(2) 1	195	6025	3036	3795	93	2301

*** – Use corresponding letters in “Electrical Data” column headers (see page 2) to complete the model numbers.**

Note: above data is for 60 Hz at 1725 RPM. For 50 Hz, RPM is 1425 with a 17% reduction in performance. Units may not comply with ANSI/NSF 37 minimum airspeed requirements at 50 Hz.

- *The AMCA Certified Ratings Seal applies to airflow rate, average outlet velocity, outlet velocity uniformity, velocity project, and power rating at free delivery only.*

† *Limited availability, long lead times may apply.*

NOTE: Mars Air Systems, LLC reserves the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions, or replacements for previously purchased equipment.

NH2 (Sanitation Service Entrance) Series

Unheated
Model Lengths: 36”–144”
Insect Control (up to 7’)

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Standard Features:

- ETL-certified to conform to UL 507 (US) and CSA 22.2 (Canada) standards for indoor and outdoor use
- AMCA-certified to AMCA 211 (includes performance testing per AMCA 220)
  - Certified models are approved for use as alternate to vestibules (per ASHRAE 90.1, IECC, and IgCC)
- Sleek self-contained one-piece heavy-gauge corrosion-proof paint lock metal design
- Fire retardant and rust preventative electrostatic polyurethane powder coating
  - Standard color is Titanium Silver (TS)
- 1 HP continuous duty Totally Enclosed Air Over (TEAO) motors (NEMA 1)
- Adjustable air directional vanes with 40° sweep front to back
- 5-year parts warranty
- Freight included (FOB continental USA)
- Proudly made in the USA

Electrical Data Full Load Amp (FLA)	Unit Amperage (Voltage Code)				
	Single Phase		Three Phase		
	115V/1Ø ☐ (A)	208-230V/1Ø ☐ (D)	208-230V/3Ø ☐ (G)	460V/3Ø ☐ (H)	575V/3Ø ☐ (I)
☐ NH236-1U*-TS	9.0	5.0	3.3/3.2	1.6	1.3
☐ NH242-1U*-TS	9.0	5.0	3.3/3.2	1.6	1.3
☐ NH248-1U*-TS	9.0	5.0	3.3/3.2	1.6	1.3
☐ NH260-2U*-TS	18.0	10.0	6.6/6.4	3.2	2.6
☐ NH272-2U*-TS	18.0	10.0	6.6/6.4	3.2	2.6
☐ NH284-2U*-TS	18.0	10.0	6.6/6.4	3.2	2.6
☐ NH296-2U*-TS	18.0	10.0	6.6/6.4	3.2	2.6
☐ NH2108-3U*-TS	27.0	15.0	9.9/9.6	4.8	3.9
☐ NH2120-3U*-TS	27.0	15.0	9.9/9.6	4.8	3.9
☐ NH2144-3U*-TS	27.0	15.0	9.9/9.6	4.8	3.9

* – Use corresponding letters in “Voltage Code” column headers to complete the model numbers.

Ampacity (MCA) = total FLA x 1.25

Alternate voltage codes with FLA data:
·277V/1Ø/60Hz (L) – 5.2A per motor
·220V/1Ø/50Hz (U) – 7.1A per motor
·380-415V/3Ø/50Hz (W) – 1.8A per motor

Washdown motor FLA data (INS-WD-STD2):
·115V/1Ø/60Hz (A) – 12A per motor
·208-230V/1Ø/60Hz (D) – 6.4/6A per motor
·208-230V/3Ø/60Hz (G) – 3.3A per motor
·460V/3Ø/60Hz (H) – 1.5A per motor

Mars Recommended Accessories (see catalog for complete listing):

- Door Limit Switches (§)
  - ☐ 99-014, Combination mechanical switch, 250V, 1HP Max
  - ☐ 99-125, Industrial surface mounted magnetic switch (controller required)
- Controllers
  - ☐ MCPB-†U*, Motor Control Panel, 120V control voltage († = # of Motors, * = Voltage Code) (§)
  - ☐ MCP-TD, Adjustable time delay, 1sec-100hr (panel required)
  - ☐ MCP-24V, Low voltage control option (panel required)
  - ☐ BMS-303, BMS for monitor and control (panel with MCP-24V required)

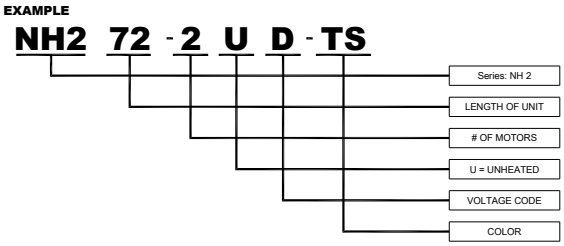
  Note: *Dry contact provided in panel for monitoring motor. 24Vac signal provided from panel for controlling motor.*
- Brackets (§)
  - ☐ B0004, Adjustable mounting bracket set, 3½” clearance
  - ☐ B0008 to B0011, Extended wall mounting bracket set, 10”, 16”, 19”, and 23” clearance respectively
- Severe Duty and Finish
  - ☐ HSG-304SS-HV/EP, 304 Stainless steel housing construction
  - ☐ INS-WD-HV2, Washdown motor fan assembly, IP54

  Note: *Washdown units draw higher motor amperage (see electrical data table). Control panels for these units require OL/MP with higher amperage range (use MCP-MWD accessory).*

(§) = Shipped loose

AMCA Certified Projection Velocity		
Model	Distance from Nozzle (in)	Average Core Velocity (fpm)
NH236-1U*	40	2002
	80	1238
	120	1088
	160	1039
	200	967

EXAMPLE



Sound Levels (measured at 10’ in a free field):

1 Motor Unit = 70 dBA, 2 Motor Unit = 73 dBA, 3 Motor Unit = 75 dBA

MARS Air Systems, LLC certifies that the Air Curtains shown on this data sheet are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Ratings Program.
The AMCA Certified Ratings Seal applies to airflow rate, average outlet velocity, outlet velocity uniformity, velocity projection and power rating at free delivery only.

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Door Switches

NEMA1 to NEMA9 Models

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Door Switch Number	Description	Max Voltage	Phase	Max HP	Amperage	Poles	NEMA Rating
Mechanical Switches – controller not required for air curtains under switch electrical limits							
99-014	Combination Plunger/Roller	250V	1	1	20 A	1	NEMA 1
99-270	Washdown Roller	250V	1	1	20 A	1	NEMA 4X
99-016	Explosion Resistant Roller	250V	1	¾	15 A	1	NEMA 7 and 9
Magnetic Switches – controller required							
99-018	Commercial, Plastic, Surface Mounted	24V	1	-	½ A	1	NEMA 1
99-125	Industrial, Metal, Surface Mounted	120V	1	-	3 A	1	NEMA 1
99-124	Industrial, Metal, Floor Mounted	120V	1	-	3 A	1	NEMA 1

Note: DO NOT ground the green wire (for 99-124 and 99-125) or COM terminal (for all others). This is the switch common, not ground or neutral. Please refer to the wiring instructions included with the switches.

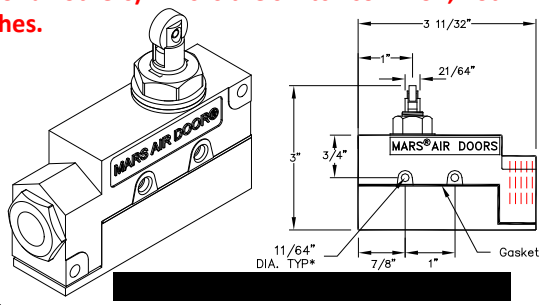
Mechanical Switch Features:

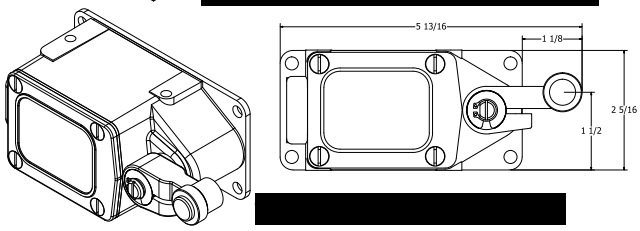
Combination Roller/Plunger Switch (99-014)

- UR (UL Recognized) and rated for NEMA 1 applications (field installed by others)
- Used to enable automatic control of air curtain(s): turns air curtain on when door opens and off when door closes
- Suitable for various applications and installation types
- Maximum ratings of 250V, 20A, and 1HP (see individual model specs for details)
  - If the air curtain exceeds any of these ratings, or if it is three phase, a Motor Control Panel (MCP) or solid state controller is required
- Single pole (1P) switch with normally closed (NC) and normally open (NO) contacts
  - Only normally closed and common (COM) terminals are provided with screws for wiring
- Requires less than 1/8" of travel and 2 lbs. of force on plunger to activate switch
- 1/2" FPT conduit connection (field wired by others)
- (2) 11/64" mounting holes*

**Do not use a fastener larger than a #6 sheet metal screw or a #8 Machine screw to mount this door limit switch. Larger screws may damage the switch and void the warranty.*

- 1 year parts warranty for all switches



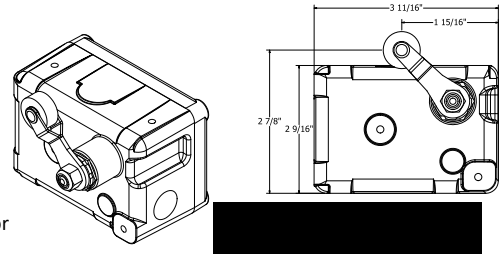


Washdown Roller Switch (99-270)

- UR (UL Recognized) and rated for NEMA4X/IP55

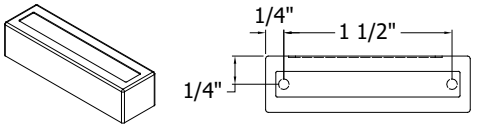
Explosion Resistant Roller Switch (99-016)

- UR (UL Recognized) and rated for NEMA 7 & 9 (Class 1, Division 1, Group D)

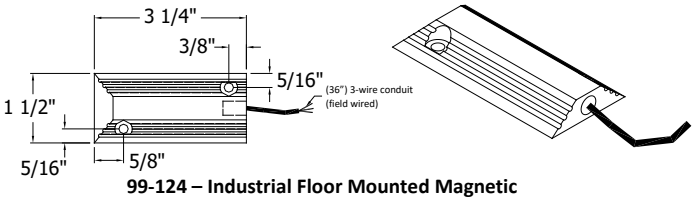


Magnetic Switch Features:

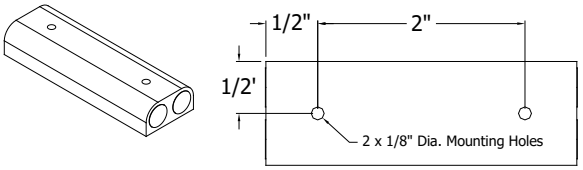
- UR (UL Recognized) and rated for NEMA 1 applications (field installed by others)
- Used to enable automatic control of air curtain(s): turns air curtain on when door opens and off when door closes
- Typical applications for each switch:
  - 99-018: for neat trim and finish in commercial applications
  - 99-125: for heavy duty industrial applications
  - 99-124: for roll-up doors with forklift traffic
- A Motor Control Panel (MCP) or solid state controller is required for use with all magnetic door switches (except for electric heated air curtain)
  - For 99-018, MCP-24V adder is required for use with MCP
- Single pole (1P) switch with normally closed (NC) and normally open (NO) contacts
- Maximum acceptable gap of 1/8" distance (commercial) or 1/2" (industrial) between magnets to activate switch
- Lightweight and easy to install
- 1 year parts warranty for all switches



99-018 – Commercial Surface Mounted Magnetic Switch



99-124 – Industrial Floor Mounted Magnetic



99-125 – Industrial Surface Mounted Magnetic Switch

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ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

HAND SINKS

KNEE VALVE

Conforms To NSF 61/9 Lead Free Requirements

7-PS-62

7-PS-59

SPACE SAVERS

7-PS-58

7-PS-63

7-PS-30

7-PS-78

7-PS-82

Item #:_____ **Qty #:**_____

Model #:_____

Project #:_____

FEATURES:

One piece **Deep Drawn** sink bowl design.

7-PS-30 Sink bowl is 16" x 14" x 6".

7-PS-78 Sink bowl is 16" x 20" x 8".

7-PS-59, 7-PS-62, 7-PS-82 Sink bowl is 10" x 14" x 5".

7-PS-63 Sink bowl is 9" x 9" x 5".

7-PS-58 Sink bowl is 9" x 9" x 5". Includes two side splashes.

7-PS-59 Welded 7 3/4" high side splashes.

Stainless steel basket drain 1-1/2" IPS.

Knee valve operated faucet provides true hands-free operation.

All sink bowls have a large liberal radii with a minimum dimension of 2" and are rectangular in design for increased capacity.

Apron conceals plumbing on all three sides.

"Hands Free" splash mounted gooseneck faucet furnished with aerator.

Specific Features:

7-PS-82 has Towel Dispenser with hinged towel box. Unit uses standard C-fold towels. Liquid soap dispenser also included.

7-PS-63 "Hands Free" splash mounted 6" "D" Spout faucet furnished with aerator.

CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Die formed Countertop Edge with a 3/8" No-Drip offset.

One sheet of stainless steel - No Seams.

MATERIAL:

Heavy gauge type 304 series stainless steel.

Wall mounting bracket is galvanized steel and of offset design.

All fittings are brass / chrome plated unless otherwise indicated.

MECHANICAL:

Spout supply is 1/2" IPS male thread.

Faucet Flow Rate: 1.0 GPM/3.8 LPM aerator. 60 PSI.
Knee Valve is barrel type and is activated by pedal.

(Contractor on site must connect faucet to knee operated valves.)

⚠WARNING:

Equipment that includes a faucet may expose you to chemicals, including lead, that are known to the State of California to cause cancer or birth defects or other reproductive harm. For more Info.,visit www.p65warnings.ca.gov.

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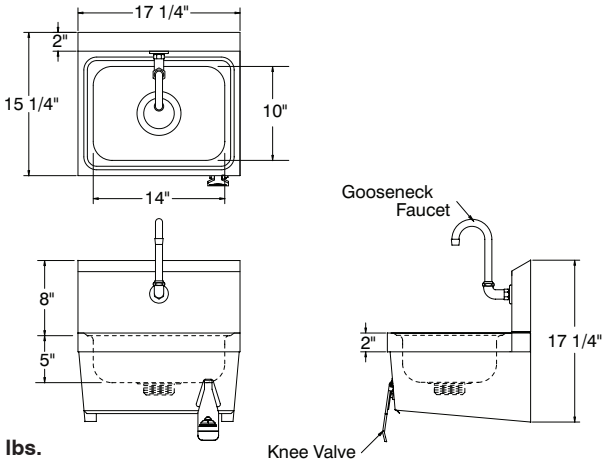
REF-B

DIMENSIONS and SPECIFICATIONS

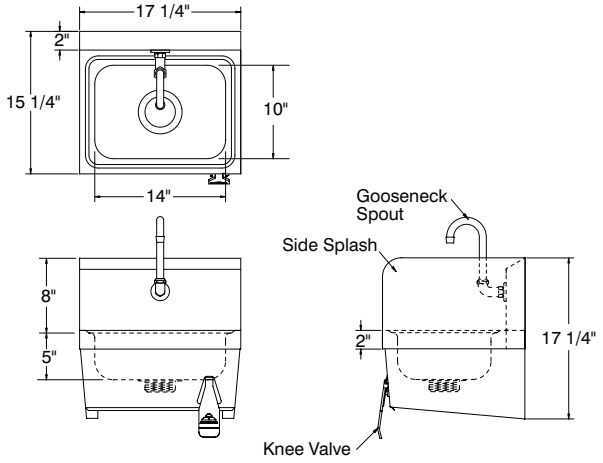
TOL Overall: ± .500" Interior: ± .250" **FITTINGS SUPPLIED AS SHOWN** **ALL DIMENSIONS ARE TYPICAL**

7-PS-62



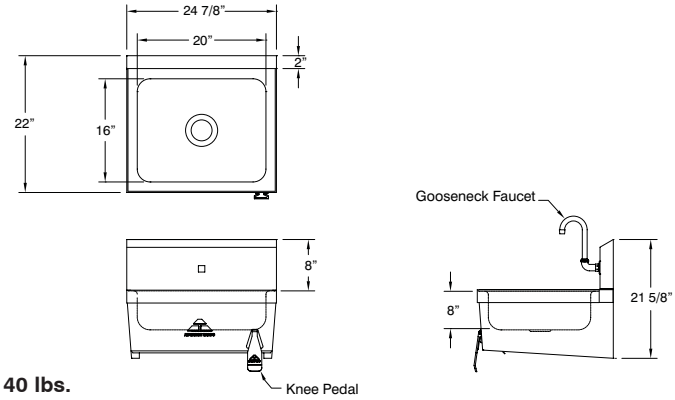
25 lbs.

7-PS-59



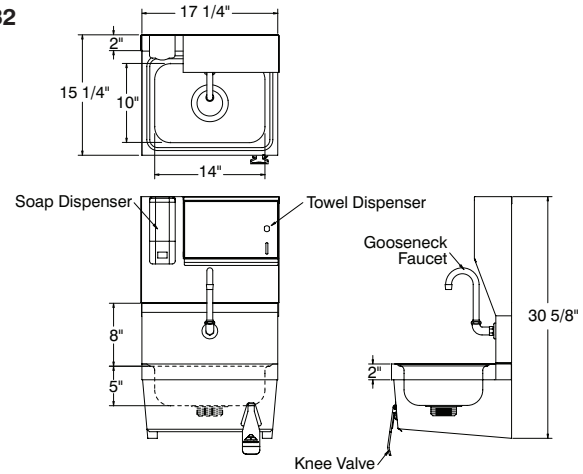
27 lbs.

7-PS-78



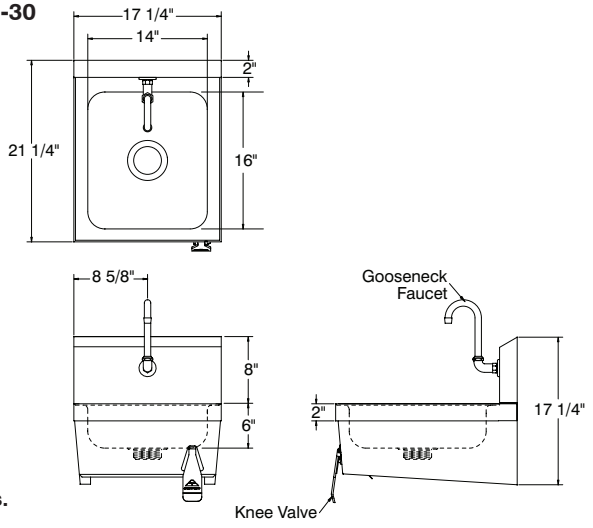
40 lbs.

7-PS-82



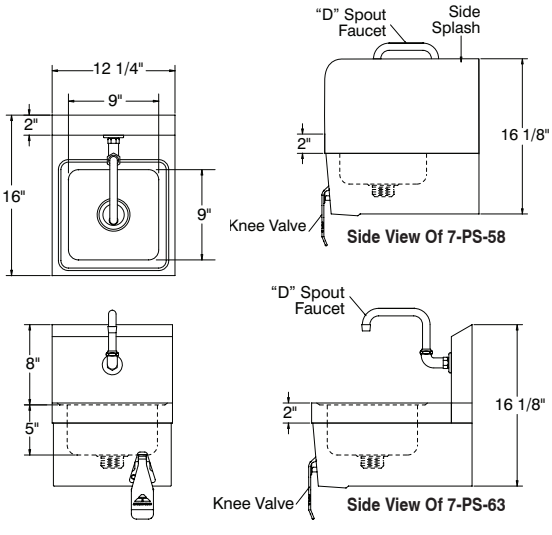
38 lbs.

7-PS-30



33 lbs.

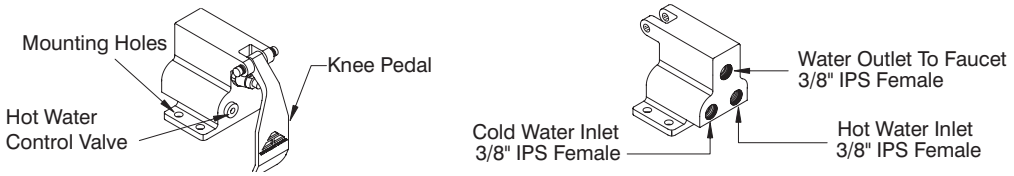
7-PS-63/ 7-PS-58



20 lbs.

KNEE VALVE DETAIL

3/8" IPS FEMALE



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ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

REF-B 325 Wireless Boulevard, Hauppauge, NY 11788

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FAUCET PARTS & ACCESSORIES

Faucet Repair Kit
For K-22, K-59, K-123, K-125, K-126, K-206 & K-316 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00A (Set of 2)

Faucet Repair Kit
For K-1, K-11, K-50, K-51, K-52, K-53, K-56, K-124, K-101, K-160, K-208 & K-240 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00B (Set of 2)

K-02 Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased From 2016 - 2019. For Older Faucets, See Below.

K-02A Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased Before January 2016 or After 2019.

Service Faucet Vacuum Breaker Repair Kit
For K-240 Faucet
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-03

Pedal/Knee Valve Replacement Parts

Replacement Bonnet for Pedal/Knee Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-01

Replacement Check Valves
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19

Thermostatic Mixing Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-425

Mixing Valve & Retainer
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19A

Faucet Options & Accessories

Hands-Free Wand

K-400

Low Flow Aerator

.5 GPM
K-08

Wrist Handles (Pair)

*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-316-LU

Wrist Handles (Pair)
For Heavy Duty 8" O.C. Faucets

K-416-LU

Splash Mount Faucet Mounting Kit
K-1, K-11, K-101, K-105, K-112, K-119 & K-211

K-06

Faucet Wall Mounting Bracket
8" O.C.

K-30

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FAUCET PARTS & ACCESSORIES

Faucet Repair Kit
For K-22, K-59, K-123, K-125, K-126, K-206 & K-316 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00A (Set of 2)

Faucet Repair Kit
For K-1, K-11, K-50, K-51, K-52, K-53, K-56, K-124, K-101, K-160, K-208 & K-240 Faucets
Includes 2 Cartridges and Handles
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K-00B (Set of 2)

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Thermostatic Mixing Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-425

Mixing Valve & Retainer
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19A

Faucet Options & Accessories

Hands-Free Wand

K-400

Low Flow Aerator

.5 GPM
K-08

Wrist Handles (Pair)

*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-316-LU

Wrist Handles (Pair)
For Heavy Duty 8" O.C. Faucets

K-416-LU

Splash Mount Faucet Mounting Kit
K-1, K-11, K-101, K-105, K-112, K-119 & K-211
K-06

Faucet Wall Mounting Bracket
8" O.C.
K-30

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P-TRAPS & CONTINUOUS WASTES

Continuous Waste for 2 and 3 Compartment Sinks

K-351

Chrome Plated P-Trap

STANDARD
22 Gauge - 1-1/2" IPS
7-PS-14

HEAVY DUTY
17 Gauge - 1-1/2" IPS
7-PS-10

Offset Tail Piece

K-46

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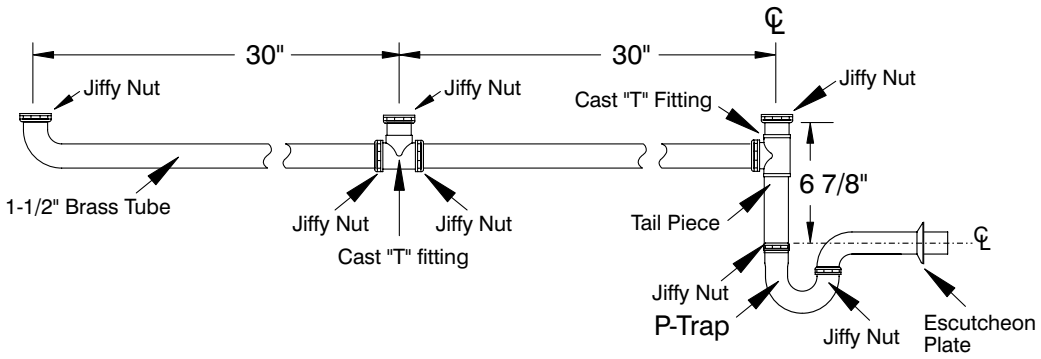
NEVADA Fax: (775) 972-1578

DIMENSIONS and SPECIFICATIONS

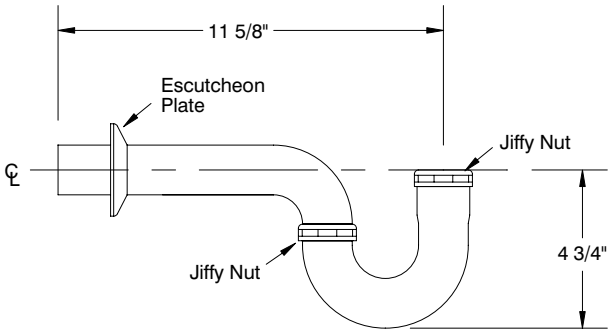
TOL ± .125” ALL DIMENSIONS ARE TYPICAL

3 Compartment
Continuous Waste



K-351

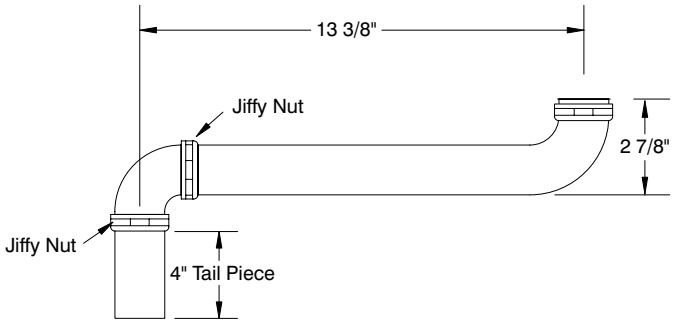
Chrome Plated P-Trap



STANDARD
22 Gauge - 1-1/2” IPS
7-PS-14

HEAVY DUTY
17 Gauge - 1-1/2” IPS
7-PS-10

Offset Tail Piece



K-46

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© ADVANCE TABCO, JUNE 2024

16 GAUGE 300 SERIES STAINLESS STEEL

HAND SINK SIDE SPLASHES

WELDED & BOLT-ON

Item #: _____ **Qty #:** _____

Model #: _____

Project #: _____

FEATURES:

Shields surround work area from splashes and prevents cross-contamination.

Available as 7-3/4" and 12" high.

Welded Side Splashes

Available as 7-3/4", 12" & 24" high.

Factory installed only.

Bolt-on Single Panel Side Splash

Available as 7-3/4" and 12" high.

Includes holes only. Hardware not included.

CONSTRUCTION:

Welded Side Splashes (factory installed) are spot welded and polished to a satin finish.

Bolt-on Side Splashes (field installation) require drilling holes in hand sink to match holes in side splash. Mounting hardware is not included.

24" Side Splashes With Included Back Panel Shown
Factory Installed Only

Single Sided 7-3/4" Side Splash Shown
Factory Installed Only

Double Sided Bolt-On 7-3/4" Side Splashes Shown
Hardware Not Included

WELDED

	One Side Splash			Two Side Splashes				
	Model #	Approx. Weight	Approx. Cu. Ft.	Model #	Approx. Weight	Approx. Cu. Ft.	O.A. Splash Size W x H	Description
7-3/4" High Welded Side Splashes	**7-PS-16**	5 lbs.	1	**7-PS-17**	12 lbs.	1	15-1/4" x 9-3/4"	For 10" x 14" Bowls w/ Splash Mt. Faucets
	7-PS-16A	5 lbs.	1	**7-PS-17A**	12 lbs.	1	16-1/8" x 9-3/4"	For 9" x 9" Bowls
	7-PS-16B	5 lbs.	1	**7-PS-17B**	13 lbs.	1	17-1/8" x 9-3/4"	For 10" x 14" Bowls w/ Deck Mt. Faucets
	7-PS-16C	7 lbs.	1	**7-PS-17C**	15 lbs.	1	21-3/4" x 9-3/4"	For 16" x 20" Bowls
	7-PS-16D	8 lbs.	1	**7-PS-17D**	16 lbs.	1	23-3/8" x 9-3/4"	For Handicapped Hand Sinks
	7-PS-16E	6 lbs.	1	**7-PS-17E**	14 lbs.	1	19-5/8" x 9-3/4"	For 14" (F/B) x 16" Bowls
	7-PS-16F	6 lbs.	1	**7-PS-17F**	14 lbs.	1	21-1/8" x 9-3/4"	For 16" (F/B) x 14" Bowls
12" High Welded Side Splashes	**7-PS-11**	6 lbs.	1	**7-PS-15**	14 lbs.	1	15-1/4" x 14"	For 10" x 14" Bowls w/ Splash Mt. Faucets
	7-PS-11A	6 lbs.	1	**7-PS-15A**	14 lbs.	1	16-1/8" x 14"	For 9" x 9" Bowls
	7-PS-11B	6 lbs.	1	**7-PS-15B**	14 lbs.	1	17-1/8" x 14"	For 10" x 14" Bowls w/ Deck Mt. Faucets
	7-PS-11C	8 lbs.	1	**7-PS-15C**	18 lbs.	1	21-3/4" x 14"	For 16" x 20" Bowls
	7-PS-11D	9 lbs.	1	**7-PS-15D**	20 lbs.	1	23-3/8" x 14"	For Handicapped Hand Sinks
	7-PS-11E	7 lbs.	1	**7-PS-15E**	16 lbs.	1	19-5/8" x 14"	For 14" (F/B) x 16" Bowls
	7-PS-11F	8 lbs.	1	**7-PS-15F**	18 lbs.	1	21-1/8" x 14"	For 16" (F/B) x 14" Bowls
24" High Welded Side Splashes	**NOTE:** 24" High Side Splashes Include A Rear Panel That Matches The Height Of The Side Panels. (Only Available As Two Side Design, Single Side Not Offered)			**7-PS-28**	28 lbs.	1	15-1/4" x 26"	For 10" x 14" Bowls w/ Splash Mt. Faucets
				7-PS-28A	28 lbs.	1	16-1/8" x 26"	For 9" x 9" Bowls
				7-PS-28B	28 lbs.	1	17-1/8" x 26"	For 10" x 14" Bowls w/ Deck Mt. Faucets
				7-PS-28C	36 lbs.	1	21-3/4" x 26"	For 16" x 20" Bowls
				7-PS-28D	40 lbs.	1	23-3/8" x 26"	For Handicapped Hand Sinks
				7-PS-28E	32 lbs.	1	19-5/8" x 26"	For 14" (F/B) x 16" Bowls
				7-PS-28F	36 lbs.	1	21-1/8" x 26"	For 16" (F/B) x 14" Bowls

BOLT-ON Hardware Not Included

7-3/4" High				12" High				
Model #	O.A. Splash Size W x H	Approx. Weight	Approx. Cu. Ft.	Model #	O.A. Splash Size W x H	Approx. Weight	Approx. Cu. Ft.	Description
7-PS-27	15-1/4" x 10"	5 lbs.	1	**7-PS-13**	15-1/4" x 14"	6 lbs.	1	For 10" x 14" Bowls w/ Splash Mt. Faucets
7-PS-27A	16-1/8" x 10"	6 lbs.	1	**7-PS-13A**	16-1/8" x 14"	7 lbs.	1	For 9" x 9" Bowls
7-PS-27B	17-1/8" x 10"	6 lbs.	1	**7-PS-13B**	17-1/8" x 14"	7 lbs.	1	For 10" x 14" Bowls w/ Deck Mt. Faucets
7-PS-27C	21-3/4" x 10"	6 lbs.	1	**7-PS-13C**	21-3/4" x 14"	7 lbs.	1	For 16" x 20" Bowls
7-PS-27D	23-3/8" x 10"	7 lbs.	1	**7-PS-13D**	23-3/8" x 14"	8 lbs.	1	For Handicapped Hand Sinks
7-PS-27E	19-5/8" x 10"	7 lbs.	1	**7-PS-13E**	19-5/8" x 14"	8 lbs.	1	For 14" (F/B) x 16" Bowls
7-PS-27F	21-1/8" x 10"	7 lbs.	1	**7-PS-13F**	21-1/8" x 14"	8 lbs.	1	For 16" (F/B) x 14" Bowls

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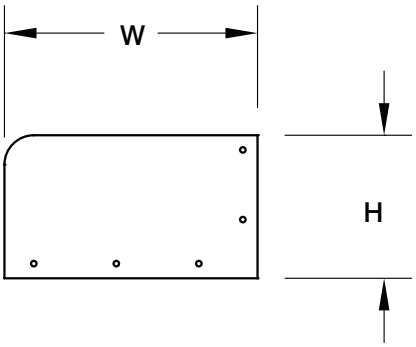
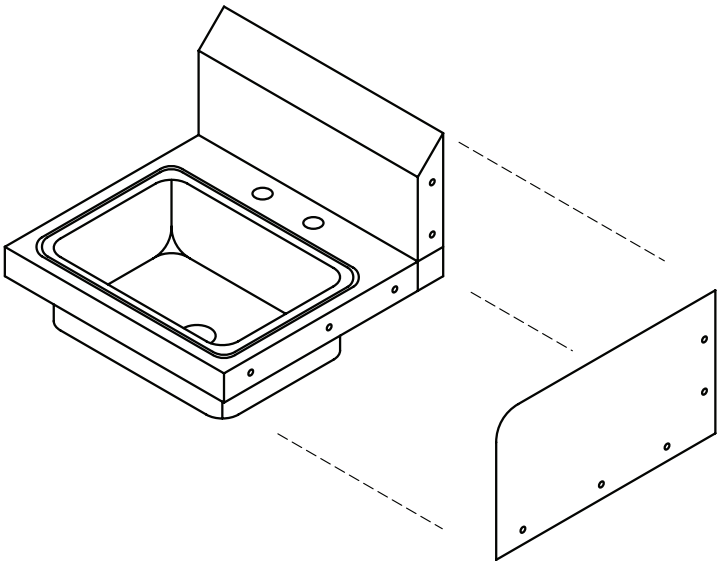
REF-B

DIMENSIONS and SPECIFICATIONS

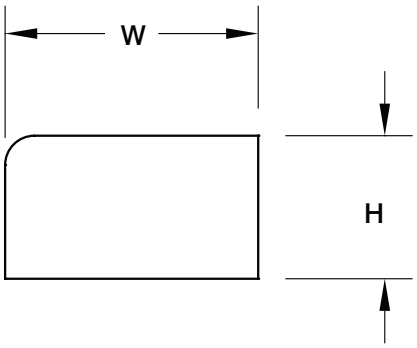
TOL ± .500" ALL DIMENSIONS ARE TYPICAL

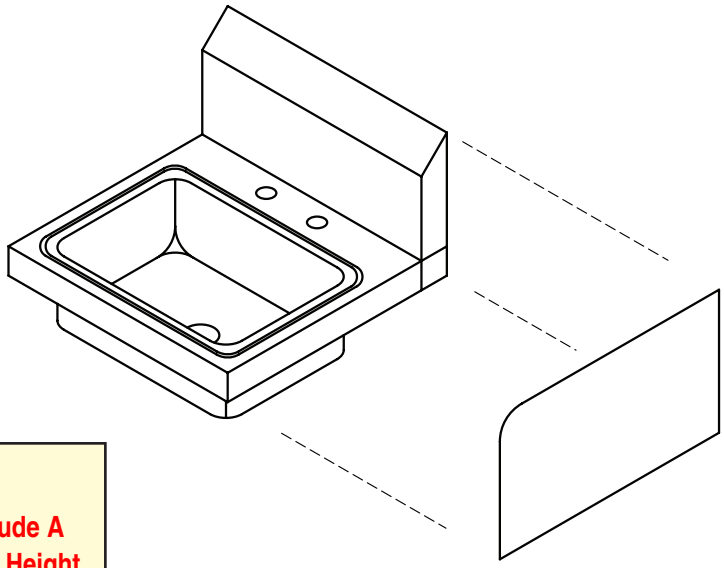
BOLT-ON SIDE SPLASHES (Hardware Not Included)





WELDED SIDE SPLASHES (Factory Installed Only)





NOTE:

24" High Side Splashes Include A Rear Panel That Matches The Height Of The Side Panels And Is To Be Secured To The Rear Wall.

Rear Panel Mounting Holes Are Provided. (Hardware Not Included).

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© ADVANCE TABCO, APRIL 2020

34201523 - TrimLine™ Rectangle Waste Container Trash Can 15 Gallon - Gray

Item Number	Case Pack
34201523	4ea

$61.32/Each

$245.28/Case

1 Case is 4ea

- Slim rectangle waste container fits neatly beside work tables or in narrow spaces
- Textured surface resists scuffs and marking
- Integrated tabs prevent liners from slipping into container
- Hand grips on container bottom simplify lifting and emptying
- Smooth inner surface is easy to clean
- BPA Free

Tech Specs

	US	Metric
Length	10.50 in	26.67 cm
Width	20.00 in	50.80 cm
Height	24.75 in	62.87 cm
Capacity	15.00 gal	56.78 l
Min Temperature	-50.00 °F	-45.56 °C
Max Temperature	120.00 °F	48.89 °C
Bottom Length	17.00 in	43.18 cm
Bottom Width	8.10 in	20.57 cm
Cut Out Length	19.25 in	48.90 cm
Cut Out Width	9.25 in	23.50 cm
Material	Polyethylene (LLDPE)	
Country of Origin	China	

Tech Specs

	US	Metric
Case Weight	5.70 lb	2.59 kg
Case Cube	3.16 ft3	0.09 m3
Case Length	24.81 in	63.02 cm
Case Width	20.03 in	50.88 cm
Case Height	11.00 in	27.94 cm
Pallet Case Qty	8	
Pallet Tier	8	
Pallet High	1	
Harmonized Code	392490.5650	
Freight Class	300	

	US	Metric
Each UPC	017183381659	
Case GTIN	10017183381656	

Related Products

Product	Description	Case Pack	Case Weight	Case Cube
Lids				
342026REC	TrimLine™ Rectangle RECYCLE Lid with Paper Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
342027REC	TrimLine™ Rectangle RECYCLE Lid with Bottle and Can Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
Accessories				
369210		1 ea	12.00 lb	1.58 ft^3

WASTE CONTAINERS

TRIMLINE™ RECTANGLE WASTE CONTAINERS

- Slim shape saves space by fitting into narrow spaces along walls and near work benches
- Corner tabs keep trash bags securely in place for spill-free, even filling
- Base helper handles stabilize container while being lifted and emptied
- Swing top, handled, or cut-out recycling lid styles available

34202423

34201523

34202469

34202369

342027REC

34202314

BPA FREE

Black (03) Beige (06) Green (09) Blue (14) Gray (23) Dark Brown (69)

Prod No	Description	Color	UOM	Case Qty	List Price
TrimLine™ Containers					
342023 Δ	Rectangle Waste Container - 23 Gallon	03, 06, 09, 14, 23, 69	CS	4	$288.08
342015 Δ	Rectangle Waste Container - 15 Gallon	23	CS	4	$243.28
TrimLine™ Waste Containers Lids					
342024 Δ	Rectangle Swing-Top Waste Container Lid - 15 & 23 Gallon	03, 23, 69	CS	4	$203.20
342027REC Δ	Rectangle Waste Container Recycle Lid with Bottle and Can Receptacles - 15 & 23 Gallon	14	CS	4	$224.44

DESCRIPTION: FIRE EXTINGUISHER

CUSTOM FABRICATED

EXISTING

- WHERE SHOWN
- RELOCATED
- MODIFIED

SPARE NUMBER

X NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC)
FURNISHED BY:

- OWNER
- SUPPLIER/VENDOR
- GENERAL CONTRACTOR
- MILLWORK TRADE

X ARCHITECT

COMMENTS:
NIKEC; BY ARCHITECT; VERIFY UTILITY REQS.

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: EXHAUST HOOD

X CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:
STREIVOR

DESCRIPTION: Fire Suppression System

X CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

STREIVOR

DESCRIPTION: HOOD CONTROL PANEL

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

REFER TO MANUFACTURER DRAWING FOR DETAILS.

DESCRIPTION: S/S WALL FLASHING

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

S/S WALL FLASHING

CONSTRUCTED PER 114000 SPECIFICATIONS

SIZE AND SHAPE PER PLAN

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

Project_____

Item No._____

Quantity_____

SOLSTICE ELECTRIC (SE) Series
SE14, 14T, 148 (R,X), 18 (R), 184 (R) Fryer

SE14 (R,X) w/ standard SSTC

SE14T (R,X) w/ optional rear casters

SE148 (R,X) w/ optional Digital Control

SE18 (R) w/ optional I12 Computer & Basket Lifts, front / rear casters

** EnergyStar Qualified Model

STANDARD FEATURES
- Tank - stainless steel construction
- Cabinet - stainless steel front, door and sides.
- Fixed heating elements for EnergyStar™** performance
- Solid State T-Stat (SSTC) w/melt cycle & boil out mode
- Mercury Free heating contactors
- High Temperature safety limit switch
- Drain valve interlock
- 1 ¼" (3.2 cm) Full port drain valve for fast draining
- 9" (22.9 cm) adjustable legs, easier access to clean
- Element rack
- Removable basket hanger, requires no tools
- Drain Line Clean out rod
- Fryer cleaning brush
- Fryer cleaner sample packet
- Choice of basket options:
  - ❑ 2 Twin baskets
  - ❑ 1-Full basket (not available on 14T or Basket Lifts)

APPLICATION
For High Production Electric frying specify Pitco Solstice Electric Models SE14, 14T, 148 (RX) or 18 (R),184 (R) fryers with multiple heat input (kilowatt) options for that EnergyStar™** performance to meet your frying demands. The Solstice electric fryer comes in numerous sizes to match different product frying applications and uses highly reliable fixed heating elements and environmentally friendly mercury-free contactors. For precise temperature control the fryer comes standard with a behind the door solid state thermostat with melt cycle and boil out modes. For additional timer capability the optional digital control and the elastic time computer are available and can be used with our optional labor saving highly reliable basket lift system.

MODELS AVAILABLE

SE14 Series (40-50 lbs, 14 x 14" fry area)
- ❑ ***SE14*** 17kW/hr
- ❑ ***SE14R**** 22kW/hr
- ❑ ***SE14X*** 14kW/hr

SE14T Series (20-25 lbs, 7 x 14-9/32" fry area per side for this twin vat fryer)
- ❑ ***SE14T*** 17kW/hr (8.5kW per tank side)
- ❑ ***SE14TR*** 22kW/hr (11kW per tank side)
- ❑ ***SE14TX*** 14kW/hr (7kW per tank side)

SE148 Series (60 lbs, 14 x 18" fry area)
- ❑ ***SE148*** 17kW/hr
- ❑ ***SE148R*** 22kW/hr
- ❑ ***SE148X*** 14kW/hr

SE184 Series (60 lbs, 18 x 14" fry area)
- ❑ ***SE184**** 17kW/hr
- ❑ ***SE184R*** 22kW/hr

SE18 Series (70-90 lbs, 18 x 18" fry area)
- ❑ ***SE18*** 17kW/hr
- ❑ ***SE18R*** 22kW/hr

OPTIONS & ACCESSORIES (AT ADDITIONAL COST)
- ❑ Digital Controller (2 timers w/ melt cycle & boil out mode)
- ❑ Intellifry I12 Computer (12 elastic timers w/ melt cycle & boil out)
- ❑ Backup thermostat (only on Digital and I12 computer)
- ❑ Basket Lift (must be ordered with Digital control or Computer)
- ❑ Stainless steel back (not available with basket lift)
- ❑ 9" (22.9 cm) adjustable rear and front locking casters
- ❑ Tank cover
- ❑ 3-Triple Baskets (not available on 14T)
- ❑ Consult Factory for other basket configurations
- ■ Splash Guard reversible ❑ 6" ❑ 8" ❑ 12" ❑ 18"
- ❑ Work shelves call factory for specifications and availability.
- ❑ Fish Grids only available on SE18 and SE18R
- ❑ Institutional Prison security package
- ❑ BNB Dump Station, see BNB spec sheet for details
- ■ Filter System Options
  - ❑ Filter Drawer see spec sheet for details
  - ❑ SoloFilter see spec sheet for details
- ❑ 6' Power Cord (14KW and 17KW 3ph, 208V or 240V 3Phase only)

SOLSTICE ELECTRIC (SE) Series SE14, 14T, 148 (R,X), 18 (R) ,184 (R) Fryer

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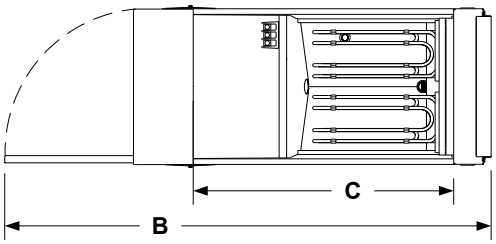
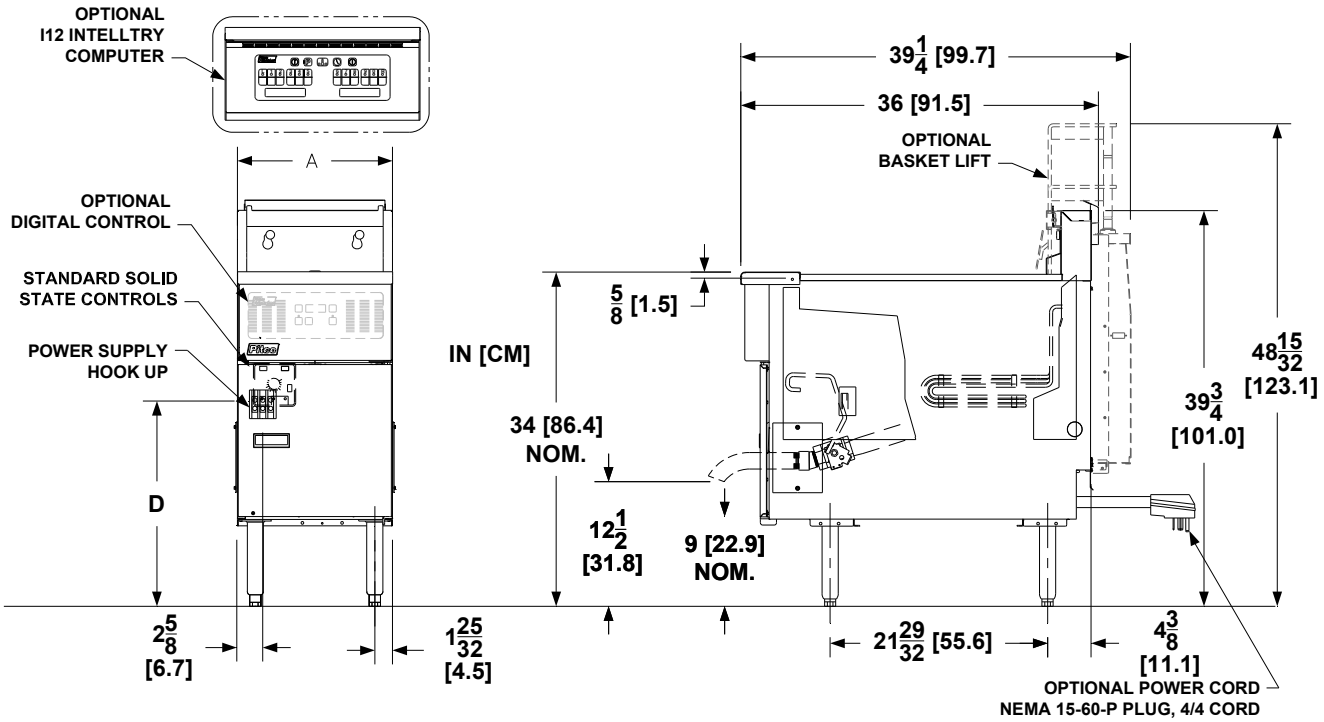
SOLSTICE ELECTRIC (SE) Series SE14, 14T, 148 (R,X), 18 (R), 184 (R) Fryer

SOLSTICE ELECTRIC (SE) Series SE14, 14T, 148 (R,X), 18 (R), 184 (R) Fryer

TABLE				
MODEL	DIM A	DIM B	DIM C	DIM D
SE14,14T (R,X)	15 5/8 [39.7]	48 5/16 [122.8]	21 27/32 [39.7]	21 5/8 [39.7]
SE148 (R,X)	15 5/8 [39.7]	48 5/16 [122.8]	24 27/32 [63.1]	20 5/8 [52.4]
SE18 (R)	19 5/8 [49.8]	52 5/16 [132.9]	24 27/32 [63.1]	20 5/8 [52.4]
SE184 (R)	19 5/8 [49.8]	52 5/16 [132.9]	21 27/32 [39.7]	21 5/8 [39.7]





INDIVIDUAL FRYER SPECIFICATIONS			SHIPPING INFORMATION (Approximate)			
Model	Cooking Area & Depth	Oil Capacity	Shipping Weight	Shipping Weight w B/L	Shipping Crate Size H x W x L	Shipping Cube
SE (14, 14R, 14X)	14 x 14 x 4 in (35.6 x 35.6 x 10.2 cm)	40-50 lbs (18-23 kg)	200 lbs (91 kg)	250 lbs (113 kg)	45 x 19 x 36 in 114.3 x 48.3 x 91.4 cm	17.8 ft^3 0.5 m^3
SE (14T,14TR,14TX) * per Tank side	7 x 14 9/32 x 4 in * (17.8 x 36.3 x 10.2 cm)	20-25Lbs * (9-11.5 kg)	230 lbs (104 kg)	280 lbs (127 kg)	45 x 19 x 36 in 114.3 x 48.3 x 91.4 cm	17.8 ft^3 0.5 m^3
SE (148, 148R,148X)	14 x 18 x 4 in (35.6 x 45.7 x 10.2 cm)	60 lbs (27 kg)	215 lbs (97.5 kg)	265 lbs (120 kg)	45 x 19 x 36 in 114.3 x 48.3 x 91.4 cm	17.8 ft^3 0.5 m^3
SE (18, 18R)	18 x 18 x 4-3/4 in (45.7 x 45.7 x 12.1cm)	70-90 lbs (32-41 kg)	226 lbs (103 kg)	276 lbs (125 kg)	59 x 23 x 44 in 149.8 x 58.4 x 111.7 cm	34.6 ft^3 1.0 m^3
SE (184, 184R)	18 x 14 x 4-3/4 in (45.7 x 35.6 x 12.1cm)	60 lbs (27 kg)	226 lbs (103 kg)	276 lbs (125 kg)	59 x 23 x 44 in 149.8 x 58.4 x 111.7 cm	34.6 ft^3 1.0 m^3

ELECTRICAL REQUIREMENTS		Nominal Amps Per Line (50/60 HZ)											
		Single Phase (2 wire + ground)					3 Phase (3 wire + ground)				3 Phase "Y" (4 wire + ground)		
Model	KW/Hr	208V	220V	230V	240V	480V	208V	220V	240V	480V	380/220V	400/230V	415/240V
SE (14, 14T, 148, 18, 184)	17	82	78	74	71	36	48	45	41	21	26	25	24
SE (14R, 14TR, 148R, 18R, 184R)	22	106	100	96	92	46	62	58	53	27	34	32	31
SE (14X, 14TX, 148X)	14	67.3	64.7	60.9	58.3	29.2	38.9	36.7	33.7	16.8	21.3	20.2	19.5

Note: 1. Each fryer requires it's own separate power cord. **2.** Power supply for Basket Lifts is wired into the fryer's high voltage line terminal block, except for 480V which requires another separate 115V (6.8 amp) power cord connection to the unit.

SHORT FORM SPECIFICATIONS

Provide Pitco Solstice Electric Model (SE xxx) electric fryer. Fryer shall be xx-xx lbs oil capacity, xxx kW/hr, "xx by xx" cook area, SS peened tank, stainless front, door,sides. Fixed immersion type heating elements with high temp alloy sheath, mercury-free contactors, drain valve interlock, 1-1/4" full port drain, 3/16" bottom hinge with standard behind the door solid state thermostat with melt cycle and boil out (or specify optional digital or computer controls). Provide options and accessories as follows.

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Model P14, P18
Portable Filter System

Project_____
Item No._____
Quantity_____

Model P14, P18 Portable Filter System

OPERATIONS

- Four swivel caster design allows for easy movement and storage of the filter
- Quick disconnect hose connections make it easy to assemble and disassemble.
- Low profile allows for easy placement under the fryer drain.
- Easy to remove filter media assembly for quick and easy filter paper replacement.
- Lift out filter pan for easy cleaning.

CONTROLS

- ON/OFF/HEATER

STANDARD ACCESSORIES

- (1) 7 inch (17.8cm) drain nipple
- Filter catch basket
- Sample Filter power
- Sample filter paper (Flat)
- (1) Sediment clean out scoop

STANDARD FILTER FEATURES

- Filter pan and pump assembly enclosure are constructed of polished stainless steel
- All other surfaces are nickel plated finish
- Welded steel frame mounted on four ball-bearing swivel casters for easy movement
- 1/3 HP heavy duty motor and pump assembly
- 5 foot (1.5 meter) flexible, sanitary, high temperature return hose equipped with nozzle
- Return hose nozzle is nickel plated steel with a non-heat conducting handle
- Extra large filter area for improved filtering 10 Foot (3.05 meters) oil proof supply cord

AVAILABLE OPTIONS & ACCESSORIES

- ❑ Filter Heater (for solid shortening use)
- ❑ Paperless pick-up option
- ❑ Filter powder packets
- ❑ Filter paper flat
- ❑ Filter paper envelopes
- ❑ Cover

APPROVALS

- **CSA Certified (AGA,CGA)**
- **NSF Listed**
- **MEA Approved**
- **CE Certified**
- **UL Listed**

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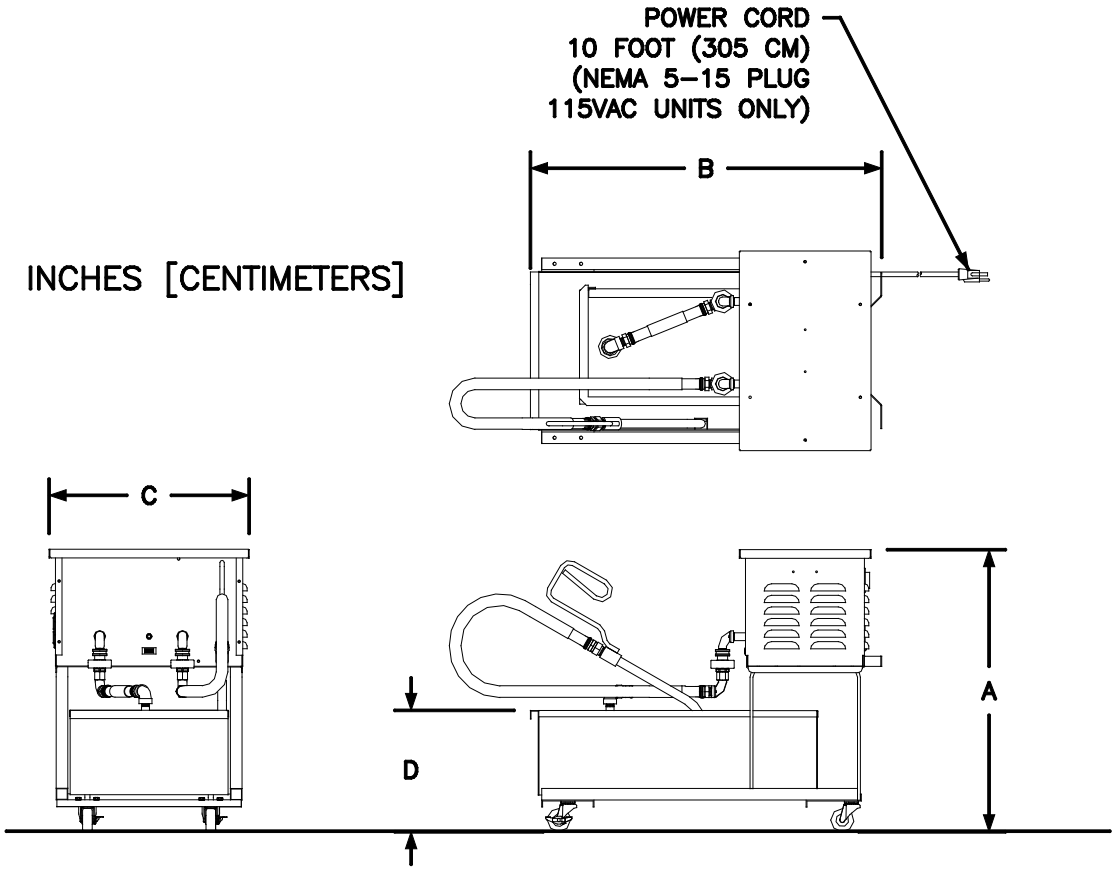
Model P14, P18 Portable Filter System

Model P14, P18 Portable Filter System



ELECTRICAL				
Pump		115V 60HZ	220-230-240V 50HZ	
		7 amps	4 amps	
DIMENSIONS				
Model	**A**	**B**	**C**	**D**
P14	24 3/8 in (61.9 cm)	30 1/4 in (76.8 cm)	17 7/32 in (43.7 cm)	10-1/2 in (28 cm)
P18	24 3/8 in (61.9 cm)	34 1/4 in (86.9 cm)	20-1/4 in (51.4cm)	10-1/2 in (28 cm)

FILTER PAN CAPACITY		
Model	**Pan Capacity**	**Shipping Information**
P14	55 lbs (24.9 Kg)	131 lbs (59.4 Kg.) 10 cu ft. (0.28 cu meters)
P18	75 lbs (34.1 Kg.)	150 lbs (68.0 Kg.) 14 cu ft. (0.40 cu meters)

SHORT FORM SPECIFICATION

Provide Pitco Model P-(14, 18) Unit will have the ability to receive oil gravity drained from fryers. The model P14 will have 300 square inches (1,936 square cm) of filter area. If Paperless units will have 280 square inches (1,806 square cm) of filter area. Models P-18 shall have 450 square inches (2,903 square cm) of filter area. Unit will have a polished stainless steel filter pan and pump enclosure; all other surfaces to be nickel plated.

TYPICAL APPLICATION

Mobile filtering of frying appliances. Filter is used with gravity drain fryers.

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AccuSteam™ Griddle EG Series
Electric/Steam-Heated,
Tabletop Griddle

Project: _____ Location: _____ Item #: _____ Quantity:_____

Short Specification

Griddle shall be an ENERGY STAR compliant electric-heated unit, with a hermetically sealed chamber that produces steam that heats the 7-gauge stainless steel griddle plate. Efficient steam heat transfer provides 200–400°F (93–204°C) operating temperature range and uniform griddle surface temperatures of ±5°F (±3°C). Griddle fabricated from cold-rolled stainless steel with 4" high back splash, sides that taper from 4" to 1 5/16", a 3 7/8" wide by ½" deep full front grease trough and 5 - 6 ½ quart grease drawer. Unit to be UL listed, UL EPH Sanitation Certified (NSF/ANSI 4) and manufactured in the USA.

Construction Features

- Cold-rolled and annealed stainless steel griddle plate with polished stainless steel body
- 7 gauge griddle plate with 4" high rear splash and 4" to 1 5/16" tapered side walls
- 3 7/8" wide by ½" deep full front grease trough
- 1 ½ x 3 ½" drop chute to 5 [24"], 6 ½ [36", 48"] quart capacity grease pan
- 4" legs with bullet feet
- Control guard
- 5' power cord supplied

Performance Features

- Hermetically-sealed steam chamber heats griddle plate
- 9.6-kW [24"] or 14.25-kW [36", 48"] total power, long-life low watt density heating elements mounted inside vacuum chamber and immersed in chemically pure water (Water never needs replacement)
- Steam transfers heat evenly to entire cooking surface with only ±5°F (±3°C) in temperature variation
- Rapid surface temperature recovery allows turning product to same spot
- Smooth cold-rolled stainless steel griddle surface speeds and simplifies cleaning

Standard Control Features

- Heating indicator light
- 200–400°F (93–204°C) digital thermostat
- Easy front service access to controls
- Control guard
- 3 preset temperatures capable
- Manager mode to lock out temperature controls
- Over temperature indicator light

Cooking Capacity & Applications

Effective Cooking Area

Depth	24" Wide	36" Wide	48" Wide
30"	717 sq. in	1077 sq. in.	1437 sq. in.
24"	574 sq. in.	862 sq. in.	1150 sq. in.

Griddle Applications include:

- Pancakes, Eggs, Sausage, French Toast
- Burgers, Grilled Onions, Toasted Buns
- Grilled Cheese, Sandwiches
- Fried Potatoes, Fish, Chicken Breasts, Philly Steaks, Liver and MORE

Safety, Sanitation & Environmental

c UL us LISTED

NSF/ANSI 4

ENERGY STAR

MADE IN THE USA

ECOLOGIX

Options & Accessories

- "U" Channel for connecting 2 griddles
- Front mounted prep shelf—8" wide stainless steel
- Condiment Board
- Maritime Package (call for details)
- Correction Package (call for details)
- Chain Package (call for details)
- Heavy duty stainless steel stand with bottom shelf and 5" casters

EGF-A36 AccuSteam™
Tabletop Griddle shown

AccuTemp product may be covered by one or more US Patents. See www.accutempip.net

MM5206-2110

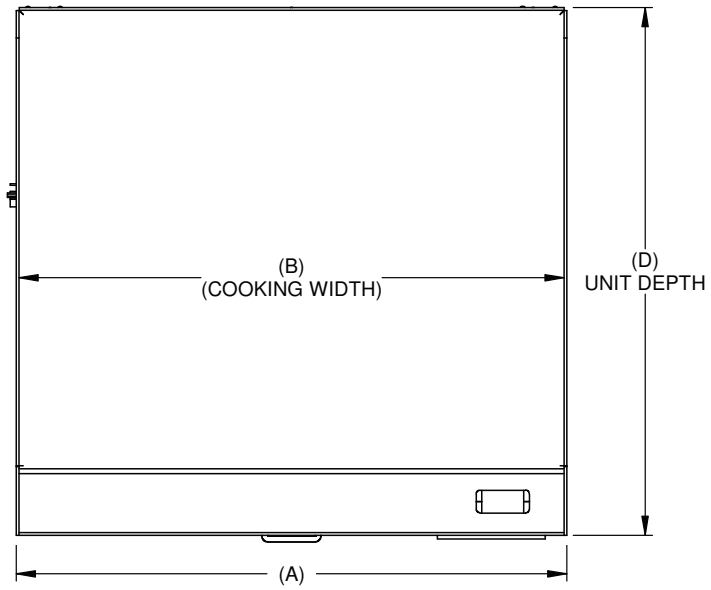
INNOVATIVE COOKING EQUIPMENT SOLUTIONS

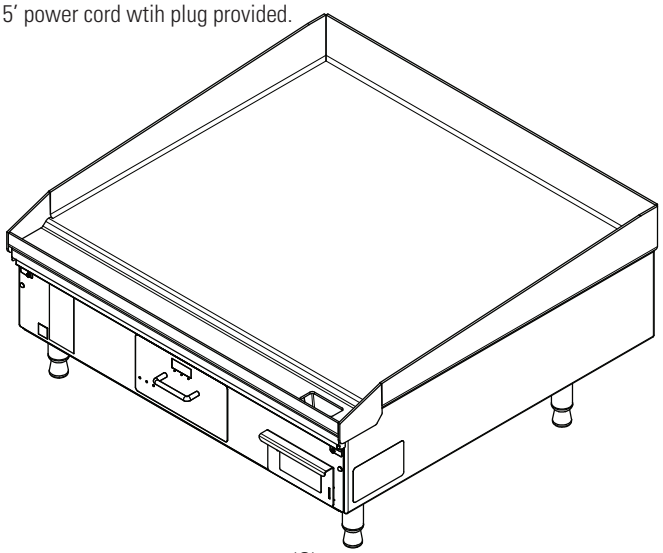
ACCUSTEAM™
HIGH PRODUCTION GRIDDLE

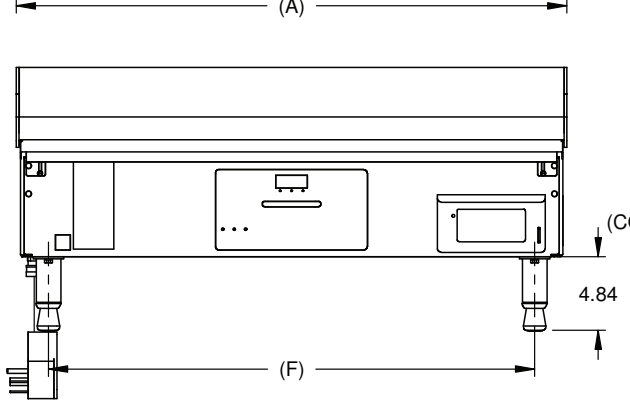
ACCUSTEAM™ GRIDDLE EG SERIES
Electric/Steam-Heated,
Tabletop Griddle

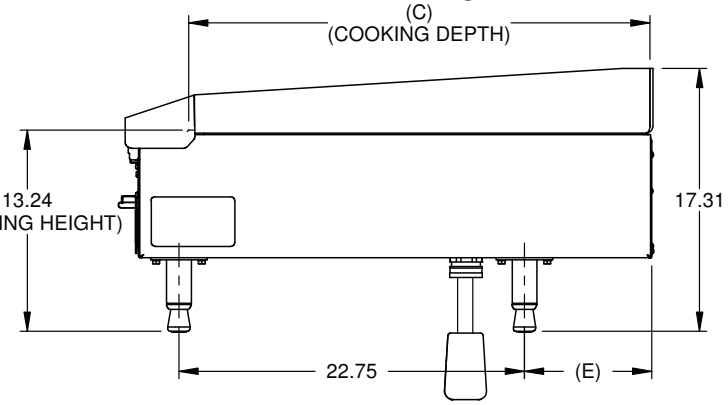
AccuSteam Griddle Specifications (replace **** with voltage & phase, i.e. 2083)						
Model #	EGF****A2450-T1	EGF****B2450-T1	EGF****A3650-T1	EGF****B3650-T1	EGF****A4850-T1	EGF****B4850-T1
KW Input	9.6 kW	9.6 kW	14.25 kW	14.25 kW	14.25 kW	14.25 kW
208/3 Amp Load	27A / 9.6 kW	27A / 9.6 kW	40A / 14.25 kW	40A / 14.25 kW	40A / 14.25 kW	40A / 14.25 kW
240/1 Amp Load	40A	40A	n/a	n/a	n/a	n/a
240/3 Amp Load	24A / 9.6 kW	24A / 9.6 kW	34A / 14.25 kW	34A / 14.25 kW	34A / 14.25 kW	34A / 14.25 kW
440/3 Amp Load	14A / 11 kW	14A / 11 kW	21A / 16 kW	21A / 16 kW	21A / 16 kW	21A / 16 kW
480/3 Amp Load	16A / 13kW	16A / 13kW	23A / 19kW	23A / 19kW	23A / 19kW	23A / 19kW
Unit Width (A)	24.25 [616]	24.25 [616]	36.25 [921]	36.25 [921]	48.25 [1226]	48.25 [1226]
Unit Depth (D)	34.7 [881]	28.7 [729]	34.7 [881]	28.7 [729]	34.7 [881]	28.7 [729]
Cooking Surface Width (B)	23.9 [607]	23.9 [607]	35.9 [912]	35.9 [912]	47.9 [1217]	47.9 [1217]
Cooking Surface Depth (C)	30 [762]	24 [610]	30 [762]	24 [610]	30 [762]	24 [610]
Depth to Rear Leg (E)	8.5 [216]	2.5 [64]	8.5 [216]	2.5 [64]	8.5 [216]	2.5 [64]
Center right to left (F)	20 [508]	20 [508]	32 [813]	32 [813]	44 [1117]	44 [1117]
Effective Cooking Area	717 sq. in.	574 sq. in.	1077 sq. in.	862 sq. in.	1437 sq. in.	1150 sq. in.
Grease Pan Capacity	5 qt	5 qt	6 1/2 qt	6 1/2 qt	6 1/2 qt	6 1/2 qt
NEMA Plug (208/240)	15-50P	15-50P	15-50P	15-50P	15-50P	15-50P
NEMA Plug (440/480)	L16-20P	L16-20P	L16-30P	L16-30P	L16-30P	L16-30P

Notes:
1.) Dimensions in brackets [ ] are metric.
2.) 5' power cord wtih plug provided.









AccuTemp product may be covered by one or more US Patents. See www.accutempip.net

MM5206-2110

TRUE MANUFACTURING CO., INC.
U.S.A. FOODSERVICE DIVISION
2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400
Fax (636)272-2408 • Toll Free (800)325-6152 • Intl Fax# (001)636-272-7546
Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com

Project Name: _____
Location: _____
Item #: _____ *Qty:* _____
Model #: _____

AIA #
SIS #

Model:
TRCB-36-HC~SPEC3

Chef Base:
Drawered Refrigerator with Hydrocarbon Refrigerant~Spec Package 3

TRCB-36-HC~SPEC3

- True's refrigerated chef bases are designed with enduring quality that protects your long term investment.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & 0.02) global warming potential (GWP).
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- Cabinet top is one piece, heavy duty reinforced stainless steel. Drip resistant "V" edge protects against spills. Supports up to 717 lbs. (326 kg).
- All stainless steel front, top, sides, and back.
- Each drawer accommodates one (1) 12"L x 20"W x 4"D (305 mm x 508 mm x 102 mm) full size and three (3) 6"L x 6"W x 4"D (153 mm x 153 mm x 102 mm) ⅙ size food pans (sold separately).
- Heavy-duty stainless steel drawer slides and rollers. Removable without tools for easy cleaning.
- Foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- Counter-Top front is flush with front of drawers.
- Heavy duty all metal working spec door handle.
- Electronic temperature control with digital display.
- Spec Series® logo.

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Drawers	Cabinet Dimensions (inches) (mm) W	D†	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
TRCB-36-HC~SPEC3	2	36⅜ 922	32⅛ 814	20½ 520	¼ ¼	115/60/1 220-240V/50-60Hz	2.4 1.1	5-15P ▲	10 3.05	250 114

† Depth does not include 1½" (39 mm) for drawer handles. † Depth does not include 1" (26 mm) for rear bumpers.
* Height does not include 5" (127 mm) for castors or 6" (153 mm) for optional legs.

▲Plug type varies by country.

MADE WITH INNOVATION IN THE USA · c UL us · CE · natural refrigerant.

12/23 Printed in U.S.A.

APPROVALS:

AVAILABLE AT:

Model:
TRCB-36-HC~SPEC3

Chef Base:
Drawered Refrigerator with Hydrocarbon Refrigerant~Spec Package 3

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & 0.02) global warming potential (GWP).
- Oversized, factory balanced refrigeration system with guided airflow to provide uniform product temperatures.
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- Sealed, self-lubricating evaporator fan motor and larger fan blades give True chef base units a more efficient, low velocity, high volume airflow design. This unique design ensures faster temperature recovery and shorter run times in the busiest of food service environments.
- True's Self-Cleaning RCU technology eliminates the need to clean the condenser coil, reduces energy consumption and helps maintain the coldest temperatures and freshest product.
- Condensing unit accessed from behind side grill; slides out for easy maintenance.

CABINET CONSTRUCTION
- Exterior - stainless steel front, top, sides and back.
- Interior - stainless steel interior liner and floor with coved corners.
- Insulation - entire cabinet structure and drawer facings are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 4" (102 mm) diameter plate castors - locks provided on front set.
- Cabinet top is one piece, heavy duty reinforced 300 series stainless steel. Drip resistant "V" edge protects against spills. Supports up to 717 lbs. (326 kg).

DRAWERS
- Stainless steel exterior drawer facings and liners. Stainless steel drawer frames.
- Heavy duty all metal working spec drawer handles.
- Heavy-duty stainless steel drawer slides and rollers. Removable without tools for easy cleaning.
- Magnetic drawer gaskets of one piece construction, removable without tools for ease of cleaning.
- Each drawer accommodates one (1) 12"L x 20"W x 4"D (305 mm x 508 mm x 102 mm) full size and three (3) 6"L x 6"W x 4"D (153 mm x 153 mm x 102 mm) ⅙ size food pans (sold separately).
- Drawers support a wide variety of incremental pan size configurations.
- Drawer locks.

MODEL FEATURES
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- Counter-Top front is flush with front of drawers.
- Electronic temperature control with digital display.
- Spec Series® logo.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

115/60/1
NEMA-5-15R

RECOMMENDED OPERATING CONDITIONS
- Counter-top cooking equipment should be used in conjunction with the manufacturer supplied legs. Minimum clearance of 4" (102 mm) is required between bottom of cooking equipment heating element and the TRCB top. Failure to provide clearance voids manufacturer warranty.
- Installation of a heat shield is recommended for optimum performance (supplied by others).

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs (1 set of 4 leg mounting plates required).
- ❑ 6" (153 mm) seismic/flanged legs (1 set of 4 leg mounting plates required).
- ❑ Heavy duty, 16 gauge top (available for flat and marine top).
- ❑ Flat top (no marine edge).
- ❑ Additional size drawer divider bars.

PLAN VIEW

Drawing Not Yet Available

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

KCL	Model	Elevation	Right	Plan	3D	Back
	TRCB-36-HC~SPEC3					

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T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0592-LF20
Item No.

This Space for Architect/Engineer Approval

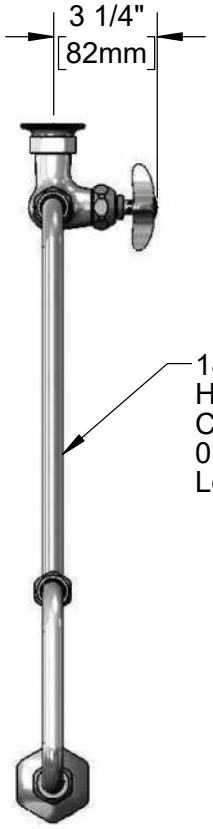
Job Name_____Date_____

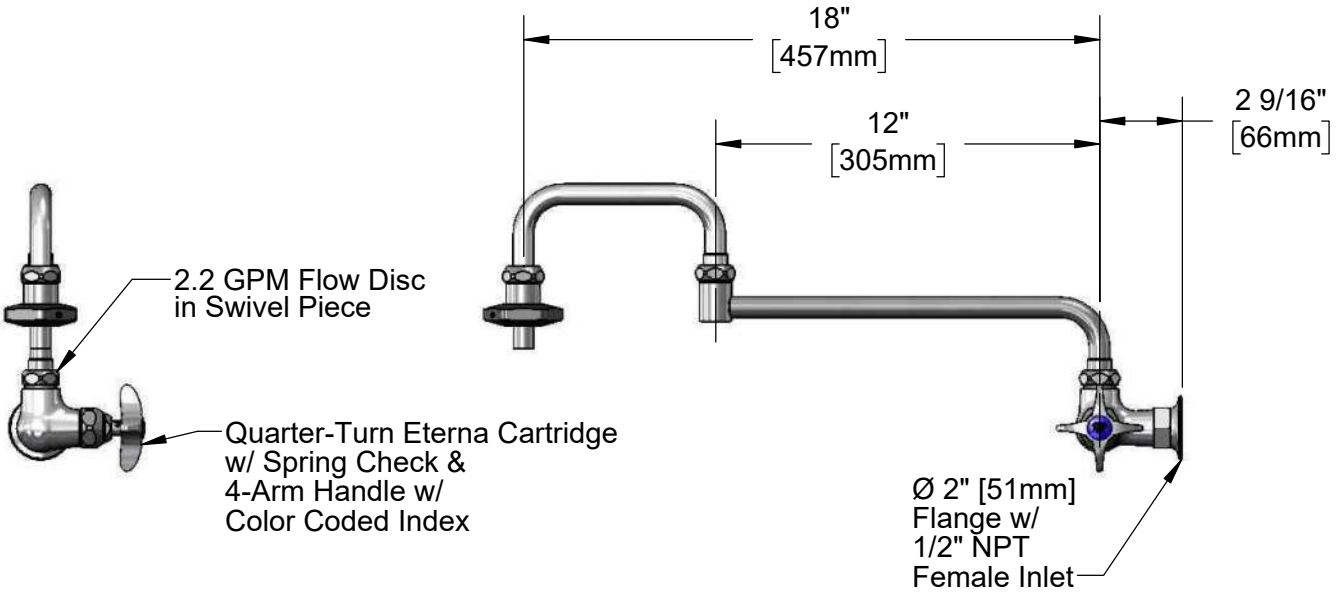
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Product Specifications:
Pot Filler Faucet, Quarter-Turn Eterna Cartridge w/ Spring Check, 4-Arm Handle, 18" Double Joint Swing Nozzle w/ Heat Resistant Handle & 2.2 GPM Flow Control Swivel Piece & 1/2" NPT Female Inlet

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: MRC	Checked: JRM	Approved: JHB	Date: 05/11/18	Scale: 1:6	Sheet: 1 of 2

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

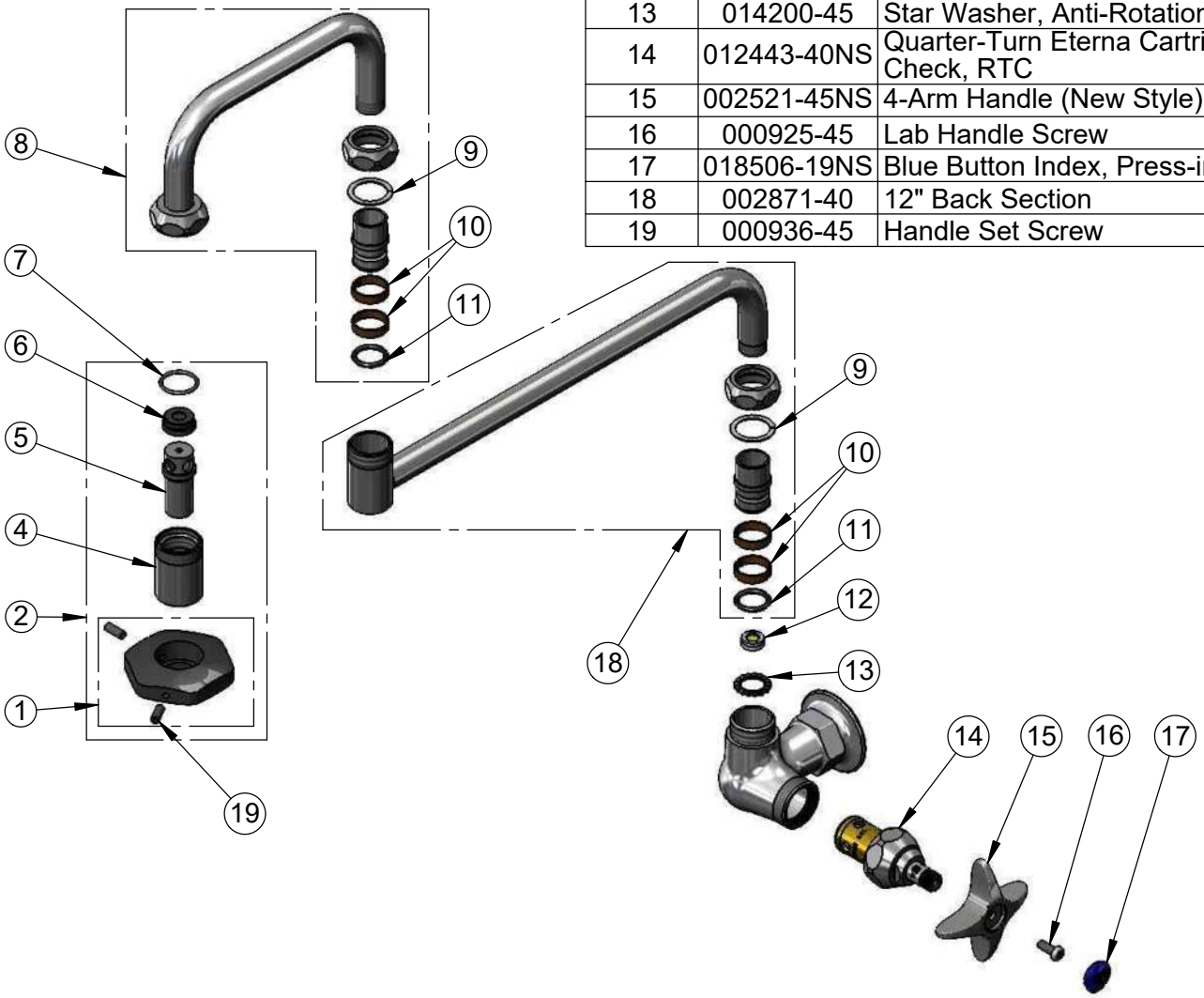
Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0592-LF20

Item No.

Additional View For Bill of Material Clarification w/o Faucet

ITEM NO.	SALES NO.	DESCRIPTION
1	002848-40	18" Double Joint Swing Nozzle w/ Heat Resistant Handle
2	001126-20	Handle w/ (2) Set Screws
3	035A	Outlet
4	000587-25	Spout Body
5	001498-25	Spout
6	001089-45	Seal
7	003426-45	O-Ring
8	002870-40	6" Front Section
9	009538-45	Swivel Washer
10	011429-45	Swivel Sleeves (2)
11	001074-45	O-Ring
12	FD22	Flow Disc, 2.2 GPM [8.3 L/min.] - Yellow
13	014200-45	Star Washer, Anti-Rotation
14	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
15	002521-45NS	4-Arm Handle (New Style)
16	000925-45	Lab Handle Screw
17	018506-19NS	Blue Button Index, Press-in
18	002871-40	12" Back Section
19	000936-45	Handle Set Screw



Product Specifications:
Pot Filler Faucet, Quarter-Turn Eterna Cartridge w/ Spring Check, 4-Arm Handle, 18" Double Joint Swing Nozzle w/ Heat Resistant Handle & 2.2 GPM Flow Control Swivel Piece & 1/2" NPT Female Inlet

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
MRC	JRM	JHB	05/11/18	NTS	2 of 2

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

GARLAND

Master Series Electric Induction Range with Convection Oven

Project _____

Item _____

Quantity _____

CSI Section 11400

Approved _____

Date _____

Models

- GME36M-i14C
- GME36M-i20C

Standard Features

- 36" wide electric induction range with convection oven
- All stainless steel chassis, with stainless steel front and sides
- Four (4) 3.5kW or 5kW hobs, with a 5.63kW (208V) or 7.5kW (240V), 3-phase electric convection oven
- 6" (152mm) adjustable legs
- Seamless design, easy-to-clean Ceran® glass cook-tops and stainless steel exterior
- Unique integrated air management system allows for reliable operation
- Flush back for easy installation and cleaning
- Easy-grip and cool-to-the-touch control knobs
- Integrated circuit breaker, for both induction and oven, provides electric circuit protection
- Easy access panel for regular maintenance
- Two (2) years limited parts and labor warranty (USA & Canada)

Garland Induction Cook-Top:

- Large 6mm thick Ceran® cooking glass surface, 28.3" (720mm) wide X 28.3" (720mm) deep
- The revolutionary RTCSmp induction technology monitors the energy supply and temperatures of the electronic components in real-time. This continuous control yields high performance and efficient cooking.
- Automatic pan detection and boil-dry protection
- Automatic frequency adjustment to various pan compositions for consitant performance
- Simple operation control with 360° rotation, power levels from 1 to 12

Garland Convection Oven:

- Fully insulated stainless steel oven cavity
- Flat convection motor allows for flush mount at the back
- Backward inclined fan blade allows for efficient air flow and quiet operation
- Chrome plated, removable rack guides with three (3) oven racks
- Heat-resistant, stay-cool oven door handle
- Off-Cook-Cool, 3-position convection fan control
- Higher heater power, 3-phase heater

Optional Features

- Deck fasteners, set of four
- Set of four 5" (127mm) polyurethane non-marking swivel casters with front brakes.
- NOTE: Range supplied with casters must be installed with an approved restraining device.

Cook Faster, Smarter & Safer

- Cook faster and more energy-efficiently with Garland Induction RTCSmp
- Built-in quad cooktop with boil-dry protection and faster automatic pan detection.
- Automatic frequency adjustment to various pan compositions for consitant performance.
- Smart engineering design to incorporate Garland induction cooking with Garland's convection oven.
- Variable induction frequency optimizes performance.

NOTE INDUCTION COOKING PAN: Induction cooking equipment requires "Induction Ready" pans to operate. Please consult your equipment supplier.

NSF

Master Series Electric Induction Range with Convection Oven

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

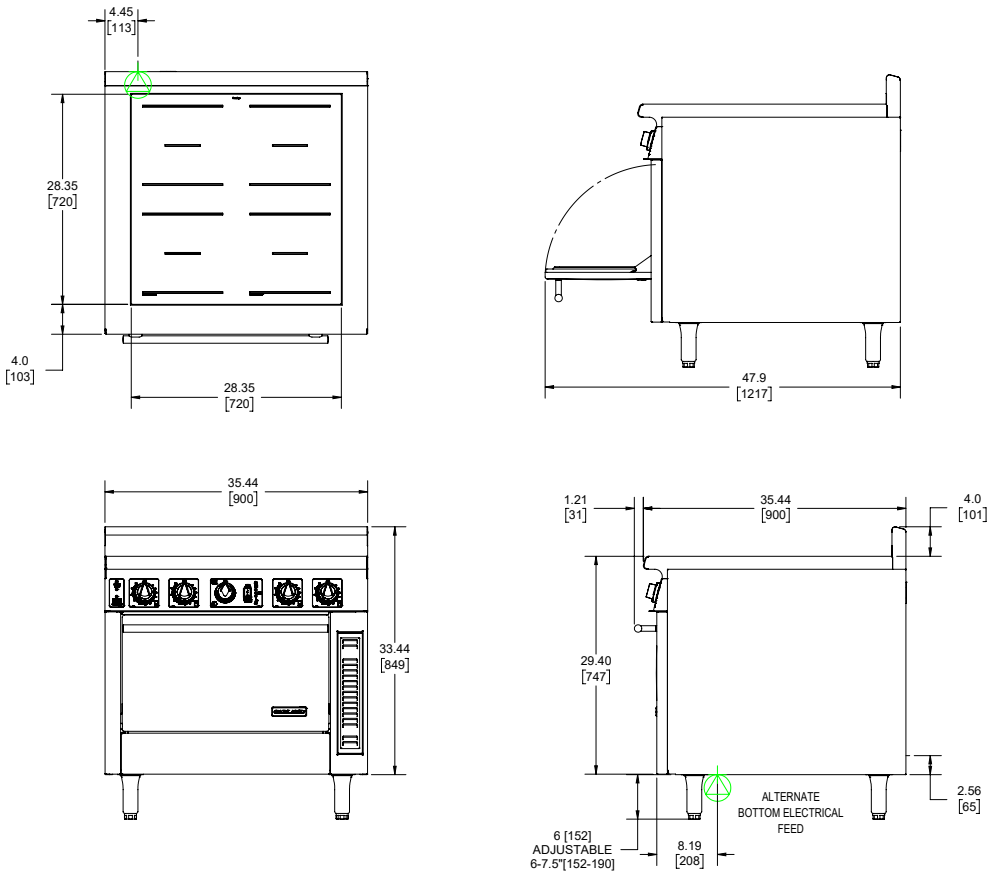
General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
8188
06/25

WELBILT an Ali Group Company

GARLAND

Master Series Electric Induction Range with Convection Oven



Garland products are not approved or authorized for home or residential use, but are intended for commercial applications only. Garland will not provide service, warranty, maintenance or support of any kind other than in commercial applications.

Electrical Loading

MODEL	REGION	VOLTAGE 5-wire: 3-phase, neutral, and ground	TOTAL kW	MAXIMUM AMPERAGE (A)		
				X	Y	Z
GME36M-i14C (3.5kW)	North America	120/208V, 3PH, 5W, 50/60Hz	20.4	56.5	56.5	56.5
		120/240V, 3PH, 5W, 50/60Hz	22.2	53.5	53.5	53.5
	Export	220/380V, 3PH, 5W, 50/60Hz	21.0	31.9	31.9	31.9
		230/400V, 3PH, 5W, 50/60Hz	21.6	31.3	31.3	31.3
		240/415V, 3PH, 5W, 50/60Hz	22.2	30.9	30.9	30.9
	Marine Applications	250/440V, 3PH, 5W, 50/60Hz	23.1	30.4	30.4	30.4
GME36M-i20C (5kW)	North America	120/208V, 3PH, 5W, 50/60Hz	26.7	74.1	74.1	74.1
		120/240V, 3PH, 5W, 50/60Hz	26.7	68.7	68.7	68.7
	Export	220/380V, 3PH, 5W, 50/60Hz	27.4	41.5	41.5	41.5
		230/400V, 3PH, 5W, 50/60Hz	27.9	40.4	40.4	40.4
		240/415V, 3PH, 5W, 50/60Hz	28.6	39.7	39.7	39.7
	Marine Applications	250/440V, 3PH, 5W, 50/60Hz	29.5	38.6	38.6	38.6

Garland reserves the right to make changes to the design or specifications without prior notice.

Garland Commercial Ranges Ltd.
1177 Kamato Road,
Mississauga, Ontario
L4W 1X4 CANADA

General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
Canadian Sales 1-888-442-7526
Canada or USA Parts/Service 1-800-427-6668

www.garland-group.com
8188
06/25

WELBILT an Ali Group Company

BLODGETT

ZEPHAIRE-100-E

Full-Size, Standard Depth Electric Convection Oven

Project _____

Item No. _____

Quantity _____

ZEPHAIRE-100-E

Standard depth baking compartment - accepts five 18" x 26" standard full-size baking pans in left-to-right positions

All data is shown per oven section, unless otherwise indicated.

Refer to operator manual specification chart for listed model names.

EXTERIOR CONSTRUCTION

- Full angle-iron frame
- Stainless steel front, top, and sides
- Dual pane thermal glass windows encased in stainless steel door frames
- Powder coated door handle with simultaneous door operation
- Triple-mounted pressure lock door design with turnbuckle assembly
- Removable front control panel
- Solid mineral fiber insulation at top, back, sides and bottom

INTERIOR CONSTRUCTION

- Double-sided porcelainized baking compartment liner (14 gauge)
- Aluminized blower wheel
- Five chrome-plated racks, eleven rack positions with a minimum of 1-5/8" (41mm) spacing

OPERATION

- Three tubular heaters
- Solid state thermostat with temperature control range of 200°F (93°C) to 500°F (260°C)
- Two speed fan motor
- 1/2 horsepower blower motor with automatic thermal overload protection
- Control area cooling fan
- Two interior oven lamps

STANDARD FEATURES

- SSI-M - solid state infinite control with separate dials for thermostat and timer
- 25" (635mm) adjustable stainless steel legs (for single units)
- 6" (152mm) adjustable stainless steel legs (for double sections)
- Two year parts and two year labor warranty*
- Three year limited oven door warranty*

** For all international markets, contact your local distributor.*

NOTE: The company reserves the right to make substitutions of components without prior notice

OPTIONS AND ACCESSORIES

(AT ADDITIONAL CHARGE)

- **Legs, casters & stands**
  - ❑ 6" (152mm) seismic legs
  - ❑ 6" (152mm) casters
  - ❑ 4" (102mm) low profile casters (double only)
  - ❑ 25" (635mm) stainless steel open stand withrack guides
  - ❑ 29" fully welded stand
- ❑ SSD - solid state digital control with LED display, Cook & Hold and Pulse Plus®
- ❑ VLF ventless hood
- ❑ Extra oven racks
- ❑ Vent connector
- ❑ 480 VAC, 3 phase
- ❑ Extended labor warranty

OPTIONS AND ACCESSORIES

(AT NO ADDITIONAL CHARGE)

- ❑ Solid stainless steel doors

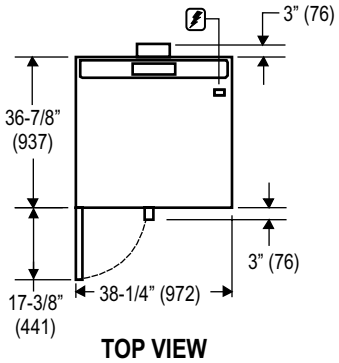
www.blodgett.com
42 Allen Martin Drive, Essex Junction, VT 05452
Phone: (802) 658-6600 | Fax: (802) 864-0183

P/N 52775 Rev M (6/22)

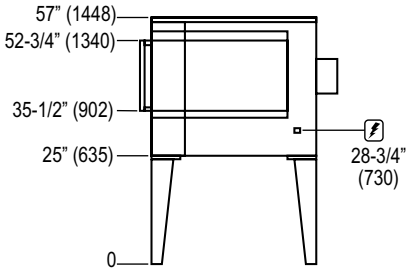
BLODGETT

ZEPHAIRE-100-E

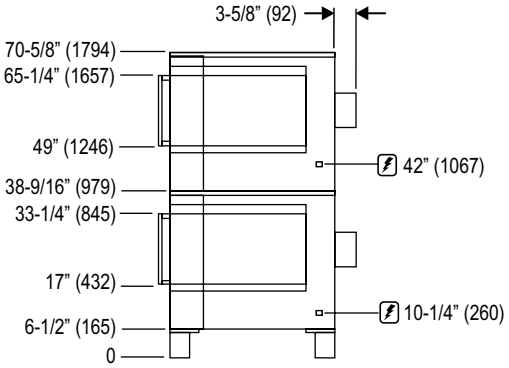
APPROVAL/STAMP



TOP VIEW



SINGLE



DOUBLE

SHORT FORM SPECIFICATIONS Provide Blodgett full-size convection oven model ZEPHAIRE-100-E, (single/double) compartment. Each compartment shall have porcelainized steel liner and shall accept five 18" x 26" standard full-size bake pans in left to right positions. Doors shall have dual pane thermal glass windows with single powder coated handle and simultaneous operation. Unit shall be electrically heated with three tubular heaters. Air in baking chamber distributed by single inlet blower wheel powered by a two-speed, 1/2 HP motor with thermal overload protection. Each chamber shall be fitted with five chrome-plated removable racks. Control panel shall be recessed with Cook/Cool Down mode selector, solid state infinite control with separate dials for thermostat and timer. Provide options and accessories as indicated.

DIMENSIONS

Floor space	38-1/4" (972mm) W x 36-7/8" (936mm) L
Interior	29" (737mm) W x 20" (508mm) H x 24-1/4" (616mm) D
If oven is on casters	
Single	Add 4-1/2" (114mm) to height
Double	Height dimensions remain the same
Double Low Profile	Subtract 2.5" (64mm) from all height dimensions

PRODUCT CLEARANCE

From combustible and non-combustible construction

1/2" (13 mm)

MINIMUM ENTRY CLEARANCE

Uncrated	32-1/16" (814mm)
Crated	37-1/2" (953mm)

SHIPPING INFORMATION

Approx. Weight

Single	480 lbs. (218 kg)
Double	960 lbs. (435 kg)

Crate Size

37-1/2" (952mm) x 43-1/2" (1105mm) x 51-3/4" (1315mm)
(2 crates required for double)

MAXIMUM INPUT

11KW per oven section

POWER SUPPLY

VAC	Hz	Phase	kW	Amps (L1-L2-L3)
208	60	1	11	51/0/51
208	60	3	11	31/29/29
220/240	60	1	11	44/0/44
220/240	60	3	11	26/24/24
440	60	3	11	15/14/14
480	60	3	11	14/13/13

1/2 H.P., 2 speed motor, 1120 and 1710 RPM (60Hz.)

VAC	Hz	Phase	kW	Amps (L1-L2-L3-N)
220/240	50	1	11	48/0/0/48
240/415	50	3	11	18/14/14/4
230/400	50	3	11	18/15/15/3

FOR COMMERCIAL USE ONLY

1200-UP

Low-Temperature Hot-Food Holding Cabinet

Keeping food that has been cooked to perfection hot and fresh until the moment it is served demands the gentle precision of Alto-Shaam's exclusive Halo Heat® technology. With controlled temperatures and a closed environment free from forced air, harsh heating elements, and added humidity, food is kept warm and flavorful, just as intended.

1200-UP

Standard features

- Simple and intuitive pushbutton control that commands all appliance functions with easily identifiable icons
- Halo Heat—a controlled, uniform heat source that gently surrounds food for better appearance, taste, and longer holding life
- Stainless steel interior resists corrosion
- Digital control senses temperature drops faster, providing quick heat recovery time
- Close temperature tolerance and even heat application maintain ideal serving temperature throughout the cabinet
- Antimicrobial handle retards the growth of illness-causing pathogens
- Door venting holds crispy food better

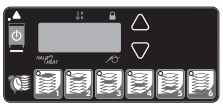
Deluxe control option (select one)

Deluxe control features SureTemp™ heat recovery system. SureTemp™ reacts immediately to compensate for any loss of heat whenever the door is opened.

☐ Deluxe control **(A)**
☐ Deluxe control with probe **(A)**
☐ Deluxe control with six (6) independent shelf timers **(B)**
☐ Deluxe control with probe and shelf timers **(B)**

A

B



Side rack model

☐ As an alternative to universal pan slides, this unit can be ordered as a "side rack" model which is equipped with two (2) side racks and three (3) chrome plated wire shelves. It will accommodate full and half size US hotel and European gastronorm pans on the side racks or shelves, or sheet pans on shelves.

TEMPERATURE

Temperature range: 60°F to 200°F (16°C to 93°C)

ANSI/NSF 4

Not for pass-through models

Capacities Guide

Configurations (select one)

Door choices

☐ Solid door, standard
☐ Window door, optional

Door swing

☐ Right hinged, standard
☐ Left hinged, optional

Electrical

☐ 120V, 1 ph
☐ 208–240V (4000W), 1 ph
☐ 230V (4000W), 1 ph
☐ 208–240V (2000W), 1 ph
☐ 230V (2000W), 1 ph

Cabinet choices

☐ Reach-in, standard
☐ Pass-through, optional—doors hinged on opposite sides
☐ Pass-through, optional—doors hinged on same side. Requires factory installed counterweight. Add 110lbs (50kg) to net and shipping weight.

Accessories (select all that apply)

☐ Bumper, full perimeter (5012932)
☐ Handle kit, push/pull—set of four (55662)
☐ Door lock with key—each handle (LK-22567)
☐ Security panel with lock—requires door lock (LK-22567) (5013934)
☐ Pan grid, wire, 16-3/8" x 24-3/4" (416mm x 619mm) (PN-2115)
☐ Legs, 6" (152mm), flanged—set of four (5011149)
☐ Drip pan with drain, 1-11/16" (43mm) deep (5014448)
☐ Water reservoir pan—for proofing (1775)
☐ Water reservoir pan cover (1774)
☐ Universal pan slides—2 required
☐ Chrome plated (SR-24447)
☐ Stainless steel (SR-24762)

Casters, stem—2 rigid, 2 swivel w/ brake

☐ 3-1/2" (89mm) (5008017)

Shelves

☐ Stainless steel (SH-23738)
☐ Chrome plated (SH-2733)

Additional features

☐ Side rack model—as an alternative to pan slides, this unit can be ordered as a "side rack" model

1200-UP

ALTO-SHAAM

CAPACITY

Pan Slides (2 per set)—1-3/4" (44mm) centers

8 Eight full-size hotel pans or GN 1/1 pans 2-1/2" (65mm) deep—per cavity. Sixteen full-size or GN 1/1 pans 2-1/2" (65mm) deep—with four additional sets of pan slides per cavity

8 Eight full-size hotel pans or GN 1/1 pans 4" (102mm) deep—per cavity. See pan capacity guide for maximums

6 Six full-size or GN 1/1 pans 6" (150mm) deep—two per set of per cavity. See pan capacity guide for maximums

4 Four full-size sheet pans—per cavity; sixteen full-size sheet pans with twelve sets of additional pan slides. See pan capacity guide for maximums

192 lb (87kg) product maximum

120 qt (152 L) volume maximum

Side Rack and Shelves

10 10 full-size hotel pans or GN 1/1 pans 2-1/2" (65mm) deep—per cavity. Requires two optional shelves. See pan capacity guide for maximums

8 Eight full-size hotel pans or GN 1/1 pans 4" (102mm) deep—per cavity. See pan capacity guide for maximums

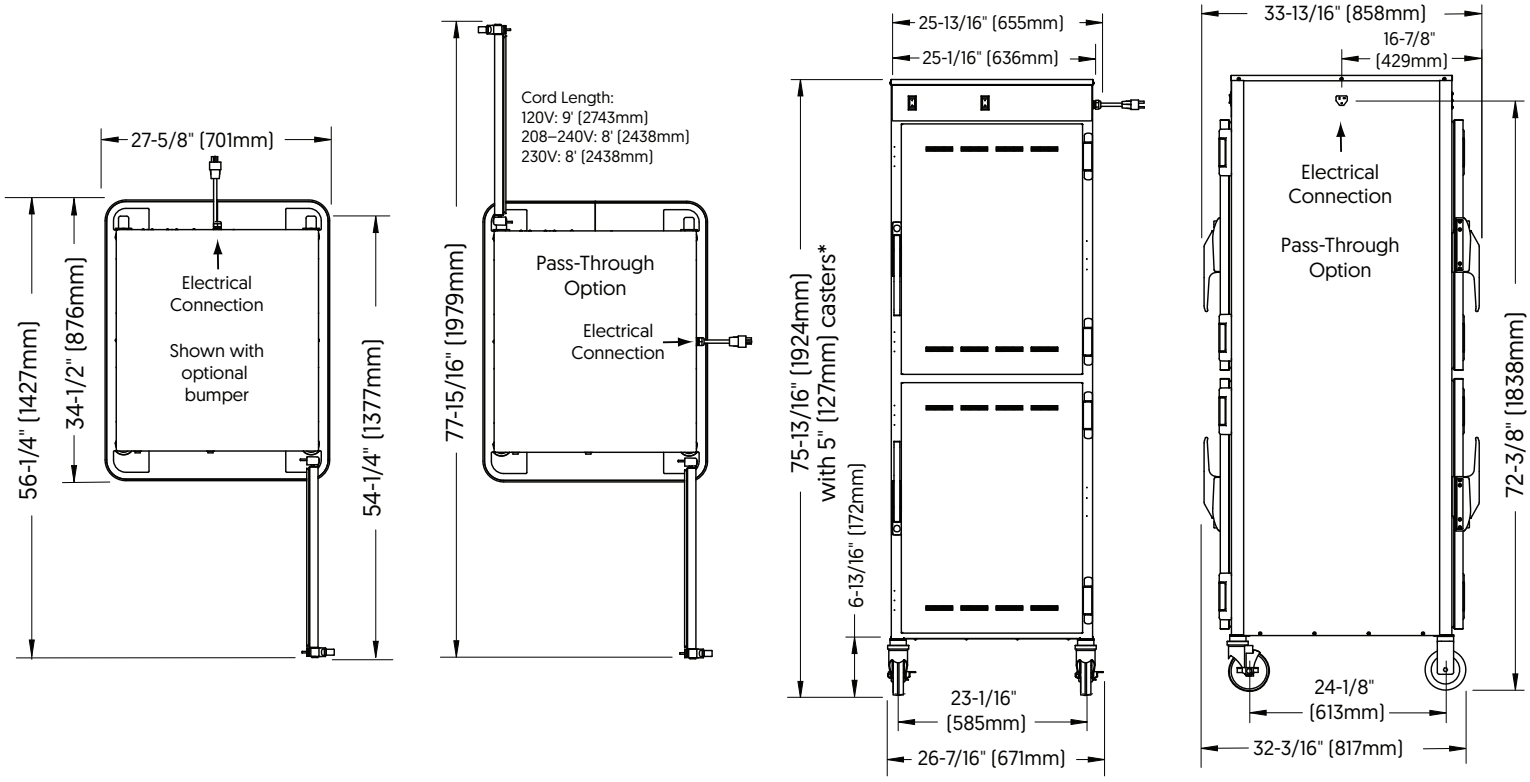
6 Six full-size hotel pans or GN 1/1 pans 6" (150mm) deep—per cavity. See pan capacity guide for maximums

3 Three full-size sheet pans—per cavity, with included shelves. See pan capacity guide for maximums

192 lb (87kg) product maximum

120 qt (152 L) volume maximum

DIMENSIONS



*74-1/16" (1881mm) with optional 3-1/2" (89mm) casters
*75-5/8" (1921mm) with optional 6" (152mm) legs

DIMENSIONS

Model
1200-UP

Exterior (H x W x D)
75-13/16" x 26-7/16" x 32-3/16" (1924mm x 671mm x 817mm)

Pass-Through Exterior
75-13/16" x 26-7/16" x 33-13/16" (1924mm x 671mm x 858mm)

Ship Dimensions (L x W x H)*
35" x 35" x 82" (889mm x 889mm x 2083mm)

Interior—each compartment (H x W x D)
28-3/4" x 21-5/16" x 26-1/2" (730mm x 541mm x 673mm)

Net Weight
333 lb (151 kg)

Ship Weight*
393 lb (178 kg)

*Domestic ground shipping information. Contact factory for export weight and dimensions.

1200-UP

ALTO-SHAAM

REQUIREMENTS

- Appliance must be installed level.
- Appliance must not be installed in any area where it may be affected by steam, grease, dripping water, extreme temperatures, or any other severely adverse conditions.
- Appliances with casters and no cord or plug must be secured to the building structure with a flexible connector. Not factory supplied.

CLEARANCE

Top:	2" (51mm)
Left:	1" (25mm)
Right:	1" (25mm)
Back:	3" (76mm)

ELECTRIC

1200-UP	V	Ph	Hz	A	kW	Cord & Plug
120V	120	1	50/60	16.0	1.9	NEMA 5-20p 20A-125V plug
208-240V	208 [2000W]	1	50/60	7.0	1.4	NEMA 6-15p 15A-250V plug (U.S.A. only)
	240 [2000W]	1	50/60	8.0	1.9	
	208 [4000W]	1	50/60	14.0	2.9	No cord or plug
	240 [4000W]	1	50/60	16.0	3.8	
230V	230 [2000W]	1	50/60	7.7	1.8	Plugs rated 250V CEE 7/7 CH2-16p
	230 [4000W]	1	50/60	15.4	3.5	BS 1363 (U.K. only) AS/NZS 3112

HEAT

Heat of rejection

1200-UP	Heat Gain qs, BTU/hr	Heat Gain qs, kW
	770	0.23

CONTACT US

W164 N9221 Water Street | Menomonee Falls, Wisconsin 53051 | U.S.A.
Phone: 262.251.3800 | 800.558.8744 U.S.A./Canada | Fax: 262.251.7067 | alto-shaam.com

HH-SPC-0007 - 3/25 EN Printed in U.S.A. Due to ongoing product improvement, specifications are subject to change without notice.

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: S/S WORKTABLE, MOBILE

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

STAINLESS STEEL WORKTABLE, MOBILE
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

SFT
Shallow Floor Trough

General Information

Project Name: _____

Consultant: _____

Item #: _____

Model #: _____

Quantity: _____

Specifications

SFT Shallow Floor Troughs are 14GA type 300 series stainless steel, with large integral coves and pitched ¼" per foot to a 6½" OD waste outlet with 4" OD tail-piece. Perforated waste basket provided at each drain. Anchor straps welded to the sides secure trough to the floor.

Recessed flange and 1" deep ledge for IMC grating are integral with the unit. Trough is 2" deep overall.

Joints are TIG welded and leak-proof. Exposed surfaces finished brush satin.

Product Guide

Use for food prep facilities where floor thickness limits trough depth to 2".

Integral coves, deep pitch and a large waste cup, assure quick and complete drainage.

Recessed flange supports floor tile and provides a grout pocket.

Setting frame for waterproof membrane and/or integral seep-age flange with "weep" holes can be added for wet floor areas.

Options*

- ☐ **DOD** - 3", 3½", 5", 6", 8" OD Tube (circle one)
- ☐ **WTO** - Waste Tube over 3" Long
- ☐ **AW** - Additional Wastes
- ☐ **WCP** - Waste Cup Strainers
- ☐ **BH** - Beehive Strainers (Each)
- ☐ **OCW** - Off Center Waste (Each)
- ☐ **ST12** - Scrap Tray Up to 18" Wide
- ☐ **PWT** - Perforated Waste Pipe
- ☐ **SF-2** - Special Size Setting Flange 2" Deep
- ☐ **SF-4** - Special Size Setting Flange 2" to 4" Deep
- ☐ **OWT** - Oversize Waste Tube
- ☐ **FSG** - Seepage Flange w/ Weep Holes
- ☐ **ST20** - Scrap Tray 20" Long
- ☐ **DSE** -Drain on the End
- ☐ **ROD** - Rim on Drain
- ☐ **BSPC** - Basket Strainer w/ Han-dle & Chain
- ☐ **BXD** - Box Type Drain
- ☐ **BSX** - Beehive Strainer for Box Drain

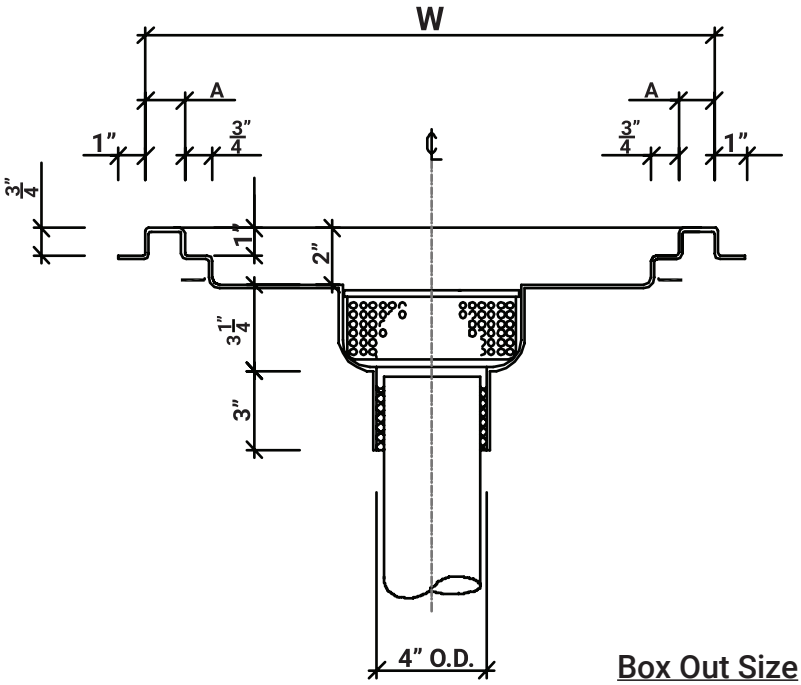
***See Price List for Complete Options**

SFT-10 1121

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

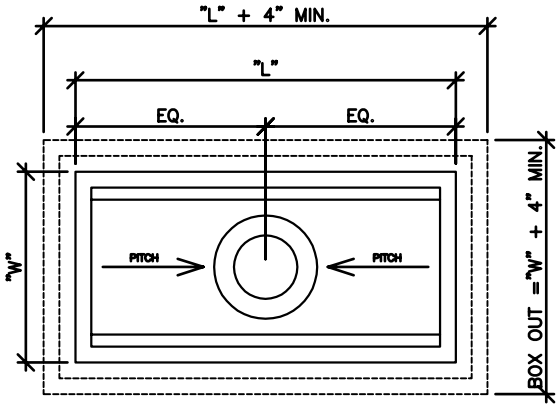
SFT
Shallow Floor Trough

DRAWINGS



A = 1" for Troughs up to 15" Wide
A = 1 1/2" for Troughs over 15" Wide

Box Out Size



Trough Area

- Width (PIT) = Width ("W") + 4" Minimum
- Length (PIT) = Length ("L") + 4" Minimum
- Depth (PIT) = Depth of Trough + 1/2" + Finish Floor
- Size of Rough-In Hole For Drains 7½ Ø Minimum

SHALLOW FLOOR TROUGHS

Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)
□ SFT-1224	12" x 24"	□ SFT-1824	18" x 24"	□ SFT-2424	24" x 24"	□ SFT-3024	30" x 24"
□ SFT-1230	12" x 30"	□ SFT-1830	18" x 30"	□ SFT-2430	24" x 30"	□ SFT-3030	30" x 30"
□ SFT-1236	12" x 36"	□ SFT-1836	18" x 36"	□ SFT-2436	24" x 36"	□ SFT-3036	30" x 36"
□ SFT-1248	12" x 48"	□ SFT-1848	18" x 48"	□ SFT-2448	24" x 48"	□ SFT-3048	30" x 48"
□ SFT-1260	12" x 60"	□ SFT-1860	18" x 60"	□ SFT-2460	24" x 60"	□ SFT-3060	30" x 60"
□ SFT-1272	12" x 72"	□ SFT-1872	18" x 72"	□ SFT-2472	24" x 72"	□ SFT-3072	30" x 72"
□ SFT-1284	12" x 84"	□ SFT-1884	18" x 84"	□ SFT-2484	24" x 84"	□ SFT-3084	30" x 84"
□ SFT-1296	12" x 96"	□ SFT-1896	18" x 96"	□ SFT-2496	24" x 96"	□ SFT-3096	30" x 96"
□ SFT-12108	12" x 108"	□ SFT-18108	18" x 108"	□ SFT-24108	24" x 108"	□ SFT-30108	30" x 108"
□ SFT-12120	12" x 120"	□ SFT-18120	18" x 120"	□ SFT-24120	24" x 120"	□ SFT-30120	30" x 120"

Note - Standard troughs up to 96" have one (1) waste at center. Over 96", troughs have two (2) wastes equidistant.

Specifications subject to change without notice.

SFT-10 1121

DESCRIPTION: COUNTER W/SINK

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

CUSTOM COUNTER WITH SINK
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0220

Item No.

ADA Compliant

This Space for Architect/Engineer Approval

Job Name_____Date_____

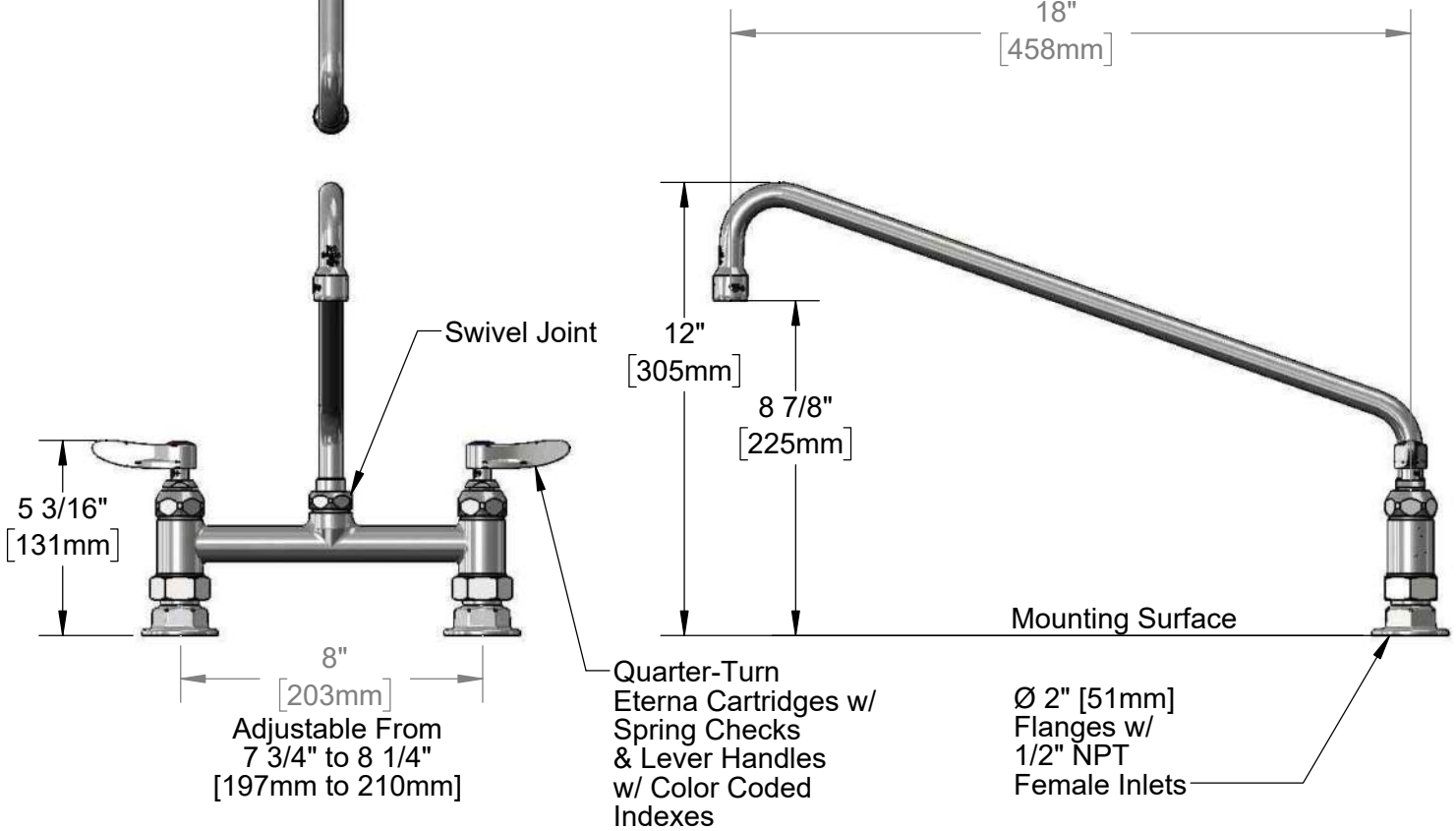
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____

065X
18" Swing Nozzle w/
Stream Regulator Outlet.
Converts to Rigid w/
014200-45
Lock Washer (Included)



Product Specifications:

8" Deck Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 18" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
MRC	JRM	JHB	05/01/18	1:5	1 of 2

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2 Saddleback Cove / P.O. Box 1088
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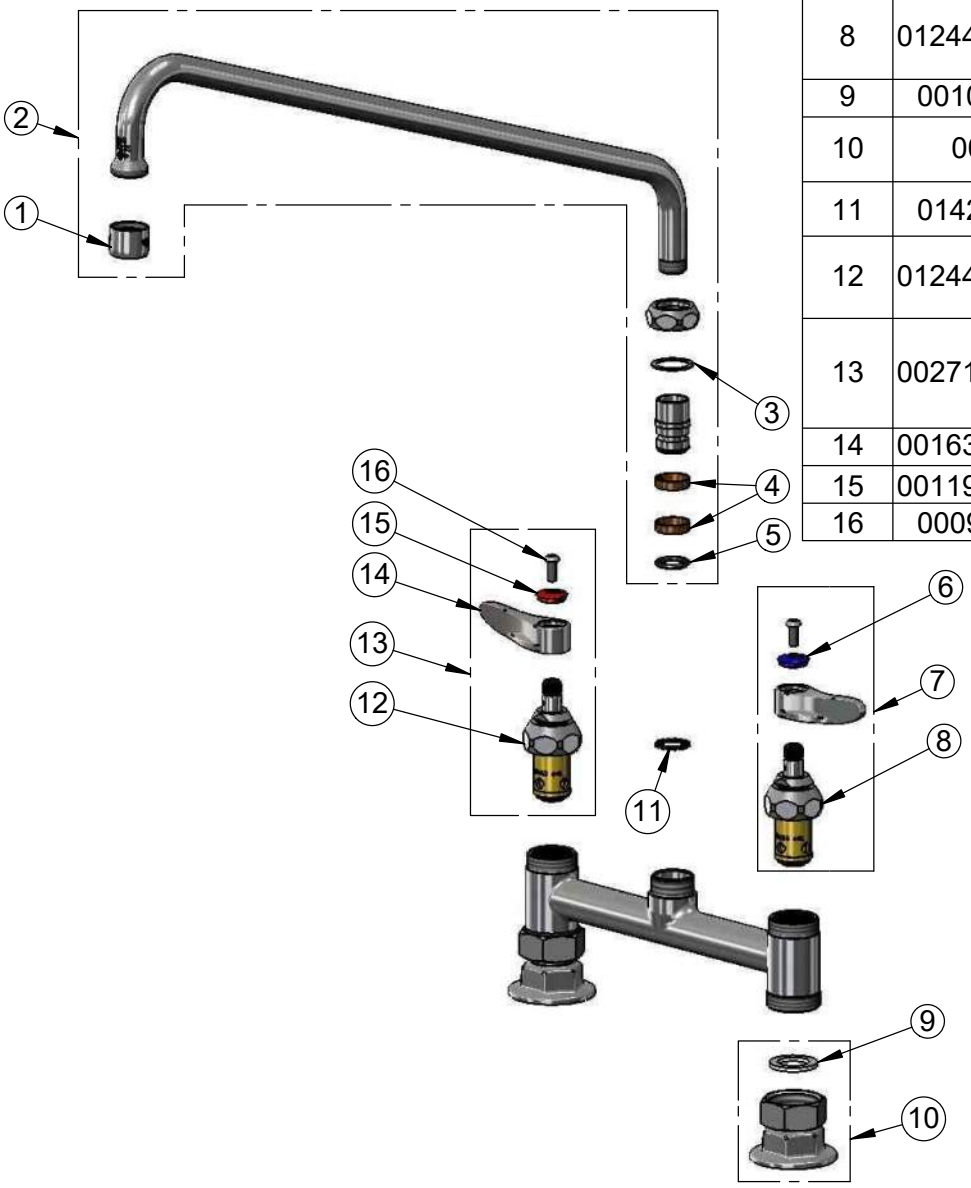
Model No.
B-0220

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-PT	Stream Regulator Outlet
2	065X	18" Swing Nozzle
3	009538-45	Swivel Washer
4	011429-45	Swivel Sleeves (2)
5	001074-45	O-Ring
6	018506-19NS	Blue Button Index, Press-in
7	002711-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, LTC
8	012442-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, LTC
9	001019-45	Coupling Nut Washer
10	00AA	1/2" NPT Female Eccentric Flange
11	014200-45	Star Washer, Anti-Rotation
12	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
13	002712-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, RTC
14	001638-45NS	Lever Handle (New Style)
15	001193-19NS	Red Button Index, Press-in
16	000925-45	Lab Handle Screw

Product Specifications:
8" Deck Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 18" Swing Nozzle & 1/2" NPT Female Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
MRC	JRM	JHB	05/01/18	NTS	2 of 2

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2 Saddleback Cove / P.O. Box 1088
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Model No.
B-0425

Item No.

This Space for Architect/Engineer Approval

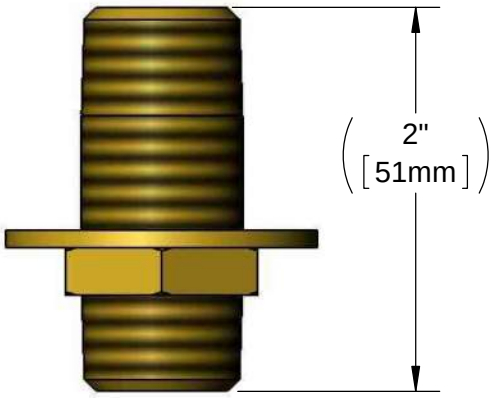
Job Name_____Date_____

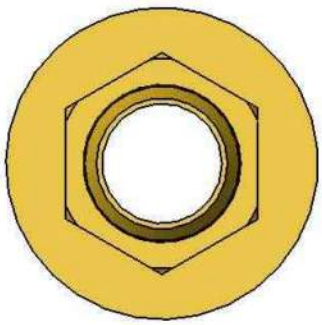
Model Specified_____ Quantity_____

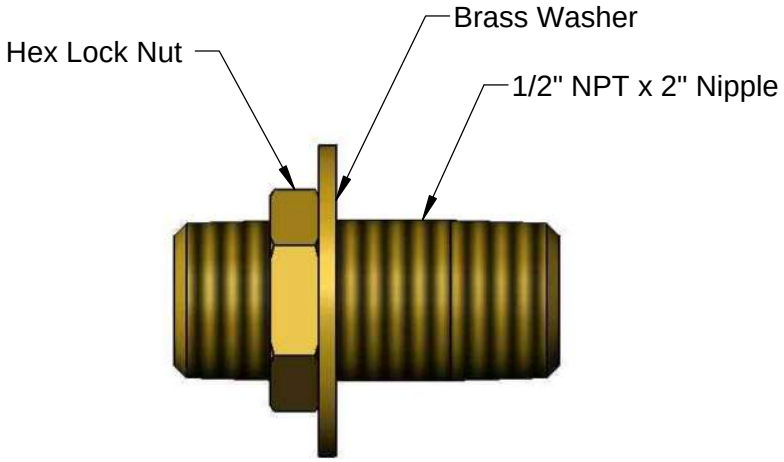
Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____







Product Specifications:
1/2" NPT Inlet Supply Nipple Kit

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: JBC	Checked: JRM	Approved: JHB	Date: 09/25/15	Scale: 1:1	Sheet: 1 of 1

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2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

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Model No.
B-0425-KIT

Item No.

This Space for Architect/Engineer Approval

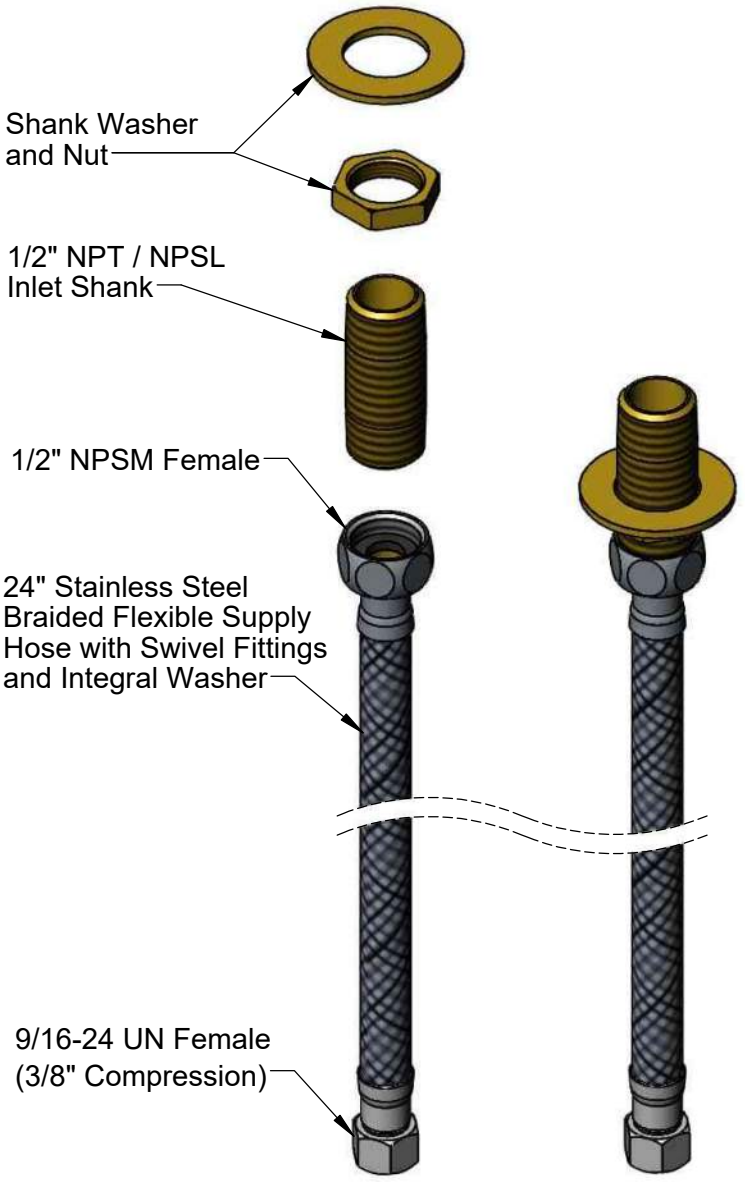
Job Name_____Date_____

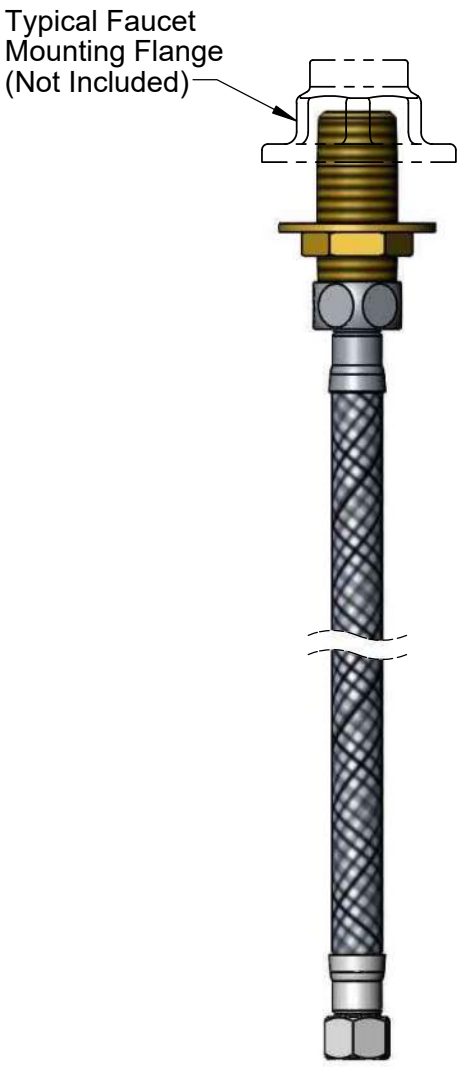
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





(2) Sets Supplied per Kit

Product Specifications:
Inlet Kit w/ 1/2" NPT Shanks, Washers, Nuts & 24" Flexible Supply Hoses

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: KJG	Checked: LSA	Approved: JHB	Date: 07/26/21	Scale: 1:2	Sheet: 1 of 2

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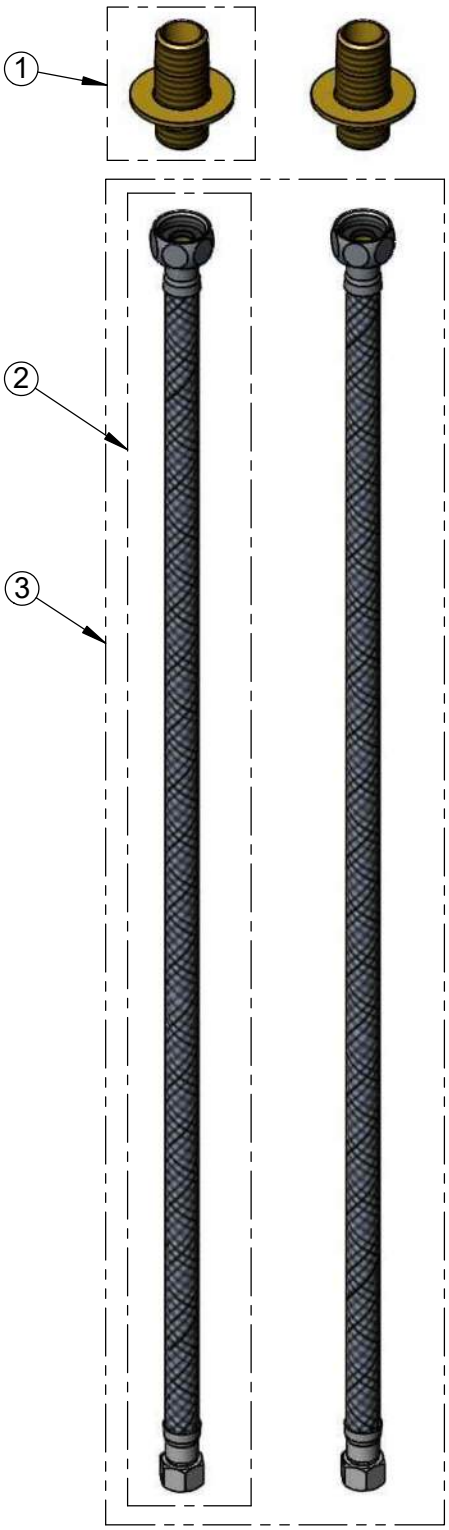
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0425-KIT

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0425	1/2" NPT Inlet Supply Nipple Kit
2	017420-45	24" Flexible Supply Hose
3	B-1100-KIT	24" Flexible Supply Hose (2)

Product Specifications:
Inlet Kit w/ 1/2" NPT Shanks, Washers, Nuts & 24" Flexible Supply Hoses

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

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KJG	LSA	JHB	07/26/21	NTS	2 of 2

34201523 - TrimLine™ Rectangle Waste Container Trash Can 15 Gallon - Gray

Item Number	Case Pack
34201523	4ea

$61.32/Each
$245.28/Case
1 Case is 4ea

- Slim rectangle waste container fits neatly beside work tables or in narrow spaces
- Textured surface resists scuffs and marking
- Integrated tabs prevent liners from slipping into container
- Hand grips on container bottom simplify lifting and emptying
- Smooth inner surface is easy to clean
- BPA Free

Tech Specs

	US	Metric
Length	10.50 in	26.67 cm
Width	20.00 in	50.80 cm
Height	24.75 in	62.87 cm
Capacity	15.00 gal	56.78 l
Min Temperature	-50.00 °F	-45.56 °C
Max Temperature	120.00 °F	48.89 °C
Bottom Length	17.00 in	43.18 cm
Bottom Width	8.10 in	20.57 cm
Cut Out Length	19.25 in	48.90 cm
Cut Out Width	9.25 in	23.50 cm
Material	Polyethylene (LLDPE)	
Country of Origin	China	

Tech Specs

	US	Metric
Case Weight	5.70 lb	2.59 kg
Case Cube	3.16 ft3	0.09 m3
Case Length	24.81 in	63.02 cm
Case Width	20.03 in	50.88 cm
Case Height	11.00 in	27.94 cm
Pallet Case Qty	8	
Pallet Tier	8	
Pallet High	1	
Harmonized Code	392490.5650	
Freight Class	300	

	US	Metric
Each UPC	017183381659	
Case GTIN	10017183381656	

Related Products

Product	Description	Case Pack	Case Weight	Case Cube
Lids				
342026REC	TrimLine™ Rectangle RECYCLE Lid with Paper Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
342027REC	TrimLine™ Rectangle RECYCLE Lid with Bottle and Can Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
Accessories				
369210		1 ea	12.00 lb	1.58 ft^3

WASTE CONTAINERS

TRIMLINE™ RECTANGLE WASTE CONTAINERS

- Slim shape saves space by fitting into narrow spaces along walls and near work benches
- Corner tabs keep trash bags securely in place for spill-free, even filling
- Base helper handles stabilize container while being lifted and emptied
- Swing top, handled, or cut-out recycling lid styles available

34202423

34201523

34202469

34202369

342027REC

34202314

BPA FREE

Black (03) Beige (06) Green (09) Blue (14) Gray (23) Dark Brown (69)

Prod No	Description	Color	UOM	Case Qty	List Price
TrimLine™ Containers					
342023 Δ	Rectangle Waste Container - 23 Gallon	03, 06, 09, 14, 23, 69	CS	4	$288.08
342015 Δ	Rectangle Waste Container - 15 Gallon	23	CS	4	$243.28
TrimLine™ Waste Containers Lids					
342024 Δ	Rectangle Swing-Top Waste Container Lid - 15 & 23 Gallon	03, 23, 69	CS	4	$203.20
342027REC Δ	Rectangle Waste Container Recycle Lid with Bottle and Can Receptacles - 15 & 23 Gallon	14	CS	4	$224.44

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

Project _____
Item No. _____
Model No. _____
Quantity _____

CSI No. 114000

COUNTER HEIGHT REFRIGERATOR - THREE SECTION

CHR-75-3S-D-EM
93" Overall Width, Three Doors
(shown with optional stainless steel flat top)

STANDARD FEATURES:

Construction/Cabinet
- Exterior front and sides – heavy gauge stainless steel
- Exterior back and bottom – heavy gauge galvanized
- Stainless steel compressor housing
- Stainless steel front, door, end mount, and interior
- Heavy-duty 6" adjustable stainless steel legs
- Cabinet body is foamed-in-place minimum 2-1/2" thick polyurethane insulation
- Fully coved interior with welded radius corners for easy cleaning
- Optional drawers hold two 12" x 20" pans or fractional pans (pans by others)
- Rugged drawer construction
- Welded stainless steel door handle or drawer pull
- Compressor housing located on left side (optional on right side)
- Stainless steel shelf clips and shelf standards
- One adjustable chrome plated wire shelf per section

Doors
- Self-closing, lift off door hinges with stay-open feature at 120°
- Standard left door hinged left, center and right door hinged right (other configurations available)
- Energy saving condensate heater around door opening
- Snap-in magnetic door gasket
- Impact-resistant PVC breaker strip

Refrigeration Package
- Slideout condensing unit - enables fast and easy service
- Expansion valve refrigeration system for superior recovery and temperature pulldown
- Low Pressure control – prevents compressor burnout in case of refrigerant loss
- R-513a, low GWP refrigerant for superior temperature recovery and pulldown
- Hot gas condensate evaporator quickly dissipates condensation using zero additional energy
- Receiver tank and service valves – allows reuse of refrigerant and enables rapid pulldown during times of peak demand
- Integrated sight glass – allows technicians to easily detect leaks or moisture without tools

Control Systems & Warranty Coverage
- Digital temperature control – easily adjust setpoint between 35-40°F
- Master power switch
- One 9 foot electrical cord
- Warranty: 5 year compressor, 5 year parts, 1 year labor

OPTIONS & ACCESSORIES:

- ☐ Stainless steel top (specify flat or marine edge type)
- ☐ Stainless steel back ___ bottom___ (specify either or both)
- ☐ Additional chrome wire shelves (specify quantity) _____
- ☐ Stainless steel wire shelves in lieu of chrome shelves
- ☐ Tray slides (specify quantity)
  "L" Type ___ Universal slides ___ "R" Type ___
- ☐ Digital temperature control & solenoid for remote models
- ☐ Refrigerant options for remote models-please specify refrigerant type
- ☐ Stainless steel curb base (specify 4" or 6" high)
- ☐ Temperature alarm
- ☐ 6" front locking casters in lieu of legs (no charge)
- ☐ 6" seismic legs
- ☐ 5" front locking casters
- ☐ 4" front locking casters
- ☐ 2 or 3 drawers in lieu of door (std depth 30", 60", or 90" sections only)
- ☐ Correctional facilities package
- ☐ Water-cooled condensing unit
- ☐ Interior LED lighting
- ☐ Marine secure latch
- ☐ ADA Height – stainless steel sub top changes overall height to 31.5" (requires 4" high casters)
- ☐ Glass doors

MODEL GUIDE

Model Number		Description
☐	CHR-75-3S-D-EM	93" Overall Width, Three Doors
☐	CHR-90-3S-D-EM	108" Overall Width, Three Doors
Options		**Model Number Modification**
☐	Remote Refrigeration	Delete suffix "EM" from model number
☐	Pass-Thru	Add prefix "PT" to model number
☐	Narrow Depth	Change "D" to "N"

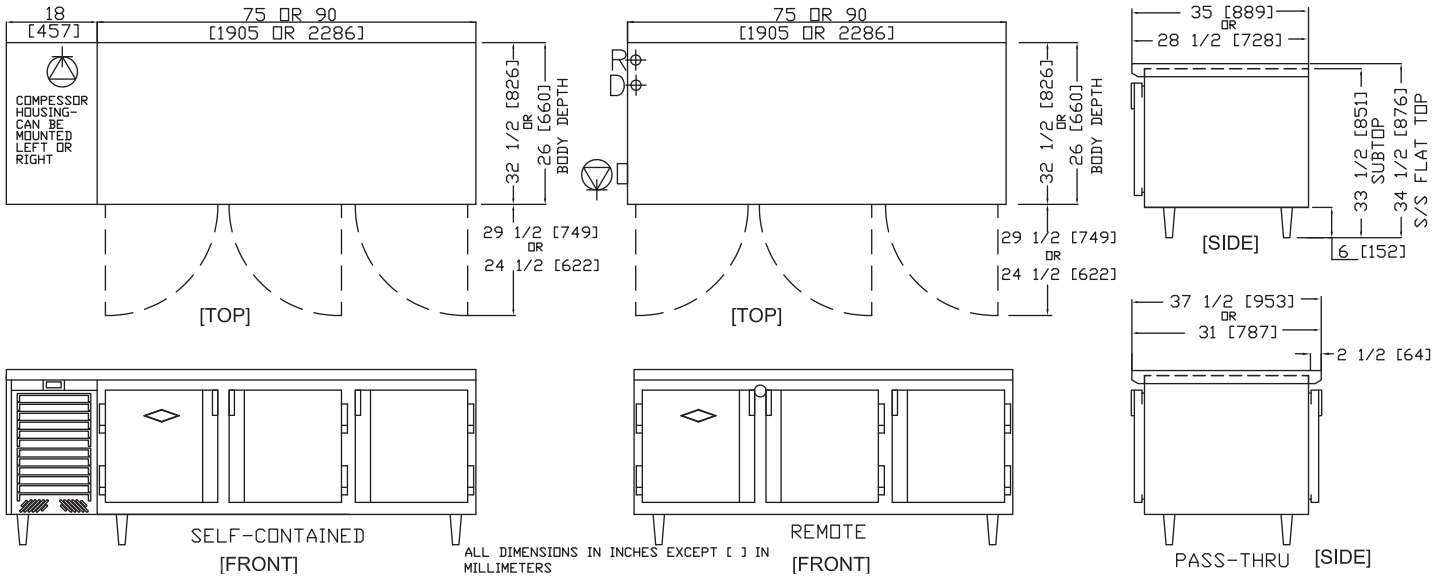
AGENCY APPROVALS: C ETL US LISTED Intertek; ETL SANITATION LISTED Intertek

UTILITY REFRIGERATOR • 12160 Sherman Way • North Hollywood CA 91605 • 818-764-6200 • Fax: 818-764-6211 • www.utilityrefrigerator.com

©/™/® Utility Refrigerator

UR-CHR3 | MU

COUNTER HEIGHT REFRIGERATOR - THREE SECTION



PRODUCT DATA	CHR-75 Standard Depth	CHR-75 Narrow Depth	CHR-90 Standard Depth	CHR-90 Narrow Depth
KEYDIMENSIONS				
Width, Self-Contained (overall)	93.0″	93.0″	108.0″	108.0″
Width, Remote (overall)	75.0″	75.0″	90.0″	90.0″
Depth (overall)	34.5″	28.0″	34.5″	28.0″
Depth Pass-Thru Models (overall)	36.5″	30.0″	36.5″	30.0″
Height (overall inc. legs; w/ subtop)	33.5″	33.5″	33.5″	33.5″
Height (overall inc. legs; w/ optional s/s finished top)	34.5″	34.5″	34.5″	34.5″
CAPACITY				
Capacity (cu.ft.)	25	19	30	23
ELECTRICAL				
Voltage (dedicated circuit required)	115	115	115	115
Amperage (self-contained)	6.7	6.7	9.7	9.7
Amperage (remote refrigeration)	5.4	5.4	5.7	5.7
BTU requirement*, remote	2097	2013	2285	2191
NEMA Plug Configuration (self-contained only)	5-15P	5-15P	5-15P	5-15P
Horsepower (self-contained)	1/4	1/4	1/3	1/3
SHIPPING				
ShipWeight, Self-Contained (lbs.)	750	700	875	825
ShipWeight, Remote (lbs.)	620	570	745	695
Ship Volume, Self-Contained (cu.ft.)	107	94	124	108
Ship Volume, Remote (cu.ft.)	88	77	104	91
Crated Dimensions, Self-Contained (39" H)	99"W x 48"D	99"W x 42"D	114"W x 48"D	114"W x 42"D
Crated Dimensions, Remote (39" H)	81"W x 48"D	81"W x 42"D	96"W x 48"D	96"W x 42"D

*90°F ambient, 20°F evaporator, 20' max. line length.

Data is for standard models: options may change specifications.

UTILITY REFRIGERATOR
12160 Sherman Way • North Hollywood, CA 91605
Telephone: (818) 764-6200 • Fax: (818) 764-6211
www.utilityrefrigerator.com

DUE TO CONTINUOUS PRODUCT IMPROVEMENTS, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

©/™/® Utility Refrigerator

WARNING - This product can expose you to chemicals including Di(2-ethylhexyl)phthalate (DEHP), which is [are] known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

UR-CHR3 | MU

HOBART

Project _____

AIA # _____ SIS # _____

Item # _____ Quantity _____ C.S.I. Section 114000

FOOD PREPARATION

FP150

Continuous-Feed Food Processor

SPECIFIER STATEMENT

Specified unit will be an NSF rated Hobart continuous-feed food processor with a large, easily removable feed hopper. Food processor has all aluminum hopper and housing and is compact for easy storage. Unit can process up to 14 pounds per minute with plate speeds at 420 RPMs and the exclusive decoring screw deflects product away from plate hub for complete processing. Cutting tools available include slicing, julienne, shredding, grating and dicing plates.

MODELS

❑ **FP150** Continuous-Feed Full Hopper Food Processor

STANDARD FEATURES

+ Red OFF, Green ON button
+ ½ HP motor with overload protection
+ Compact design
+ Front angled at 50°
+ Planetary drive
+ Large, removable full-size feed hopper
+ All-aluminum hopper and housing
+ Double Interlock switch
+ Plate speed of 420 RPMs
+ No Volt Release

ACCESSORIES (Available at extra cost)

❑ 3-Pack Plates: 1/16, 5/32 slicer plates, 3/16 shredder plate, 1 wall rack (15PLATE-3PACK-SS)

❑ 6-Pack Plates: 1/16, 5/32, 7/32, 3/8 slicer plates, 3/16 shredder plate, 3/8 dicer plate, 2 wall racks (15PLTSS-6PACK)

❑ 3-Peg Wall Rack: designed to hold three plates for additional plate storage

❑ Slicer Plates: 1/32, 1/16, 1/8, 5/32, 7/32, 5/16, 3/8

❑ Crimping Plate: 5/32

❑ Soft Slicing Plates: 5/16, 3/8, 1/2, 5/8

❑ Julienne Plates: 5/64, 5/32, 5/16

❑ Dicer Grids: 7/32, 5/16, 3/8, 1/2, 5/8, 3/4

❑ Shredder Plates: 1/16, 5/64, 1/8, 3/16, 7/32, 5/16, 3/8

❑ Grater Plate: Fine, hard cheese

❑ Machine Table: Adjustable height to hold Food Processor

❑ Adjustable height stainless steel lug cart

❑ Stainless steel receiving pan

❑ Plastic receiving pan

OPTIONS

❑ Maximum security correctional package

FP150 CONTINUOUS-FEED FOOD PROCESSOR

Approved by _____ Date _____ Approved by _____ Date _____

HOBART

FP150
Continuous-Feed Food Processor

SOLUTIONS / BENEFITS

PERFORMANCE

½ HP Motor with Overload Protection

Large, Full-Size Feed Hopper
- Flexibility, convenience, reduced labor
- Supports processing capabilities for large variety of products and eliminates pre-cutting
- Design permits continuous cutting of long products

Plate Speed of 420 RPMs
- Precise cutting and dicing action without bruising or mashing product

Compact Design
- Plates remove in seconds
- Occupies minimal counterspace

EASE OF USE

Front Angled at 50°
- 50 degree angle for ease of product loading
- Helps to reduce operator fatigue

All-Aluminum Hopper and Housing
- Anodized finish resists harsh cleaners
- Easy clean up

Compact Design
- Occupies minimal counterspace
- Production capacity for 14 pounds per minute

SANITATION & CLEANING

All-Aluminum Hopper and Housing
- Anodized finish resists harsh cleaners
- Easy clean up

Large, Removable Full-Size Feed Hopper
- Flexibility, convenience, reduced labor
- Supports processing capabilities for large variety of products and eliminates pre-cutting
- Design permits continuous cutting of long products

OPERATOR ASSURANCE

Double Interlock Switch
- Prevents machine from running when pusher plate swings away or is open

No Volt Release
- Unit will not automatically turn on if power is lost

SPECIFICATIONS

Electrical: 110-120/60/1; 5.7 amps, 3 conductor power cord (18 AWG) is 6 feet in length. Also available in 220-230/50/60/1 with a CEE 7/7 plug – not UL listed.

Motor: Planetary gear driven operating at 420 RPM output. ½ HP with overload protection.

Switches: Easy to operate (red) OFF and (green) ON switch. Pusher plate and feed hopper interlocks.

Standard Equipment: Basic unit with deflector plate and cleaning brush

Warranty: Unit has full one-year warranty on parts, labor and mileage against manufacturer's defects. Service contracts are available.

Cutting Tools: Slicer, julienne and shredder plates feature stainless steel plates with cutlery-grade stainless steel knives. Grate plates feature stainless steel cutting plates with thermoplastic support hubs. Dicing grids have molded ring construction to support stainless steel knives.

Plate combinations for dicing operations are shown in the table below:

FP150 Food Processor								
	DICEGRD-7/32	DICEGRD-5/16	DICEGRD-3/8	DICEGRD-1/2	DICEGRD-1/2L	DICEGRD-5/8	DICEGRD-5/8L	DICEGRD-3/4
SLICE-1/32-SS								
SLICE-1/16-SS								
SLICE-1/8-SS	✓	✓	✓	✓		✓		✓
SLICE-5/32-SS	✓	✓	✓	✓		✓		✓
SLICE-7/32-SS	✓	✓	✓	✓		✓		✓
SLICE-5/16-SS		✓	✓	✓		✓		✓
SLICE-3/8-SS			✓	✓		✓		✓
SFTSLC-5/16		✓	✓	✓		✓		✓
SFTSLC-3/8			✓	✓		✓		✓
SFTSLC-1/2					✓		✓	
SFTSLC-5/8							✓	

Weight: Shipping - 46 lb.; Net - 39 lb.

FP150
Continuous-Feed Food Processor

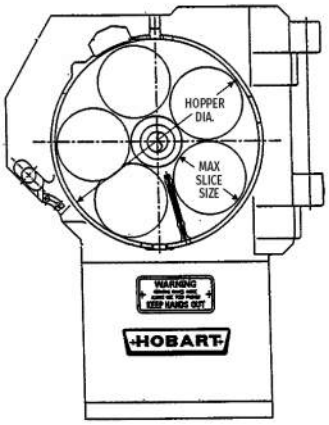
DETAILS AND DIMENSIONS

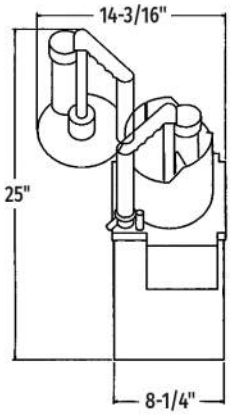
FP150	
Hopper Maximum Width	6 3/8"
Hopper Height	7 7/25"
Hopper Volume	12 17/25 cups
Maximum Slice Size	2 1/2"
Usable Depth	6"
Feed Tube Diameter	2 1/8"

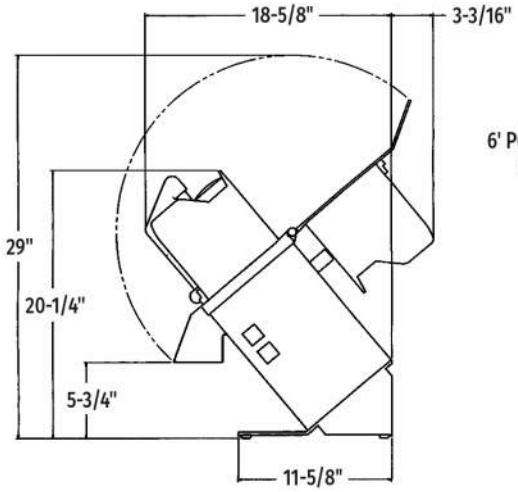
Plugs and Receptacles:

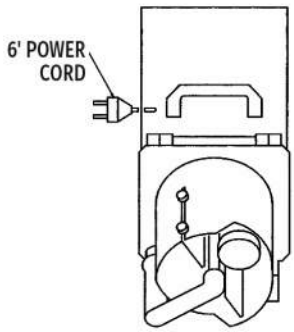
Machine Voltages	
Service Current Requirement if Plug Connected	110-120/60/1
	15 Amp.
Terminal Designation of Plug	2 Pole 3 Wire Grounding
NEMA Plug Configuration	5-15P
Plug Configuration	
Molded Plug on Cord	Yes
Plug - Straight/Angle	Straight
NEMA Receptable or Connector Configuration	5-15R

This plug configuration is for the 110-120/60/1 machine only.









As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

CAD and/or Revit Files Available

Stainless Steel Utility Carts

- Utility carts are constructed of heavy gauge stainless steel for superior strength and durability
- Continuous weld construction provides added durability as compared to other, spot welded utility carts
- Non-marking soft rubber bumpers prevent scratches and scuffs on walls

UC4031529

UC3031524

UC7022133

Service Cart

- One-piece design, all plastic construction
- Polyethylene exterior and polyurethane foam core for added strength
- Heavy-duty 5" non-marking caster with molded-in metal reinforcement plates
- Optional Trash Container (SBC11TC) and Part Holder (SBC11SH) available separately
- NSF Listed

NSF

Find replacement parts at www.carlislefsp.com/ replacement-parts

SBC230 with SBC11TC and SBC11SH

Black(03)

Prod No	Description	Weight Capacity	Color	Pack
Service Cart				
SBC230 Δ	Service Cart - 2 Fixed Casters, 2 Swivel Casters, 1 with Brake	500 lb	03	1 ea
SBC11SH	Part Holder for SBC230	—	03	1 ea
SBC11TC	Trash Container for SBC230	—	03	1 ea
Stainless Steel Utility Carts				
UC3031524	15.5" x 24", 3 Shelf Utility Cart	300 lb	—	1 ea
UC3031827	18" x 27", 3 Shelf Utility Cart	300 lb	—	1 ea
UC5031524	15.5" x 24", 3 Shelf Utility Cart	500 lb	—	1 ea
UC5031827	18" x 27", 3 Shelf Utility Cart	500 lb	—	1 ea
UC5032135	21" x 35", 3 Shelf Utility Cart	500 lb	—	1 ea
UC7022133	21" x 33", 2 Shelf Utility Cart	700 lb	—	1 ea
UC7032133	21" x 33", 3 Shelf Utility Cart	700 lb	—	1 ea
UC4031529	15.75" x 29.5", 3 Shelf Knock-Down Utility Cart	400 lb	—	1 ea
UC4031733	17.75" x 33.38", 3 Shelf Knock-Down Utility Cart	400 lb	—	1 ea

NSF Listed products are designated with a Δ and may be prefixed with an N

Shipping Notes: SBC230, UC3031524, UC3031827, UC5031524, UC5031827, UC5032135, UC7031524, UC7031827, UC7022133, UC7032133 cannot ship UPS/FedEx

CARLISLE FOODSERVICE PRODUCTS

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: CUSTOM FABRICATED COUNTER

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

CUSTOM FABRICATED COUNTER
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Hot Cold Dual Operation Drop In

PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

Wells are 6" deep and constructed of 18 gauge stainless steel. Wells are manufactured with a continuous seamless design with all corners coved for easy cleaning. Wells are fully insulated with a urethane foam for energy savings and efficiency and there are no screws used in the construction of the wells.

Each well has a 3-position control; hot, cold, and off, in addition to an infinite control to adjust the heating temperature when in the "hot" position.

Drop ins are also available in a slimline configuration as pictured below:

Standard Features

- ☐ Independent infinite temperature controls for each well
- ☐ 1250 watt heat element per well
- ☐ Compressor located on left
- ☐ 404A refrigerant
- ☐ 6' cord and plug
- ☐ 3' conduit from unit to controller
- ☐ Adjustable leveling feet
- ☐ Twist counter locking system
- ☐ One Pan Lifting Ring included per well
- ☐ Each well accommodates one 12" x 20" pan or fractional equivalent

Options

- ☐ Cord and plug; specify length
- ☐ Hard wiring
- ☐ Drain with manifolds
- ☐ Adapter bar set
- ☐ Compressor location on right

Refrigerated system; drop ins with two wells utilize a 1/3 HP compressor and drop ins with 3, 4 and 5 wells utilize a 1/2 HP compressor with 404A refrigerant. The temperature is preset at the factory. Heating system; each well has a 1250 watt heat source and an infinite control to adjust heating temperature when in the 3-position switch is in "hot" position.

Note: When installing in existing or new counter, provide adequate airflow for maximum performance and to avoid damaging the compressor.

Intertek 4003279

Conforms to UL Std. 197 & 471 & NSF/ANSI Std. 4 & 7

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Hot Cold Dual Operation Drop In

UNIT

MODEL	LENGTH	WIDTH	HEIGHT	LBs
HCDO1DI	17.512	25	26	103
HCDO2DI	33.354	25	26	155
HCDO3DI	49.196	25	26	211
HCDO4DI	64.500	25	26	254
HCDO5DI	80.500	25	26	311
HCDO2DISL	49.286	16.735	26	148
HCDO3DISL	73.359	16.735	26	205

COUNTER CUTOUT

L	W
15.831	24.157
30.885	24.157
46.767	24.157
62.68	24.157
78.66	24.157
47.523	15.831
71.592	15.831

CONTROL PANEL

H	L	H CUTOUT	L CUTOUT	D CUTOUT
6.703	9.986	5.140	8.579	4
6.703	13.950	5.140	12.542	4
6.703	17.888	5.140	17.435	4
6.703	21.844	5.156	21.437	4
6.703	25.800	5.156	25.340	4
6.703	13.950	5.140	12.542	4
6.703	17.888	5.140	17.435	4

ELECTRICAL

MODEL	VOLT	Hz.	REQUIREMENT	CORD	PLUG	WATT
HCDO1DI	208/220	60	1Ø 20 AMP 4 WIRE	6'	NEMA 14-20	1250
HCDO2DI	208/220	60	1Ø 20 AMP 4 WIRE	6'	NEMA 14-20	2500
HCDO3DI	208/220	60	1Ø 30 AMP 4 WIRE	6'	NEMA 14-30	3750
HCDO4DI	208/220	60	1Ø 30 AMP 4 WIRE	6'	NEMA 14-30	5000
HCDO5DI	208/220	60	1Ø 30 AMP 4 WIRE	6'	NEMA 14-30	6250
HCDO2DISL	208/220	60	1Ø 20 AMP 4 WIRE	6'	NEMA 14-20	2500
HCDO3DISL	208/220	60	1Ø 30 AMP 4 WIRE	6'	NEMA 14-30	3750

ITEM	MODEL
C0966	HCDO1DI
C0681	HCDO2DI
C0680	HCDO3DI
C0679	HCDO4DI
C0677	HCDO5DI
C0967	HCDO2DISL
C1002	HCDO3DISL

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Limited Warranty

G.A. Systems, Inc. warrants to the original purchase all equipment manufactured and/or sold to be free from all defects in material and workmanship under normal use and service. Its obligations under this warranty shall be limited to repairing or replacing any part of the said product. F.O.B. factory, which proves thus defective within one (1) year from date of sale, and which upon G.A. Systems, Inc.'s examination, discloses to its satisfaction to be thus defective. No claims will be accepted for any part becoming defective from damage in transit, improper installation, misuse, neglect, abnormal use, alteration, accident, fire or other casualty, or act of God. We will not assume any responsibility for labor chargers, travel, refrigerant, replacement parts purchased, or other expenses incurred outside of our factory. Neither will we be liable for food spoilage, loss of use of the equipment, inconvenience, or other consequential damage of any kind.

Rev 08/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Hot Cold Dual Operation Drop In

PROJECT: _____

ITEM #: _____

MODEL: _____

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Options

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- ☐ Hard wiring
- ☐ Drain with manifolds
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Intertek 4003279

Conforms to UL Std. 197 & 471 & NSF/ANSI Std. 4 & 7

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HCDO2DISL	208/220	60	1Ø 20 AMP 4 WIRE	6'	NEMA 14-20	2500
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ITEM	MODEL
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C0681	HCDO2DI
C0680	HCDO3DI
C0679	HCDO4DI
C0677	HCDO5DI
C0967	HCDO2DISL
C1002	HCDO3DISL

Rev 04/2019

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Rev 08/2019

DECO™ ENGINEERED FOOD SHIELDS

GENERAL INFORMATION

Project Name: _____

Item: _____

Quantity: _____

Model: DECO-250-N

Length: _____

GENERAL SPECIFICATION

Materials

- 1-1/2" Stainless Steel Round Tubing Uprights
- 1/4" Tempered Glass Front and Top
- Polished Exposed Glass Edges
- Narrow Mounting Flange

Construction

- 8 Position Glass - Adjustable without Tools
- Maximum Post Spacing
  - 42" with 1/4" Glass
  - 66" with 3/8" Glass
- NSF Standard 2 Construction
- Shipped Fully Assembled

TUBE OPTIONS

- ☐ 2" Round Diameter
- ☐ 1" Square
- ☐ 1-1/2" Square

TUBE FINISH

- ☐ #4 Brushed Stainless Steel
- ☐ #8 Mirror Polished Stainless Steel
- ☐ Powder Coated - Color _____

GLASS OPTIONS

- ☐ 1/4" Tempered Glass
- ☐ 3/8" Tempered Glass
- ☐ Full Perimeter Channel
- ☐ 1/4" Tempered Glass End Panel

TOP SHELF OPTIONS

- ☐ 3/8" Tempered Glass
- ☐ #8 Mirror Polished Brass
- ☐ Stainless: ☐ #4 Brushed ☐ #8 Mirror Polished
- ☐ Powder Coated Color _____
- ☐ Solid Surface Material Color _____

FITTING FINISH

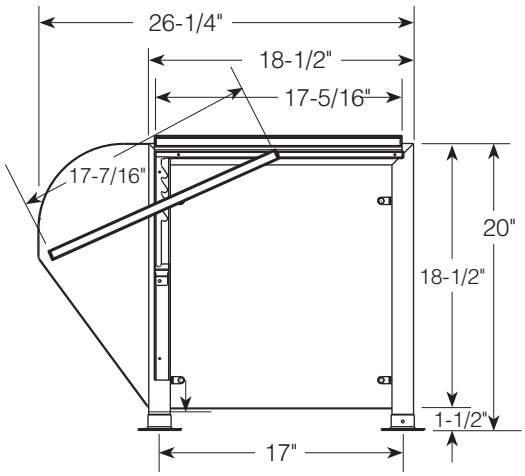
- ☐ #4 Brushed Stainless Steel
- ☐ #8 Mirror Polished Stainless Steel
- ☐ Powder Coated - Color _____

*** Approval Drawings Required**

DECO-250-N

Convertible Self-Serve or Operator-Serve Food Shield

Shown without end panels.



To meet NSF guidelines, end panels are included on all BSI quotations unless specifically excluded.

FITTING OPTIONS

- ☐ Round Flange

LIGHT AND WARMER OPTIONS

- ☐ LED Light Unit
- ☐ Linear T-5 Fluorescent Unit
- ☐ BSI Stealth™ Linear Heat Only Unit
- ☐ BSI Stealth™ Linear Heat and Light Combo Unit (Fluorescent)
- ☐ BSI Stealth™ Linear Heat and Light Combo Unit (LED)
- ☐ BSI Stealth™ Linear Double Heat and Light Combo Unit (Fluorescent)
- ☐ BSI Stealth™ Linear Double Heat and Light Combo Unit (LED)
- ☐ Hatco® Brand Heat Only Unit
- ☐ Hatco® Brand Heat and Light Combo Unit

Printed in the U.S.A. (December 2018) BSI, LLC
Specifications subject to change without notice.
Rv. 14

LIGHTS AND WARMERS

GENERAL INFORMATION

Project Name: _____

Item: _____

Quantity: _____

Model: 705

Length: _____

DESCRIPTION

Single slimline unit houses both light and heat in one unit.

Custom length housing lets you specify custom housing lengths with heat/light element placed anywhere in the housing. This allows you to heat specific wells, pans or areas of a counter.

High-efficiency design means less heat escapes out the top and more heat is directed down on the work surface. NASA-developed “space blanket” gives the Stealth Warmer a 15-20 percent cooler outer housing surface (touch temperature) than the competition as well as twenty percent higher direct heat output than industry standard.

This unit has a clean, slim profile. Small overall size means less obtrusive, distractive design to customer and easier to work into overall design.

No wire grill to clean around or collect debris. Wiping down unit will maintain reflector efficiency and attractive appearance. Smooth outer housing is also easy to wipe off.

Custom length capability. Custom lengths can be accommodated, from 22" to 82" long in single heater units, and unlimited length in multiple heater combinations.

Simple mounting design.

UL tested and certified to UL Std. 197.

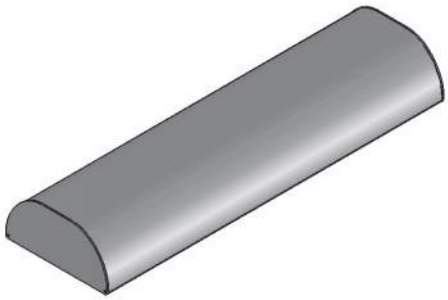
GENERAL SPECIFICATION

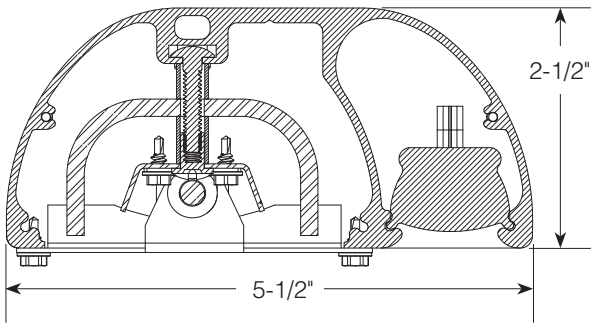
- The warmer/light combo is manufactured by BSI, LLC.
- The warmer/light combo shall consist of an exterior aluminum housing, highly polished reflector, thermal wrap, multi-layer insulation, red heating element that is tubular metal sheathed, and inner aluminum holder/reflector for the light.
- The fluorescent lamp is a shatter resistant bulb for maximum protection over food applications.
- The warmer/light combo shall include a remote on/off switch, a remote ballast and an infinite controller.
- The warmer/light combo shall be factory-assembled ready for electrical installation.

*** Approval Drawings Required**

705

Stealth™ Warmer and Light Combo





SLIMLINE LIGHT BULB OPTIONS

☐ LED Module ☐ Fluorescent Bulb

Information for LED Bulb	
Temperature	3000K
Average Rated Life (hr):	50,000
Color Rendering Index (CRI)	90
Diodes	50 per foot
Electrical	110-250V
Frequency	50/60Hz
Amp Per Foot @ 110V	0.04
Watts Per Foot	5

Information for 4100K Fluorescent Lamps	
Average Rated Life (hr):	20,000
Base:	Miniature Bi-Pin
Bulb:	T5
Color Rendering Index (CRI)	82
Diameter (in):	0.67
Bulb Type:	Shatter Resistant

UL NO. E305112

Specifications subject to change without notice. Patent Number US 7,067,733 B2 07.21

LIGHTS AND WARMERS

OPTIONS AND ACCESSORIES

Light/Heat housing is an aluminum extrusion.The housing for warmers is only available in grey or gloss black. Please contact factory for further information.

Switch Options	Wiring Exit Point Options
☐ Remote Infinite (standard)	☐ Top
☐ Remote Switch	☐ Left Side
☐ Solid State	☐ Right Side
☐ Internal Control	
☐ Indicator Light	

The warmer shall be single phase and rated at _____ watts, _____ volts.

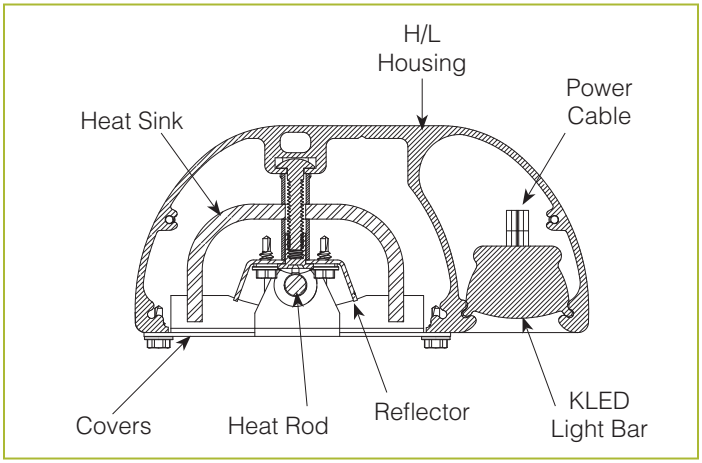
Warmer shall be _____ inches in overall width.

STANDARD NSF LISTED FINISH OPTIONS

☐ Grey ☐ Gloss Black

705

Stealth™ Warmer and Light Combo



MODEL NUMBER	OA HOUSING	VOLTS (Light)*	FREQ.	TOTAL AMPS @110V	WATTS
☐ 705-120-18	22"-28"	120 (120)	50/60Hz	3.16	381
☐ 705-120-24	28"-34"	120 (120)	50/60Hz	4.46	531
☐ 705-120-30	34"-40"	120 (120)	50/60Hz	5.76	691
☐ 705-120-36	40"-46"	120 (120)	50/60Hz	6.96	831
☐ 705-120-42	46"-52"	120 (120)	50/60Hz	8.16	981
☐ 705-120-48	52"-58"	120 (120)	50/60Hz	9.46	1131
☐ 705-120-54	58"-64"	120 (120)	50/60Hz	10.66	1281
☐ 705-120-60	64"-70"	120 (120)	50/60Hz	11.96	1443
☐ 705-120-66	70"-76"	120 (120)	50/60Hz	13.36	1603

LED Module produces lower watts and amps. Contact factory for details.

Wiring Diagrams for Stealth™ Warmer and Fluorescent Light Combos can be found at the end of the Lights and Warmers Section.

MODEL NUMBER	OA HOUSING	VOLTS (Light)*	FREQ.	TOTAL AMPS @110V	WATTS
☐ 705-208-24	28"-34"	208 (120)	50/60Hz	2.66	531
☐ 705-208-30	34"-40"	208 (120)	50/60Hz	3.46	691
☐ 705-208-36	40"-46"	208 (120)	50/60Hz	4.16	831
☐ 705-208-42	46"-52"	208 (120)	50/60Hz	4.86	981
☐ 705-208-48	52"-58"	208 (120)	50/60Hz	5.56	1131
☐ 705-208-54	58"-64"	208 (120)	50/60Hz	6.26	1281
☐ 705-208-60	64"-70"	208 (120)	50/60Hz	7.96	1443
☐ 705-208-66	70"-76"	208 (120)	50/60Hz	7.86	1603
☐ 705-208-72	76"-82"	208 (120)	50/60Hz	8.66	1768

MODEL NUMBER	OA HOUSING	VOLTS (Light)*	FREQ.	TOTAL AMPS @110V	WATTS
☐ 705-240-24	28"-34"	240 (120)	50/60Hz	2.36	531
☐ 705-240-30	34"-40"	240 (120)	50/60Hz	3.06	691
☐ 705-240-36	40"-46"	240 (120)	50/60Hz	3.56	831
☐ 705-240-42	46"-52"	240 (120)	50/60Hz	4.16	981
☐ 705-240-48	52"-58"	240 (120)	50/60Hz	4.86	1131
☐ 705-240-54	58"-64"	240 (120)	50/60Hz	5.46	1281
☐ 705-240-60	64"-70"	240 (120)	50/60Hz	6.06	1443
☐ 705-240-66	70"-76"	240 (120)	50/60Hz	6.86	1603
☐ 705-240-72	76"-82"	240 (120)	50/60Hz	7.56	1768

* VOLTS: Shown as - Element Voltage (Light Voltage)

UL NO. E305112

Specifications subject to change without notice. Patent Number US 7,067,733 B2 07.21

DESCRIPTION: COMPUTER

CUSTOM FABRICATED

EXISTING

- WHERE SHOWN
- RELOCATED
- MODIFIED

SPARE NUMBER

X NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC)
FURNISHED BY:

- OWNER
- SUPPLIER/VENDOR
- GENERAL CONTRACTOR
- MILLWORK TRADE
- OTHER _____

COMMENTS:

DESCRIPTION: WORKTABLE, WITH SINK

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

S/S WORKTABLE WITH SINK
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

DESCRIPTION: S/S WALL SHELF, 2-TIER

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

S/S WALL SHELF, 2-TIER

CONSTRUCTED PER 114000 SPECIFICATIONS

SIZE AND SHAPE PER PLAN

GRINDER SERIES

GR Series

GR 2.2 | GR 2.3

Dual Hopper

The GR 2 dual hopper coffee grinder is portion controlled so you grind only the amount you need. Grind a small, medium or large batch with the touch of a button. The GR 2's powerful .5 Hp motor and precision slice grinding discs help deliver uniform grind profiles. Grind directly into the brew basket to make grinding and brewing coffee quick and easy.

Grinder shown is GR 2.3. Model GR 2.2 also available.

Control panel is programmable and serviceable from the front.

Removable 5lb Hoppers allow operators to change coffee bean selection without spilling or the cost of additional grinders. Hoppers can be used as short term storage containers and are easily cleanable.

Grinder Platform holds all FETCO® XTS™, EXTRACTOR® and 5000 series brew baskets. Grind directly into filter paper for larger models.

FETCO®
TRUSTED | RELIABLE | QUALITY

GR-2 Dual Hopper | Technical Specifications

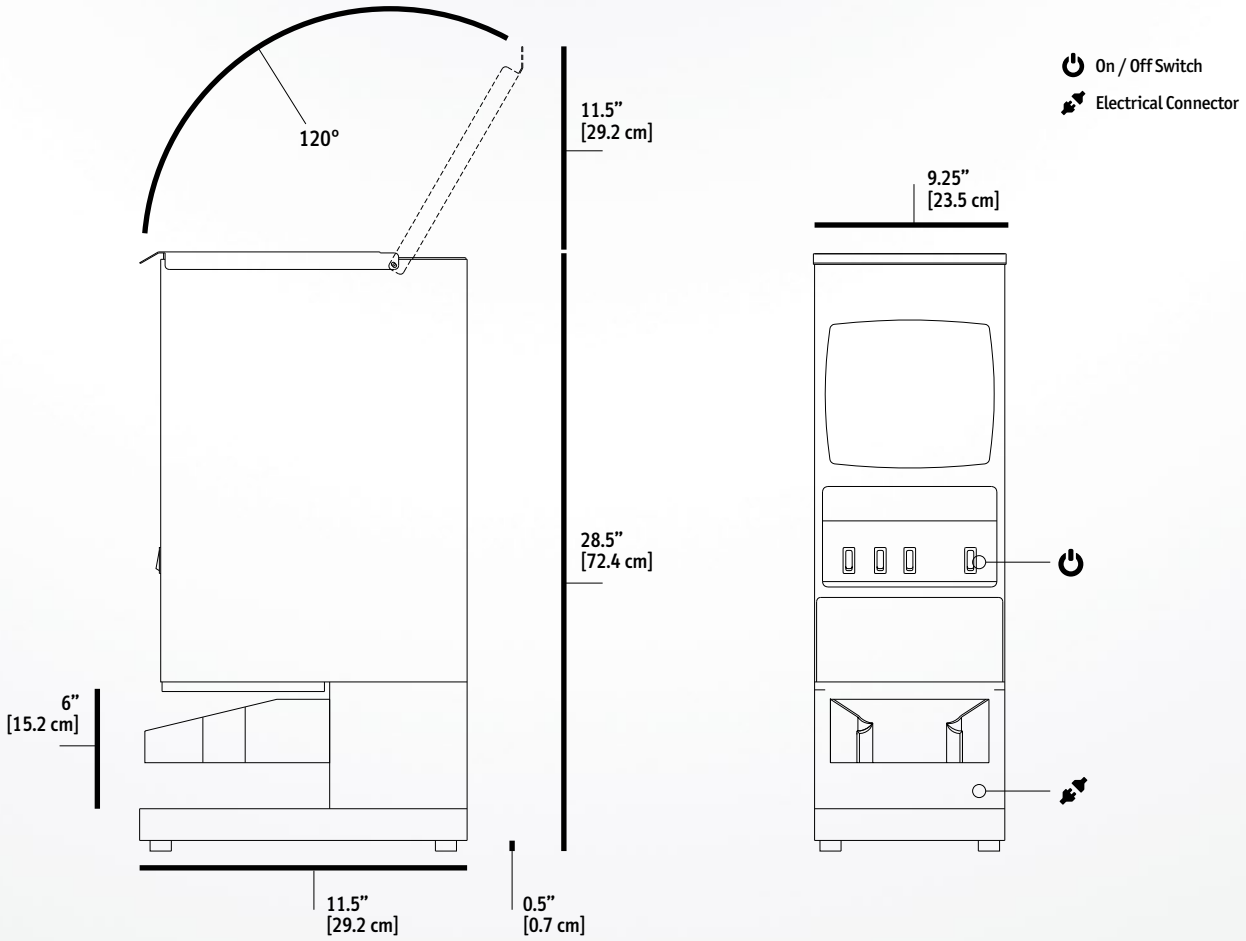
Electrical Configuration

Configuration Code	Motor Power	Voltage	Phase	Wires	KW	Electrical Connection	Max Amp Draw	Hopper Capacity Pounds [Kilos]	Grind Rate (Medium) Ounces[Grams]/Minute
US & CANADA									
G02012	0.5Hp	120	1	2+G	0.37	Cord and plug	5.7	2x5 [2.3]	18 [510]
G02013	0.5Hp	120	1	2+G	0.37	Cord and plug	5.7	2x5 [2.3]	18 [510]
INTERNATIONAL									
G02022	0.5Hp	200-240	1	2+G	0.37	Cord only	2.9	2x5 [2.3]	18 [510]
G02023	0.5Hp	200-240	1	2+G	0.37	Cord only	2.9	2x5 [2.3]	18 [510]

Brew basket sold separately.

Measurements

Height	Width	Depth	Empty Weight	Shipping Weight	Shipping Dimensions:
28½" [72.4 cm]	9¼" [23.5 cm]	11½" [29.2 cm]	50 lbs [22.7 kg]	65 lbs [29.5 kg]	31" x 12" x 19" [78.7 x 30.5 x 48.3 cm]



Customize Your Grinder

Replacement / Extra Hopper with Lid for GR-2.2 & GR-2.3	A066	Hopper Storage Rack for GR-2.2 & GR-2.3 (mounts directly to either side of grinder)	A118
Brew Basket Scoop – 16" x 6"	A088		

Information

fetco.com

800.338.2699 USA
847.719.3000

847.719.3001

Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA

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DESCRIPTION: STORAGE CABINET

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

STAINLESS STEEL STORAGE CABINET
CONSTRUCTED PER 114000 SPECIFICATIONS
REFER TO FABRICATION DRAWINGS FOR DETAILS
SIZE AND SHAPE PER PLAN

DESCRIPTION: WALL SHELF

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

STAINLESS STEEL WALL SHELF
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

DESCRIPTION: S/S WORKTABLE, MOBILE

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

STAINLESS STEEL WORKTABLE, MOBILE
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

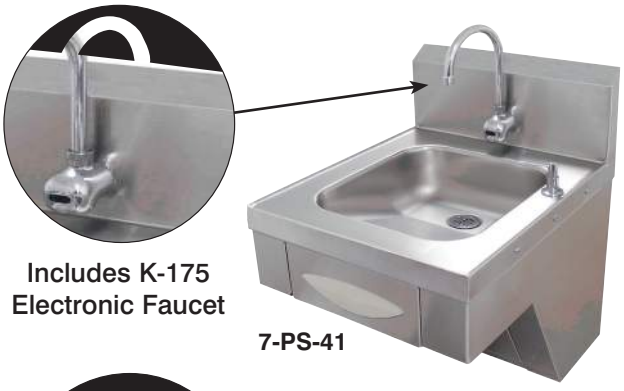
ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

HAND SINKS

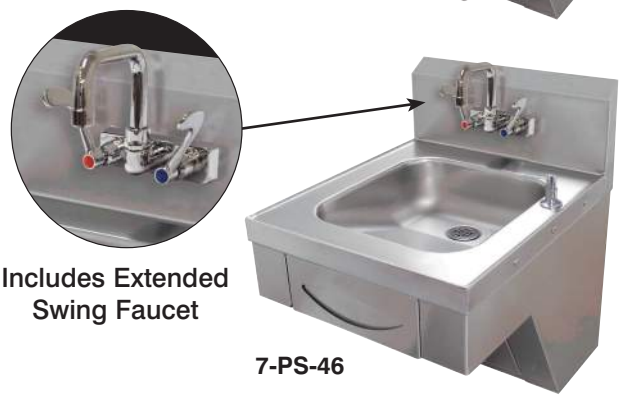
A.D.A COMPLIANT LAVATORIES WITH TAPERED SKIRT

Conforms To NSF 61/9 Lead Free Requirements



Includes K-175 Electronic Faucet

7-PS-41

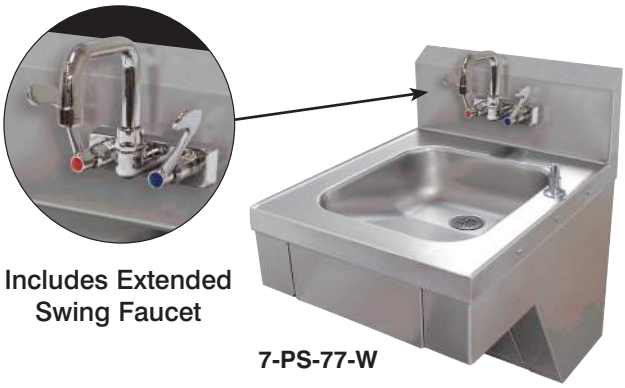


Includes Extended Swing Faucet

7-PS-46

Includes K-175 Electronic Faucet

7-PS-77-E



Includes Extended Swing Faucet

7-PS-77-W

Item #: _____ **Qty #:** _____

Model #: _____

Project #: _____

7-PS-41 / 7-PS-46 FEATURES:

One piece **Deep Drawn** sink bowl design.
Sink bowl is 14" x 16" x 5".
Undermount Towel Dispenser.
Deck mount liquid soap dispenser.
Stainless Steel Skirt with Removable Access Panel and enclosed bottom for storage.
"Z" bracket wall mounting plate
Stainless steel 1-1/2" IPS basket drain.

Additional Unit Features:

7-PS-41:
K-175 splash mount hands free electronic operated gooseneck faucet.

7-PS-46:
K-206 6" splash mount extended "d" spout faucet with wrist handles.

7-PS-77-E / 7-PS-77-W FEATURES:

One piece **Deep Drawn** sink bowl design.
Sink bowl is 14" x 16" x 5".
Deck mount liquid soap dispenser.
Stainless Steel Skirt with Removable Access Panel and enclosed bottom for storage.
"Z" bracket wall mounting plate
Stainless steel 1-1/2" IPS basket drain.

Additional Unit Features:

7-PS-77-E:
K-175 splash mount hands free electronic operated gooseneck faucet.

7-PS-77-W:
K-206 6" splash mount extended "D" spout faucet with wrist handles.

CONSTRUCTION:

All TIG welded.
Welded areas blended to match adjacent surfaces and to a satin finish.
Die formed Countertop Edge with a 3/8" No-Drip offset.
Bowl made from One sheet of stainless steel - No Seams.

MATERIAL:

Heavy gauge type 304 series stainless steel.
Skirt - 16 gauge type 304 series stainless steel.
Wall mounting bracket is Galvanized and of offset design.
All fittings are brass / chrome plated unless otherwise indicated.

MECHANICAL:

Faucet supply is 1/2" IPS male thread hot and cold.
Faucet Flow Rate: 1.0 GPM/3.8 LPM aerator. 60 PSI.

⚠ WARNING:

Equipment that includes a faucet may expose you to chemicals, including lead, that are known to the State of California to cause cancer or birth defects or other reproductive harm. For more Info.,visit www.p65warnings.ca.gov.

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Email: customer@advancetabco.com or Fax: 631-242-6900

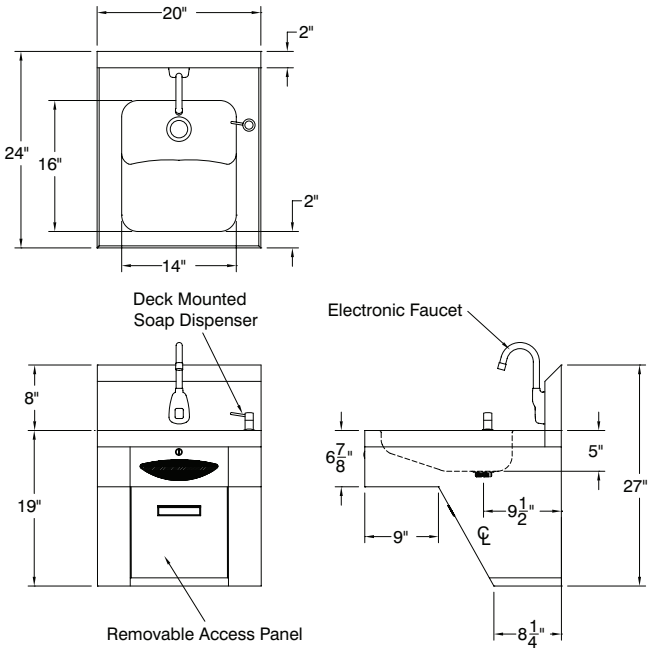
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or Fax: 631-586-2933

REF-B

DIMENSIONS and SPECIFICATIONS

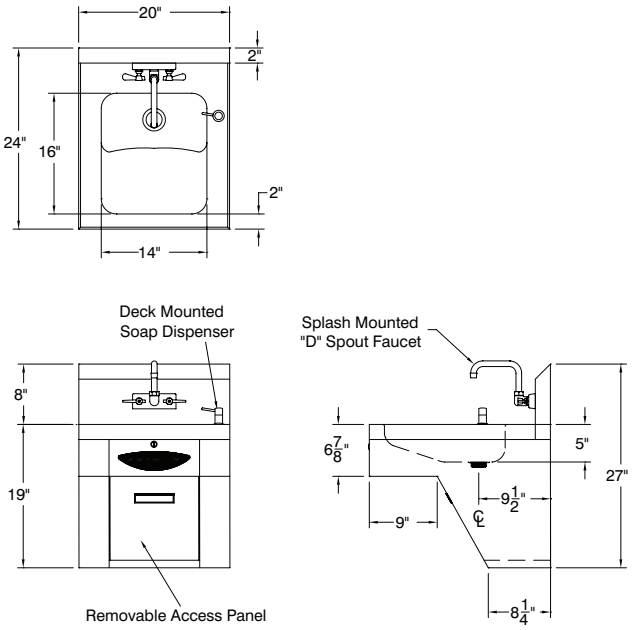
TOL Overall: ± .500" Interior: ± .250" **FITTINGS SUPPLIED AS SHOWN** **ALL DIMENSIONS ARE TYPICAL**

7-PS-41



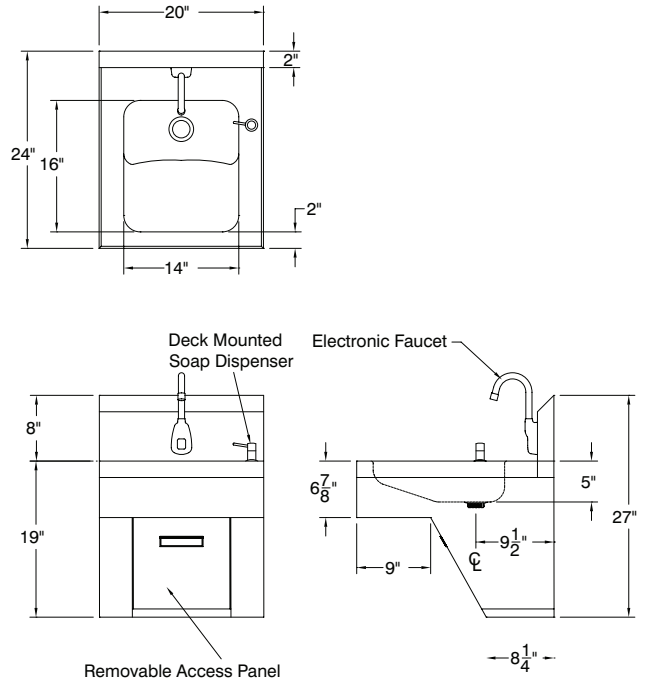
65 lbs.

7-PS-46



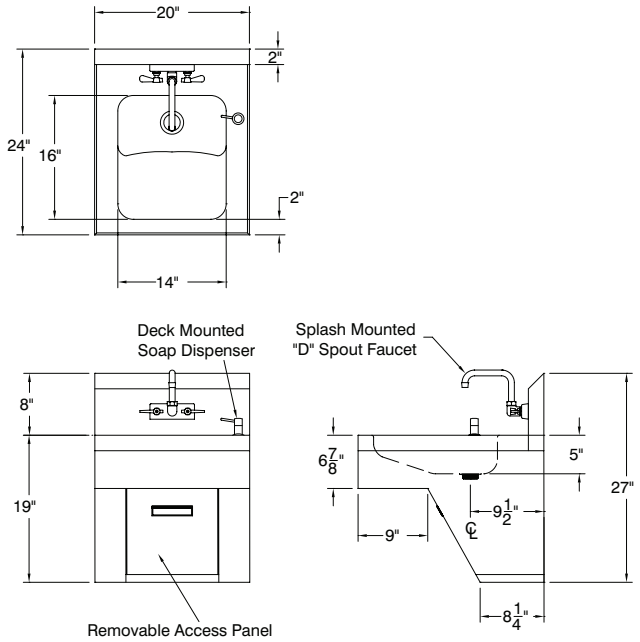
65 lbs.

7-PS-77-E



65 lbs.

7-PS-77-W



65 lbs.

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REF-B 325 Wireless Boulevard, Hauppauge, NY 11788

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FAUCET PARTS & ACCESSORIES

Faucet Repair Kit
For K-22, K-59, K-123, K-125, K-126, K-206 & K-316 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00A (Set of 2)

Faucet Repair Kit
For K-1, K-11, K-50, K-51, K-52, K-53, K-56, K-124, K-101, K-160, K-208 & K-240 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00B (Set of 2)

K-02 Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased From 2016 - 2019. For Older Faucets, See Below.

K-02A Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased Before January 2016 or After 2019.

Service Faucet Vacuum Breaker Repair Kit
For K-240 Faucet
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-03

Pedal/Knee Valve Replacement Parts

Replacement Bonnet for Pedal/Knee Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-01

Replacement Check Valves
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19

Thermostatic Mixing Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-425

Mixing Valve & Retainer
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19A

Faucet Options & Accessories

Hands-Free Wand

K-400

Low Flow Aerator

.5 GPM
K-08

Wrist Handles (Pair)

*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-316-LU

Wrist Handles (Pair)
For Heavy Duty 8" O.C. Faucets

K-416-LU

Splash Mount Faucet Mounting Kit
K-1, K-11, K-101, K-105, K-112, K-119 & K-211
K-06

Faucet Wall Mounting Bracket
8" O.C.
K-30

ADVANCE TABCO SMART FABRICATION™
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For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

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FAUCET PARTS & ACCESSORIES

Faucet Repair Kit
For K-22, K-59, K-123, K-125, K-126, K-206 & K-316 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00A (Set of 2)

Faucet Repair Kit
For K-1, K-11, K-50, K-51, K-52, K-53, K-56, K-124, K-101, K-160, K-208 & K-240 Faucets
Includes 2 Cartridges and Handles
*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-00B (Set of 2)

K-02 Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased From 2016 - 2019. For Older Faucets, See Below.

K-02A Filler Faucet Repair Kit
For K-54 & K-54A Faucets
*Can Only Be Used On Faucets Purchased Before January 2016 or After 2019.

Service Faucet Vacuum Breaker Repair Kit
For K-240 Faucet
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K-03

Pedal/Knee Valve Replacement Parts

Replacement Bonnet for Pedal/Knee Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-01

Replacement Check Valves
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19

Thermostatic Mixing Valve
For K-103, K-104, 7-PS-32 & 7-PS-39
K-425

Mixing Valve & Retainer
For K-103, K-104, 7-PS-32 & 7-PS-39
K-19A

Faucet Options & Accessories

Hands-Free Wand

K-400

Low Flow Aerator

.5 GPM
K-08

Wrist Handles (Pair)

*Can Only Be Used On Faucets Purchased After January 2016. For Older Faucets, Consult Customer Service.
K-316-LU

Wrist Handles (Pair)
For Heavy Duty 8" O.C. Faucets

K-416-LU

Splash Mount Faucet Mounting Kit
K-1, K-11, K-101, K-105, K-112, K-119 & K-211
K-06

Faucet Wall Mounting Bracket
8" O.C.
K-30

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P-TRAPS & CONTINUOUS WASTES

Continuous Waste for 2 and 3 Compartment Sinks

K-351

Chrome Plated P-Trap

STANDARD
22 Gauge - 1-1/2" IPS
7-PS-14

HEAVY DUTY
17 Gauge - 1-1/2" IPS
7-PS-10

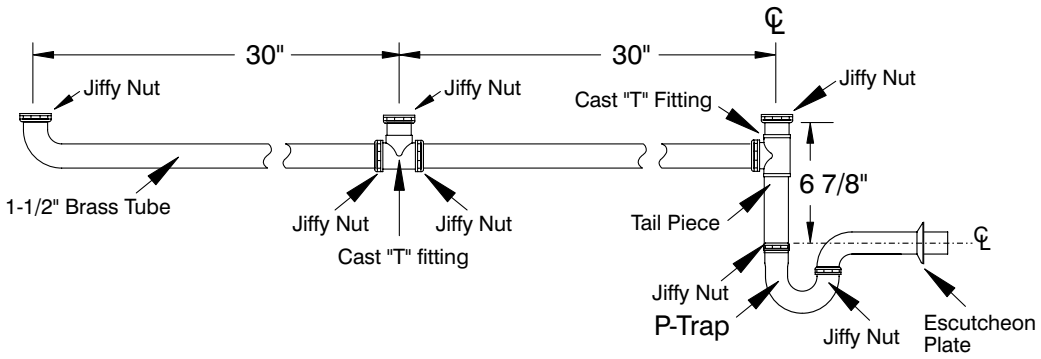
Offset Tail Piece

K-46

DIMENSIONS and SPECIFICATIONS

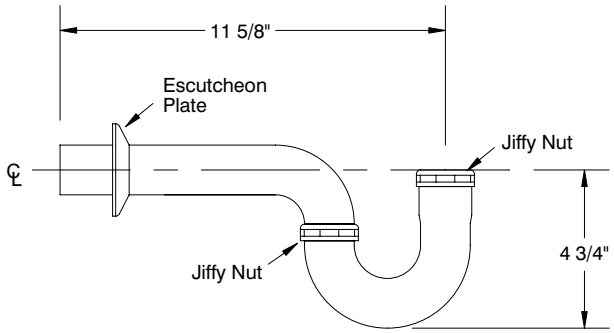
TOL ± .125" ALL DIMENSIONS ARE TYPICAL

3 Compartment
Continuous Waste



K-351

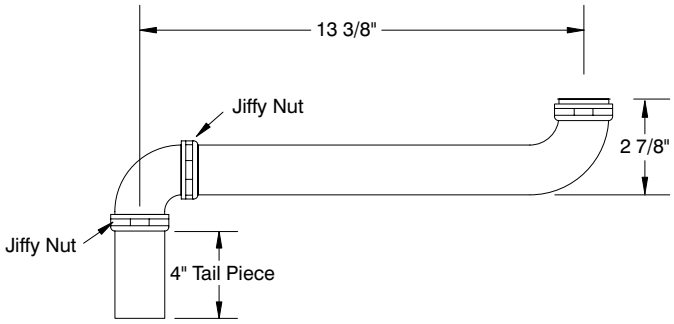
Chrome Plated P-Trap



STANDARD
22 Gauge - 1-1/2" IPS
7-PS-14

HEAVY DUTY
17 Gauge - 1-1/2" IPS
7-PS-10

Offset Tail Piece



K-46

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SMART FABRICATION™

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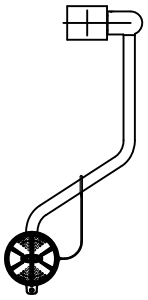
© ADVANCE TABCO, JUNE 2024

T&S BRASS AND BRONZE WORKS, INC.
2 SADDLEBACK COVE / P.O. BOX 1088 / TRAVELERS REST, SC 29690
PHONE 800-476-4103 - FAX 864- 834-3518

Sales No.: EW-7610

RELIABILITY BUILT IN

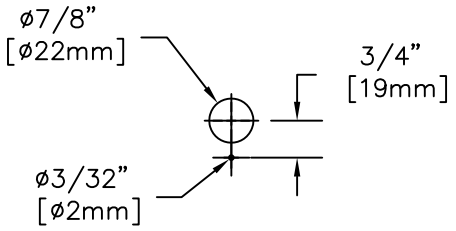
Job Name:	Architect/Engineer Approval:
Notes:	



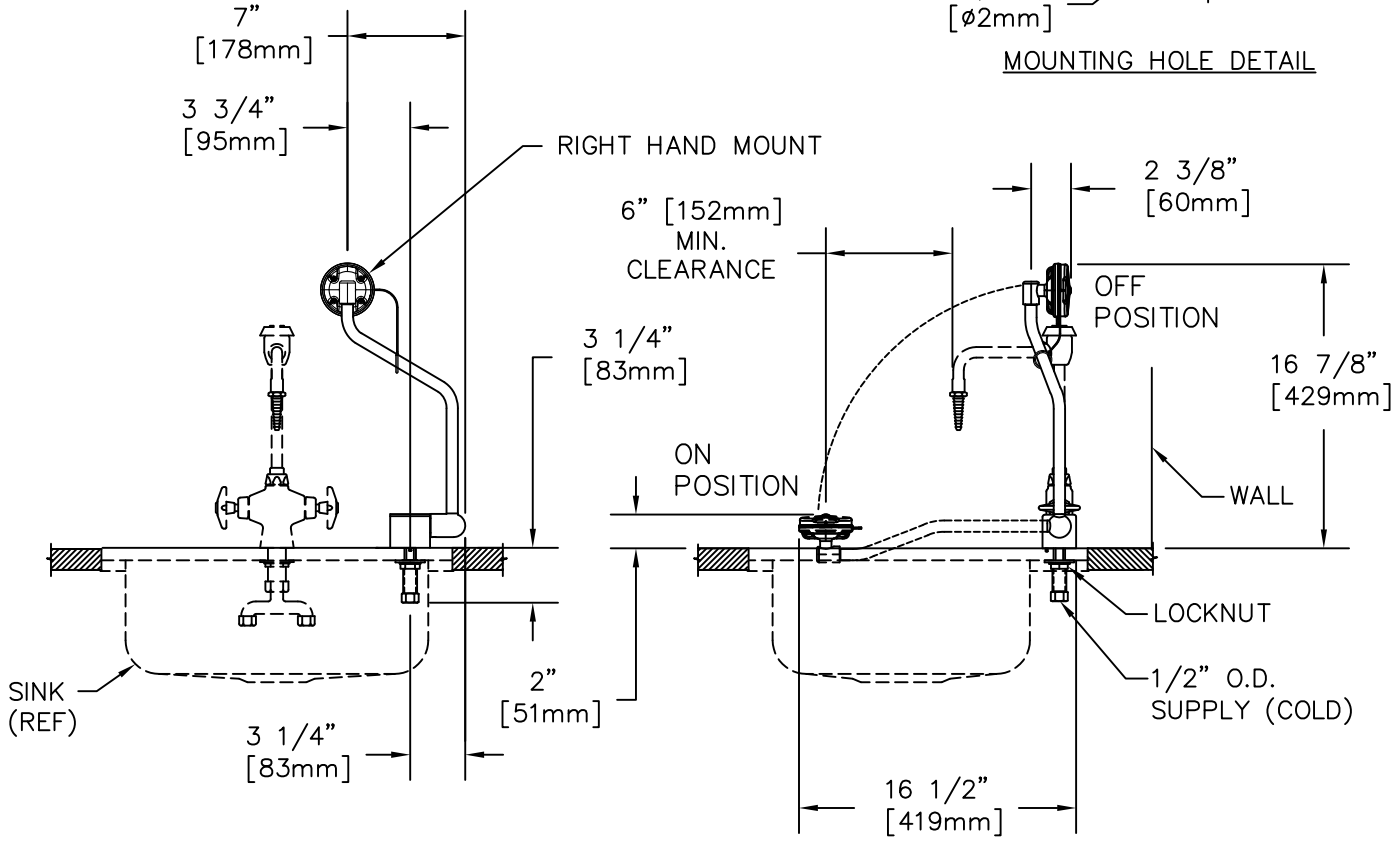
TOP VIEW
SHOWN IN ON POSITION

NOTES:

1. ANSI STANDARD Z358.1-2009 SPECIFIES EYEWASH NOZZLE HEIGHTS TO BE 33" [838mm] TO 45" [1143mm] ABOVE THE FLOOR AND 6" [152mm] MIN. FROM NEAREST OBSTRUCTION.
2. INSTALL SO THAT EYEWASH HEAD IS OVER SINK WHEN ACTIVATED.
3. DRILL ONE ø7/8" [22mm] HOLE WHERE UNIT IS TO BE INSTALLED. REFER TO MOUNTING HOLE DETAIL.
4. DIMENSIONS BELOW MAY VARY ±1/4" [6.4mm].



MOUNTING HOLE DETAIL



DECK MOUNTED OPTION

SHEET 1 OF 2

Product Description:	Drawn:	Checked	Scale:
PULL DOWN EYEWASH w/ DECK OR WALL MOUNT OPTION	DMH	DHL	1:12
	Approved: JHB		Date: 10-09-13

T&S BRASS AND BRONZE WORKS, INC.
2 SADDLEBACK COVE / P.O. BOX 1088 / TRAVELERS REST, SC 29690
PHONE 800-476-4103 - FAX 864- 834-3518

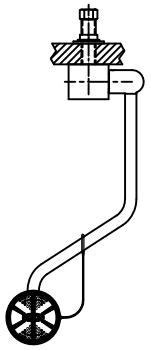
Sales No.: EW-7610

RELIABILITY BUILT IN

Job Name:

Architect/Engineer Approval:

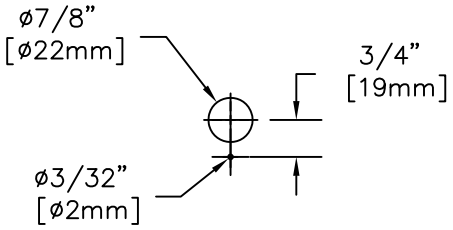
Notes:



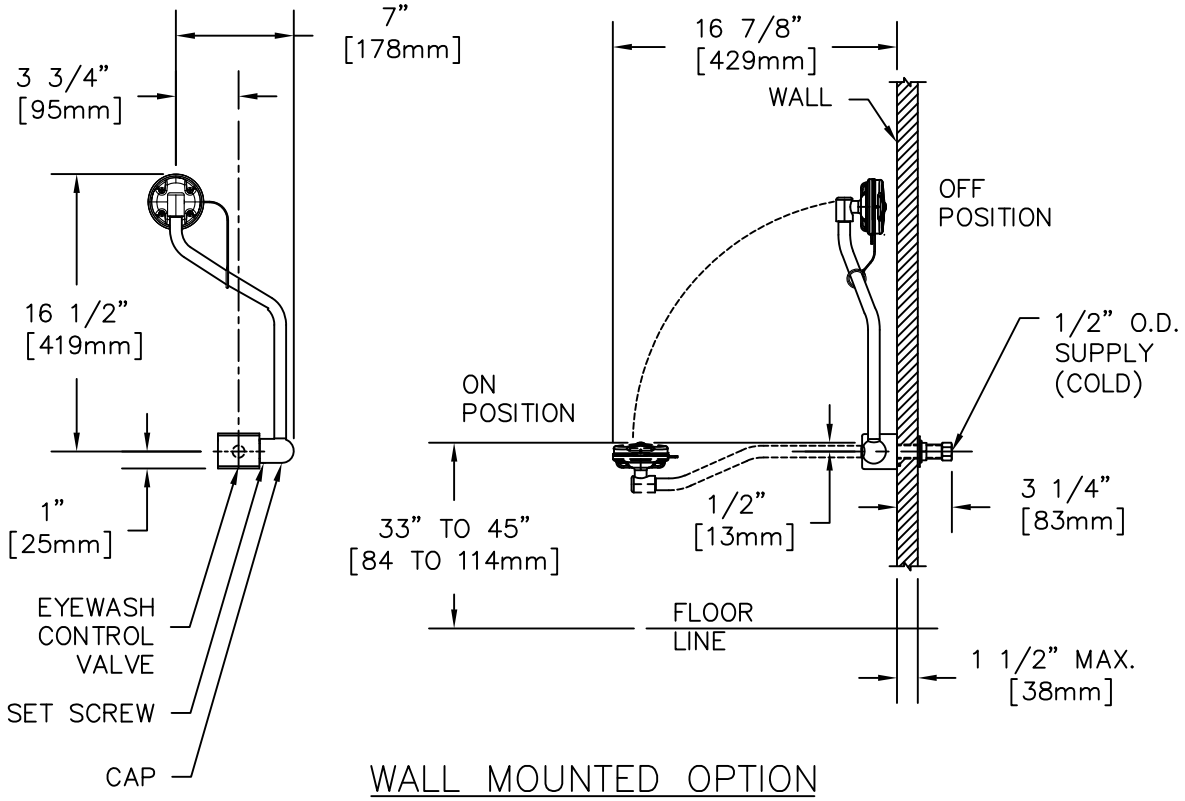
TOP VIEW
SHOWN IN ON POSITION

NOTES:

1. ANSI STANDARD Z358.1-2009 SPECIFIES EYEWASH NOZZLE HEIGHTS TO BE 33" [838mm] TO 45" [1143mm] ABOVE THE FLOOR AND 6" [152mm] MIN. FROM NEAREST OBSTRUCTION.
2. INSTALL SO THAT EYEWASH HEAD IS OVER SINK WHEN ACTIVATED. (SINK NOT SHOWN.)
3. DRILL ONE ø7/8" [22mm] HOLE WHERE UNIT IS TO BE INSTALLED. REFER TO MOUNTING HOLE DETAIL.
4. DIMENSIONS BELOW MAY VARY ±1/4" [6.4mm].



MOUNTING HOLE DETAIL



WALL MOUNTED OPTION

SHEET 2 OF 2

Product Description:
PULL DOWN EYEWASH w/ DECK OR WALL MOUNT OPTION

Drawn:	Checked	Scale:
DMH	DHL	1:12
Approved		Date:
JHB		10/09/13

34201523 - TrimLine™ Rectangle Waste Container Trash Can 15 Gallon - Gray

Item Number	Case Pack
34201523	4ea

$61.32/Each
$245.28/Case
1 Case is 4ea

- Slim rectangle waste container fits neatly beside work tables or in narrow spaces
- Textured surface resists scuffs and marking
- Integrated tabs prevent liners from slipping into container
- Hand grips on container bottom simplify lifting and emptying
- Smooth inner surface is easy to clean
- BPA Free

Tech Specs

	US	Metric
Length	10.50 in	26.67 cm
Width	20.00 in	50.80 cm
Height	24.75 in	62.87 cm
Capacity	15.00 gal	56.78 l
Min Temperature	-50.00 °F	-45.56 °C
Max Temperature	120.00 °F	48.89 °C
Bottom Length	17.00 in	43.18 cm
Bottom Width	8.10 in	20.57 cm
Cut Out Length	19.25 in	48.90 cm
Cut Out Width	9.25 in	23.50 cm
Material	Polyethylene (LLDPE)	
Country of Origin	China	

Tech Specs

	US	Metric
Case Weight	5.70 lb	2.59 kg
Case Cube	3.16 ft3	0.09 m3
Case Length	24.81 in	63.02 cm
Case Width	20.03 in	50.88 cm
Case Height	11.00 in	27.94 cm
Pallet Case Qty	8	
Pallet Tier	8	
Pallet High	1	
Harmonized Code	392490.5650	
Freight Class	300	

	US	Metric
Each UPC	017183381659	
Case GTIN	10017183381656	

Related Products

Product	Description	Case Pack	Case Weight	Case Cube
Lids				
342026REC	TrimLine™ Rectangle RECYCLE Lid with Paper Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
342027REC	TrimLine™ Rectangle RECYCLE Lid with Bottle and Can Receptacle 15 and 23 Gallon	4 ea	5.00 lb	0.88 ft^3
Accessories				
369210		1 ea	12.00 lb	1.58 ft^3

WASTE CONTAINERS

TRIMLINE™ RECTANGLE WASTE CONTAINERS

- Slim shape saves space by fitting into narrow spaces along walls and near work benches
- Corner tabs keep trash bags securely in place for spill-free, even filling
- Base helper handles stabilize container while being lifted and emptied
- Swing top, handled, or cut-out recycling lid styles available

34202423

34201523

34202469

34202369

342027REC

34202314

BPA FREE

Black (03) Beige (06) Green (09) Blue (14) Gray (23) Dark Brown (69)

Prod No	Description	Color	UOM	Case Qty	List Price
TrimLine™ Containers					
342023 △	Rectangle Waste Container - 23 Gallon	03, 06, 09, 14, 23, 69	CS	4	$288.08
342015 △	Rectangle Waste Container - 15 Gallon	23	CS	4	$243.28
TrimLine™ Waste Containers Lids					
342024 △	Rectangle Swing-Top Waste Container Lid - 15 & 23 Gallon	03, 23, 69	CS	4	$203.20
342027REC △	Rectangle Waste Container Recycle Lid with Bottle and Can Receptacles - 15 & 23 Gallon	14	CS	4	$224.44

WASTE CONTAINERS & LIDS

TrimLine™

- Designed for narrow spaces
- Self-venting for easier bag removal
- Corner tabs keep bag in place
- Helper handle on bottom makes lifting and dumping easier

Made In USA

TOP SELLER

Wire Dolly

- Compact design for easy storage
- For use with 23 gallon size container
- 100 lb weight capacity

eCARLISLE EXCLUSIVE

Black(03) Beige(06) Green(09) Blue(14) Gray(23) Brown(69)

Prod No	Description	Color	Pack
TrimLine Containers			
342015	15 gal TrimLine Container	23	4 ea
342023	23 gal TrimLine Container	03, 06, 09, 14, 23, 69	4 ea
342024	TrimLine Swing Top Lid, 20.13" x 11.5" x 4.5"	03, 06, 23, 69	4 ea
342025	TrimLine Handled Lid, 20.5" x 11.5" x 3"	03	4 ea
36920-1	Wire Frame Dolly for 23 gal TrimLine Container	03	1 ea

WASTE CONTAINERS

TRIMLINE™ RECTANGLE WASTE CONTAINERS

- Slim shape saves space by fitting into narrow spaces along walls and near work benches
- Corner tabs keep trash bags securely in place for spill-free, even filling
- Base helper handles stabilize container while being lifted and emptied
- Swing top, handled, or cut-out recycling lid styles available

34202423

34201523

34202469

34202369

342027REC

34202314

BPA FREE

Black (03) Beige (06) Green (09) Blue (14) Gray (23) Dark Brown (69)

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342023 Δ	Rectangle Waste Container - 23 Gallon	03, 06, 09, 14, 23, 69	CS	4	$288.08
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342024 Δ	Rectangle Swing-Top Waste Container Lid - 15 & 23 Gallon	03, 23, 69	CS	4	$203.20
342027REC Δ	Rectangle Waste Container Recycle Lid with Bottle and Can Receptacles - 15 & 23 Gallon	14	CS	4	$224.44

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SOILED DISHTABLE

- X CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

SOILED DISHTABLE WITH ONE COMPARTMENT SINK
REMOVABLE SCRAP/PRE-RINSE BASKET WITH
STAINLESS STEEL SLIDES
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133

Item No.

This Space for Architect/Engineer Approval

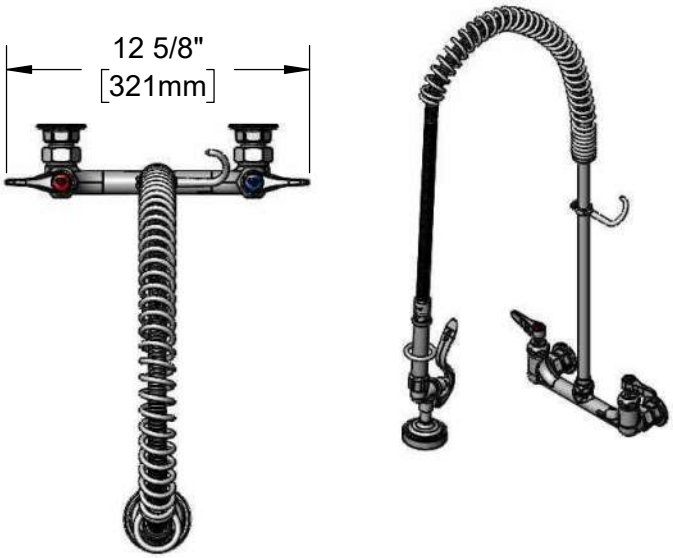
Job Name_____Date_____

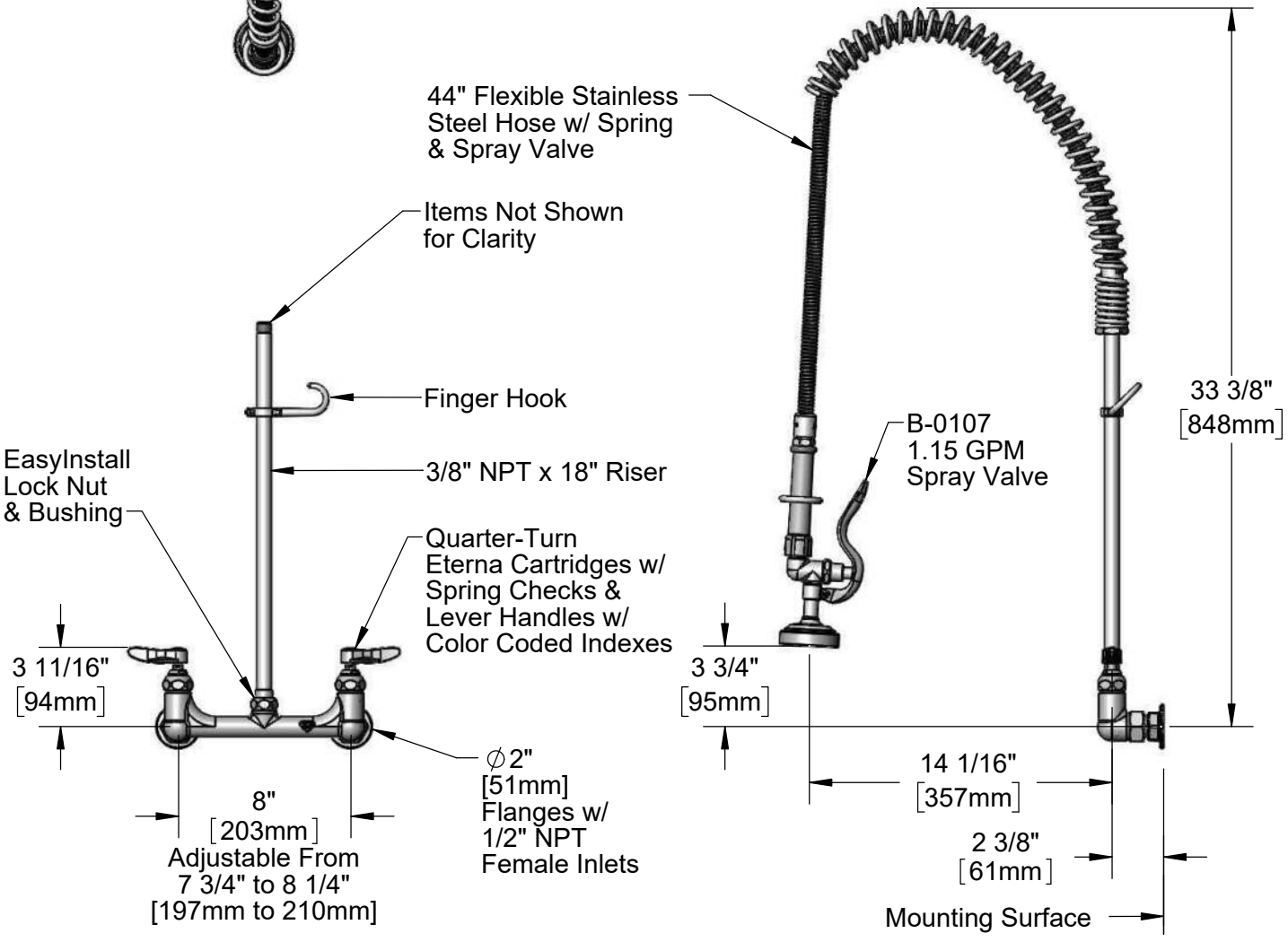
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Product Specifications:
Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve & 1/2" NPT Female Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn: MRC	Checked: JRM	Approved: JHB	Date: 06/18/20	Scale: 1:8	Sheet: 1 of 2

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2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

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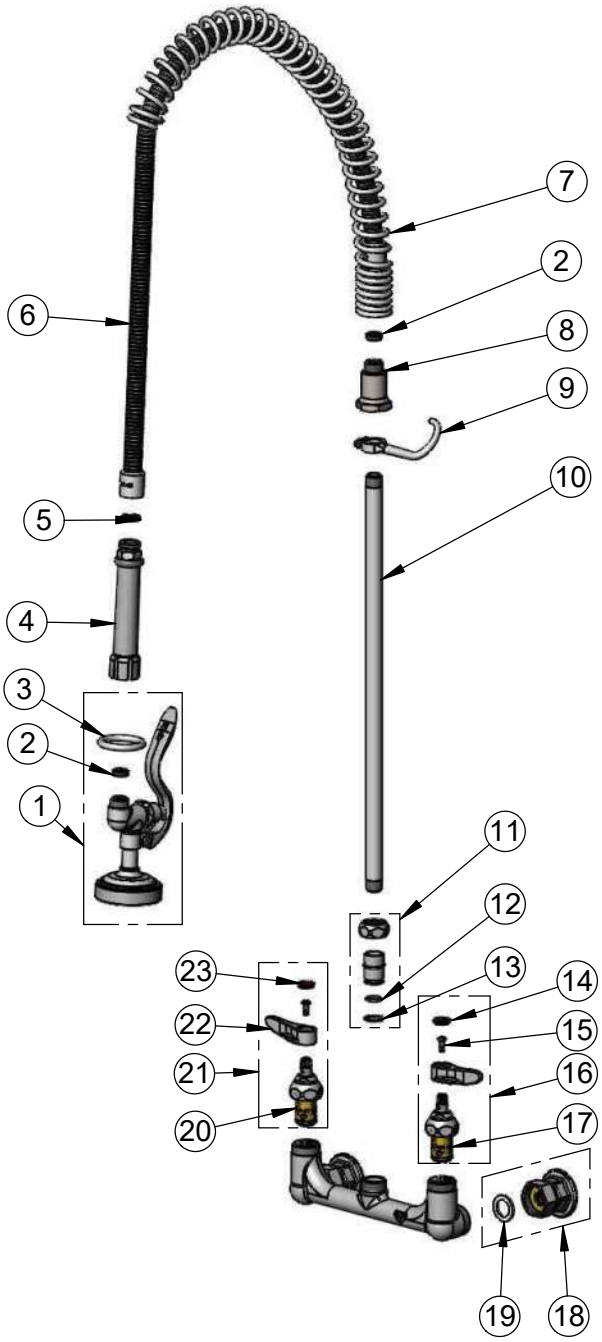
Model No. **B-0133**

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107	1.15 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Stainless Steel Flexible Hose, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	004R	Finger Hook
10	000369-40	3/8" NPT x 18" Riser
11	EZ-K	EasyInstall Kit
12	001065-45	O-Ring
13	014200-45	Star Washer, Anti-Rotation
14	018506-19NS	Blue Button Index, Press-in
15	000925-45	Lab Handle Screw
16	002711-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Blue Index & Screw, LTC
17	012442-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, LTC
18	00AA	1/2" NPT Female Eccentric Flange
19	001019-45	Coupling Nut Washer
20	012443-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, RTC
21	002712-40NS	Quarter-Turn Eterna Cartridge w/ Spring Check, Handle, Red Index & Screw, RTC
22	001638-45NS	Lever Handle (New Style)
23	001193-19NS	Red Button Index, Press-in

Product Specifications:
Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Eterna Cartridges w/ Spring Checks, Lever Handles, 44" Flexible Stainless Steel Hose, 1.15 GPM Spray Valve & 1/2" NPT Female Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
MRC	JRM	JHB	06/18/20	NTS	2 of 2

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Model No.
B-0109-01

Item No.

This Space for Architect/Engineer Approval

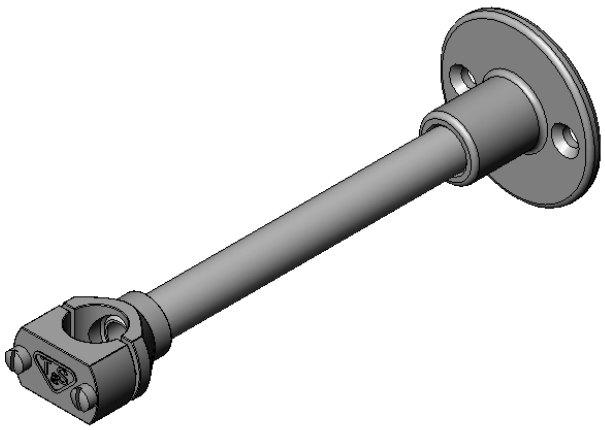
Job Name_____Date_____

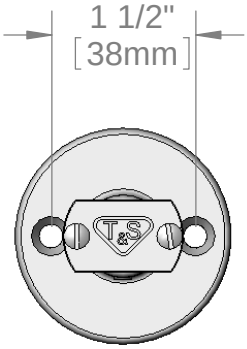
Model Specified_____ Quantity_____

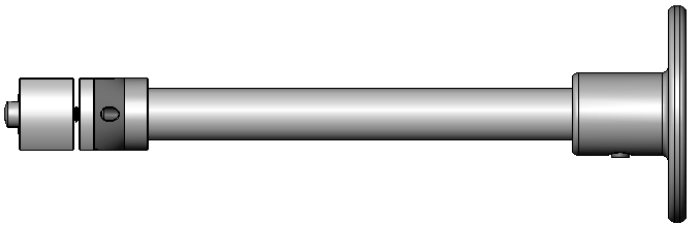
Customer/Wholesaler_____

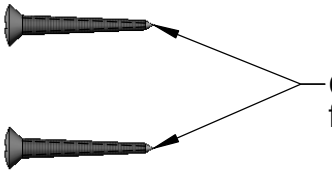
Contractor_____

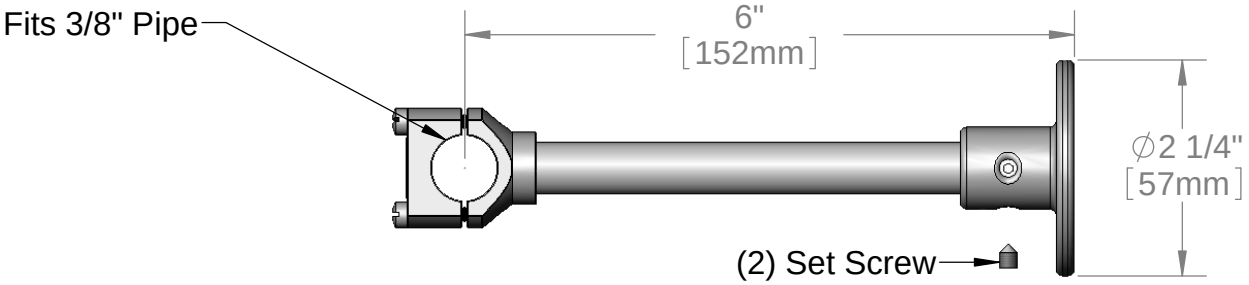
Architect/Engineer_____











Product Specifications:
6" Wall Bracket Assembly for 3/8" Pipe
w/ Mounting Hardware

Drawn	Checked	Approved
JRM	KJG	JHB
Scale: 1:2		Date: 06/02/14

Sheet: 1 of 1

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2 Saddleback Cove / P.O. Box 1088
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Model No.
B-0230-K

Item No.

This Space for Architect/Engineer Approval

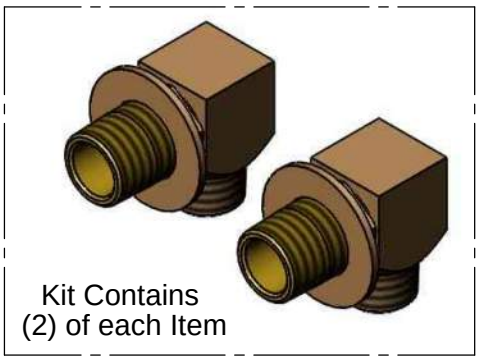
Job Name_____Date_____

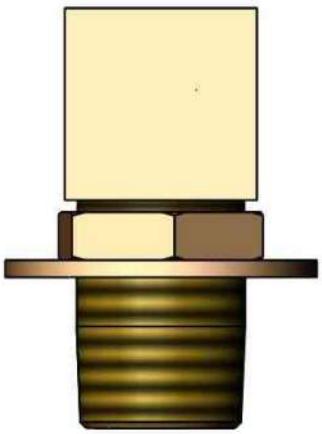
Model Specified_____ Quantity_____

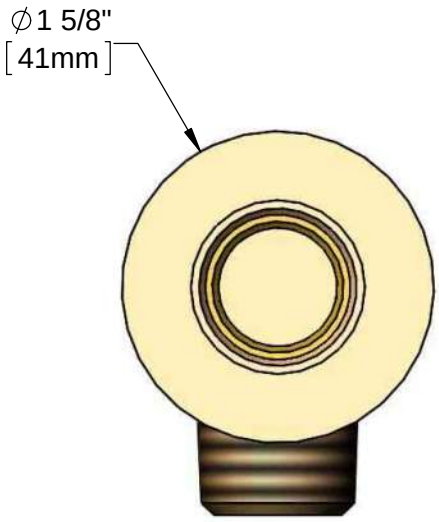
Customer/Wholesaler_____

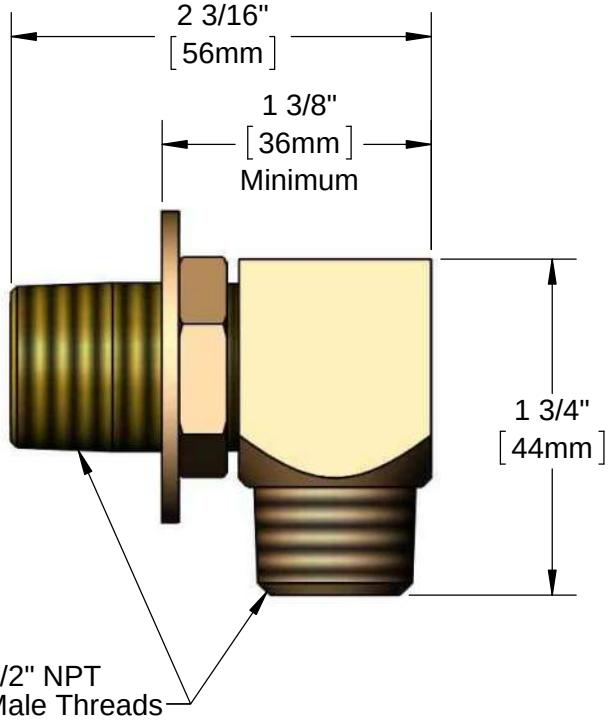
Contractor_____

Architect/Engineer_____









Product Specifications:
1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: DHL	Checked: JRM	Approved: JHB	Date: 03/13/14	Scale: 1:1	Sheet: 1 of 2

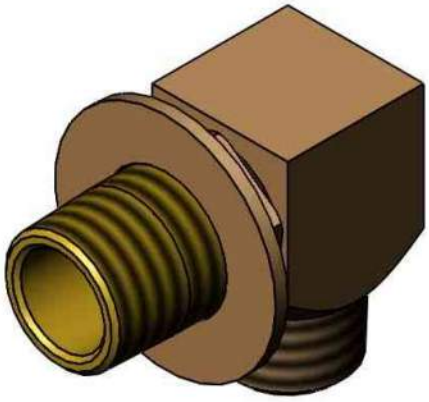
T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

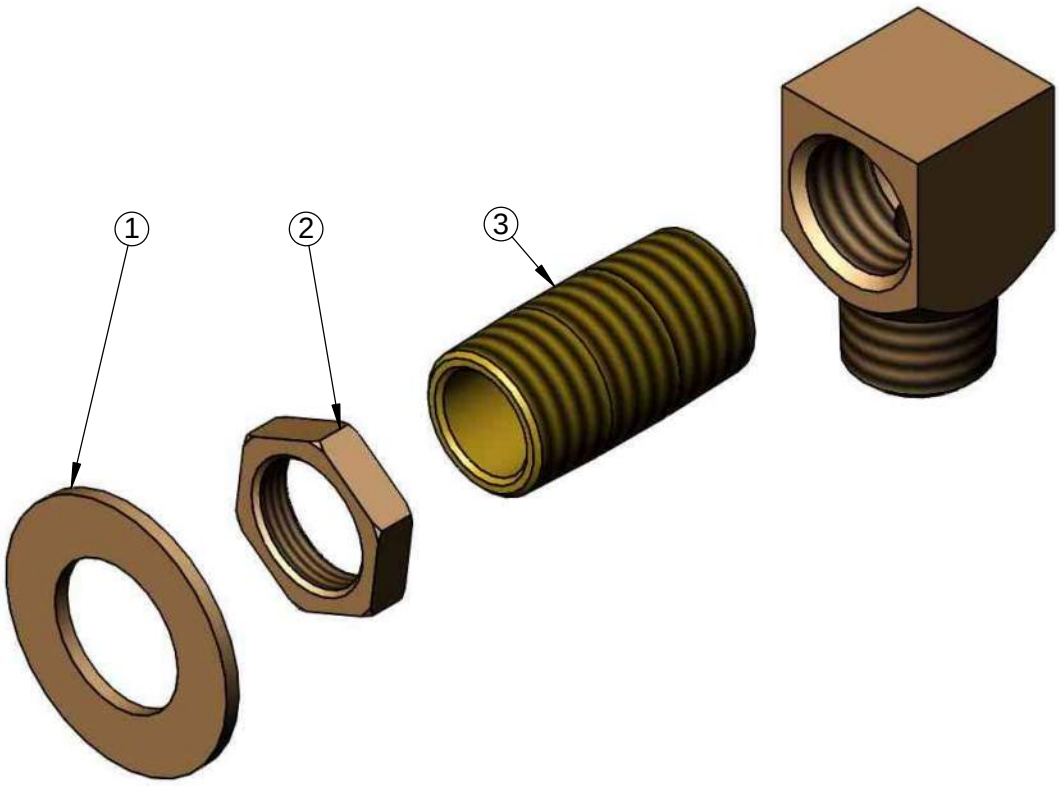
Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0230-K

Item No.

ITEM NO.	SALES NO.	DESCRIPTION
1	000999-45	Brass Lock Washer
2	002954-45	Shank Lock Nut
3	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple





Product Specifications:
1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn:	DHL	Checked:	JRM	Approved:	JHB	Date:	03/13/14	Scale:	NTS	Sheet:	2 of 2

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Model No.
B-0230-KIT

Item No.

This Space for Architect/Engineer Approval

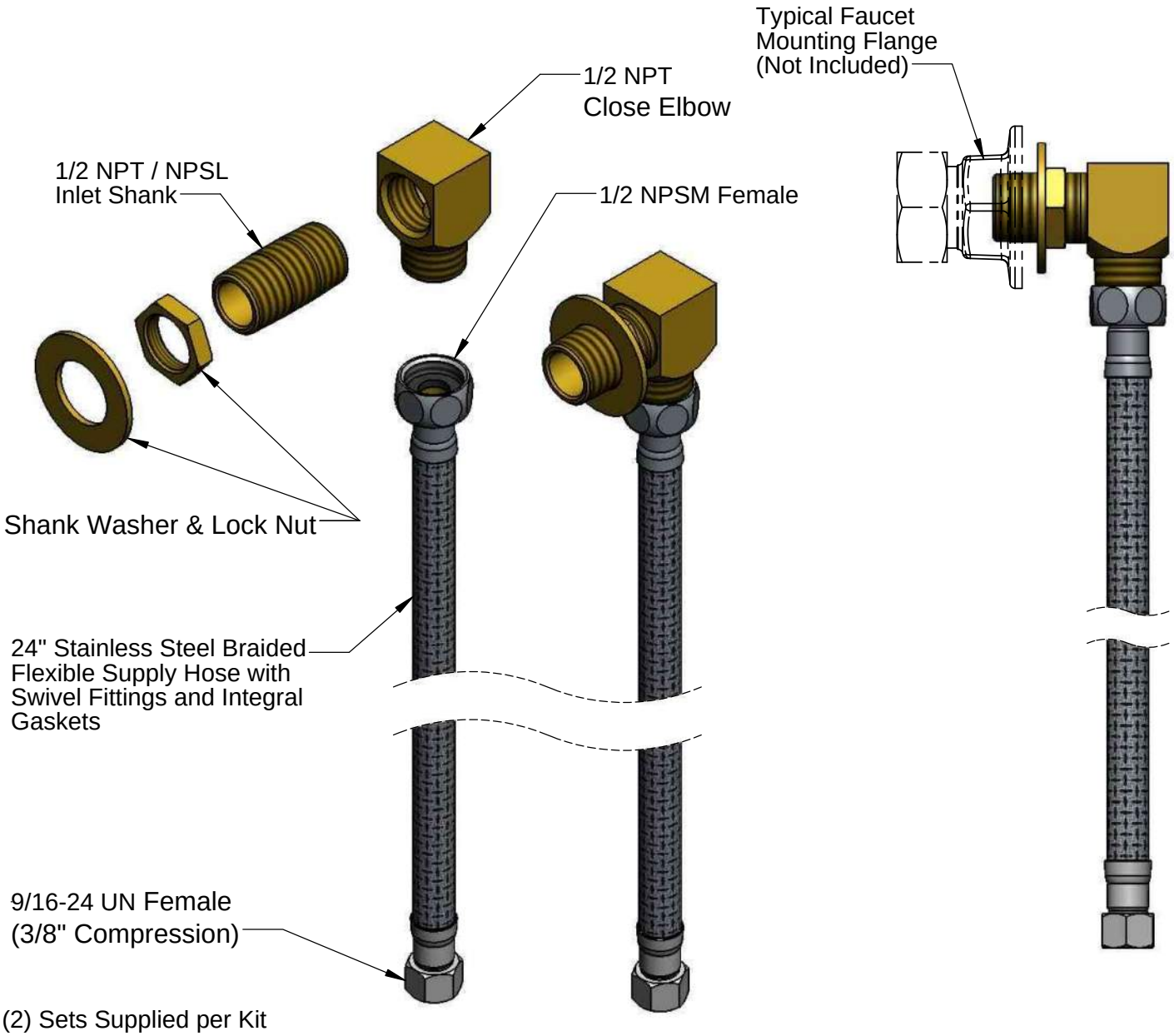
Job Name_____Date_____

Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____



(2) Sets Supplied per Kit

Product Specifications:
Inlet Kit:
1/2" Inlet Shanks, Close Elbows
and 24" Flexible Supply Hoses

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: JBC	Checked: JRM	Approved: JHB	Date: 02/23/16	Scale: 1:4	Sheet: 1 of 2

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2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

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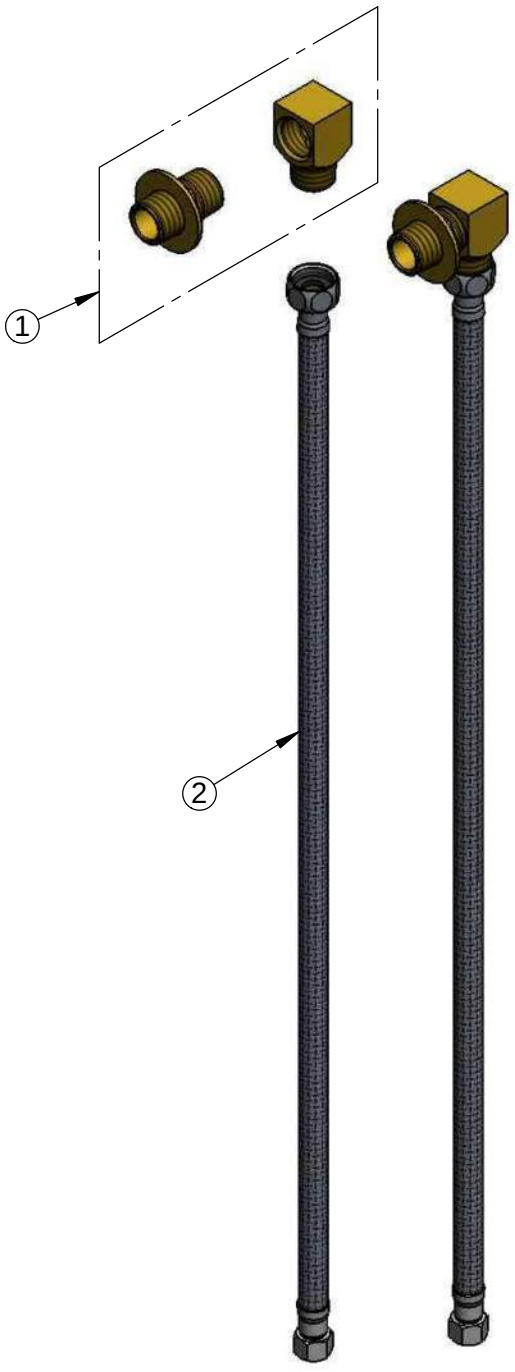
Model No.
B-0230-KIT

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0230-K	1/2" Inlet Assembly Kit (2 Sets per Kit)
2	017420-45	24" Flexible Supply Hose (Sold Individually)

Product Specifications:
Inlet Kit:
1/2" Inlet Shanks, Close Elbows
and 24" Flexible Supply Hoses

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn:	JBC	Checked:	JRM	Approved:	JHB	Date:	02/23/16	Scale:	NTS	Sheet:	2 of 2

DISHTABLE SORTING SHELVES

ADVANCE TABCO® SMART FABRICATION™

Item #: _____ Qty #: _____
Model #: _____
Project #: _____

NSF

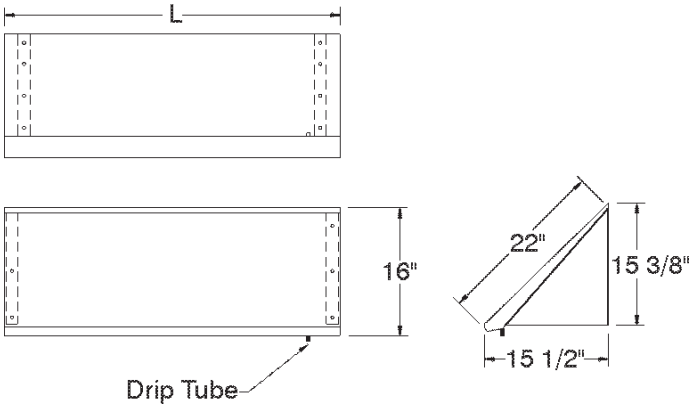
TRADITIONAL DESIGN

FEATURES:
A solid die formed wall mounted rack shelf with solid end brackets.

CONSTRUCTION:
TIG-welded with exposed areas blended to a satin finish.

MATERIAL:
Brackets are 16 gauge type 300 series stainless steel.

Shelf is 16 gauge type 300 series stainless steel.



MODEL #	# of Racks	L	Wt
DT-6R-11	1	22”	20 lbs.
DT-6R-12	2	42”	30 lbs.
DT-6R-13	3	62”	40 lbs.
DT-6R-14	4	82”	50 lbs.

KD TUBULAR DESIGN

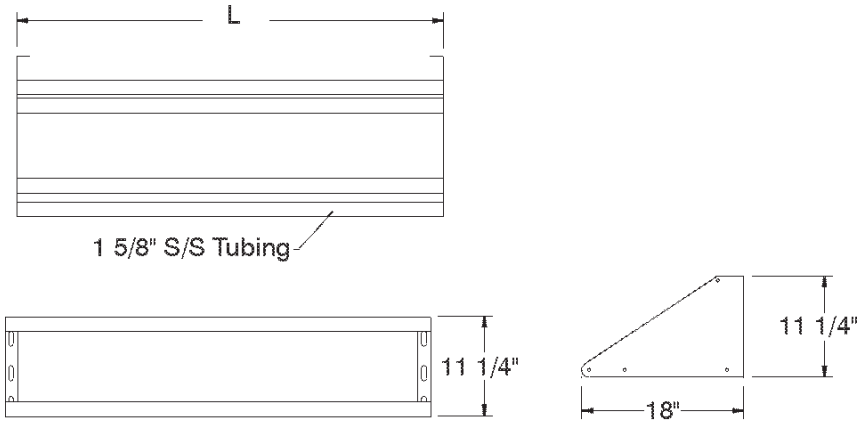
FEATURES:
A dual purpose open tubular design wall mounted rack shelf with solid end brackets bolted in field. Unit completely knock down.

CONSTRUCTION:
No welds. Unit is supplied with assembly hardware.

MATERIAL:
Brackets are 16 gauge type 300 series stainless steel.

Tubing is 1 5/8” diameter stainless steel 18 gauge tubing.

Stainless steel bolts (included).



MODEL #	# of Racks	L	Wt
DT-6R-21	1	22”	15 lbs.
DT-6R-22	2	42”	23 lbs.
DT-6R-23	3	62”	30 lbs.
DT-6R-24	4	82”	38 lbs.

ADVANCE TABCO® SMART FABRICATION™
www.advancetabco.com

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GEORGIA Fax: (770) 775-5625
TEXAS Fax: (972) 932-4795
NEVADA Fax: (775) 972-1578

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice. © ADVANCE TABCO, SEPT. 2018 REF-9

DESCRIPTION: S/S WALL FLASHING

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

S/S WALL FLASHING

CONSTRUCTED PER 114000 SPECIFICATIONS

SIZE AND SHAPE PER PLAN

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

HOBART

Project _____

AIA # _____ SIS # _____

Item # _____ Quantity _____ C.S.I. Section 114000

COMMERCIAL DISHWASHERS

AM16VLT-ADV TALL advansys ELECTRIC

High Temperature Ventless Door-Style Dishwashing Machine

c UL us NSF ENERGY STAR

SPECIFIER STATEMENT

Specified unit will be a Hobart AM16 Tall Advansys™ electric high temperature ventless dishwashing machine. Features include drain water energy recovery, automatic soil removal, 3-sided hood, ventless operation and energy recovery, door lock, touchscreen controls with WiFi connectivity, NSF pot and pan rating for 2-, 4- & 6-minute cycles, 27" door opening, pumped drain, auto door start with auto fill, interchangeable stainless steel rinse arms and X-shaped wash arms, auto delime, advanced diagnostics and service connection, up to 36 racks per hour, .67 U.S. gallons per rack pumped final rinse.

1 year parts and labor warranty.

STANDARD FEATURES

+ .67 gallons per rack pumped final rinse
+ 36 racks per hour – hot water sanitizing
+ Drain water energy recovery (DWER)
+ Automatic soil removal (ASR)
+ Ventless energy recovery
+ Pillarless opening
+ 3-sided hood
+ User-friendly smart touchscreen controls
+ Single point electrical connection standard, field convertible to dual point connection
+ 3 phase standard, field convertible to single phase
+ WiFi connectivity
+ SmartConnect app and cloud with machine status, temperature logs, error code reporting, and cost, consumption and usage analysis
+ Temperature and chemical lock outs (with Hobart equipped chemical pumps)
+ Pumped drain
+ Door lock
+ Timed wash cycles for 1, 2, 4 or 6 minutes
+ NSF pot and pan rating for 2-, 4- & 6- minute cycles
+ Sense-A-Temp™ 70°F rise electric booster heater
+ Self-draining, high efficiency wash pump with stainless steel impeller
+ 27" door opening for 18" x 26" sheet pans or 60-quart mixing bowl
+ Stainless steel drawn tank, tank shelf, chamber, trim panels, frame and feet
+ Spring counterbalanced chamber with UHMW guides
+ X- shaped revolving, interchangeable upper and lower anticlogging wash arms
+ Revolving, interchangeable upper and lower rinse arms
+ Slanted, self-locating, one-piece scrap screen and basket system
+ Automatic fill
+ Door actuated start
+ AutoClean
+ Drain water tempering kit
+ Factory startup
+ Service diagnostics
+ Straight-through or corner installation
+ Auto delime
+ Sheet pan rack

OPTIONS & ACCESSORIES (Available at extra cost)

❑ Peg rack
❑ Combination rack
❑ ASR left-hand conversion kit
❑ Chemical pumps
❑ Splash shield for corner installations
❑ Flanged and seismic feet
❑ Water hammer arrestor kit
❑ Rapid fill kit
❑ Sink integration kit
  + Sink saddle & 3" leg extension
  + Sink rail kit
  + Fold down table

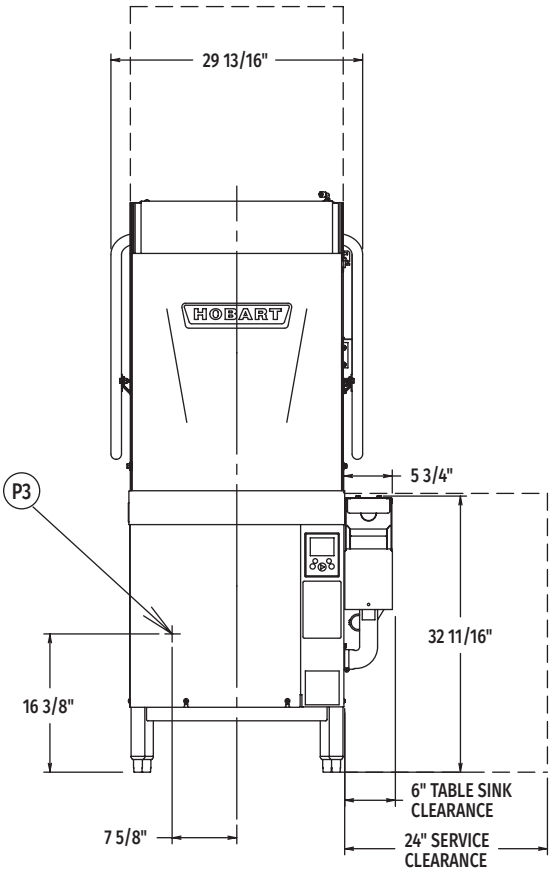
AM16 SERIES – AM16VLT-ADV TALL advansys ELECTRIC

Approved by_____ Date_____ Approved by_____ Date_____

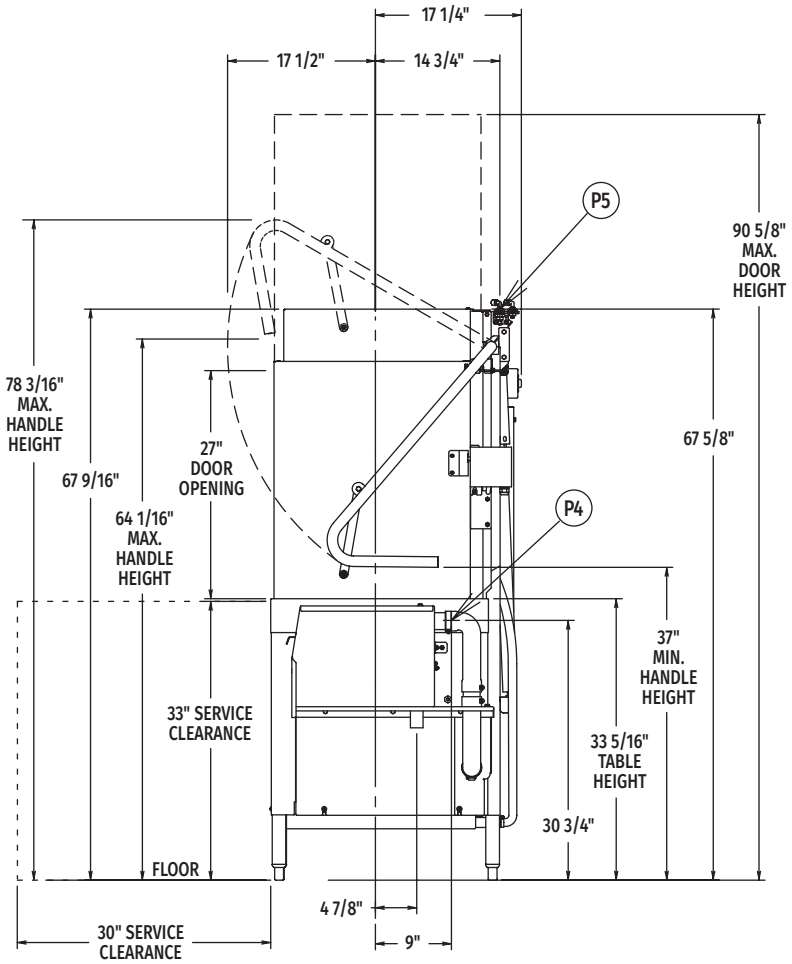
HOBART

AM16VLT-ADV TALL advansys ELECTRIC

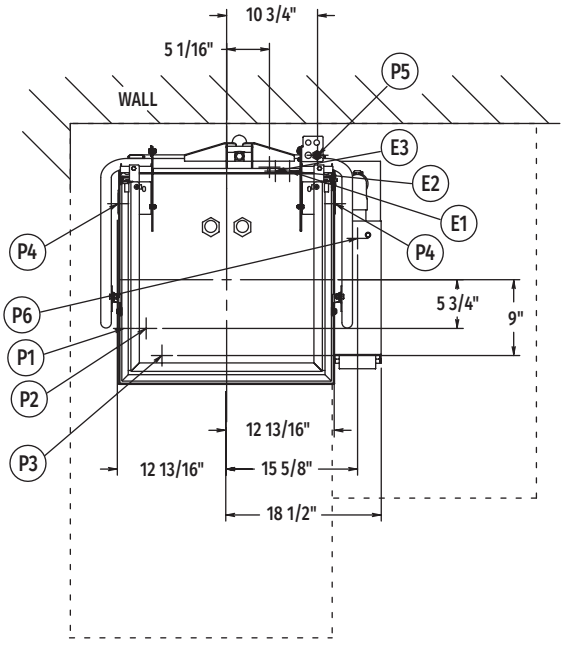
High Temperature Ventless Door-Style Dishwashing Machine



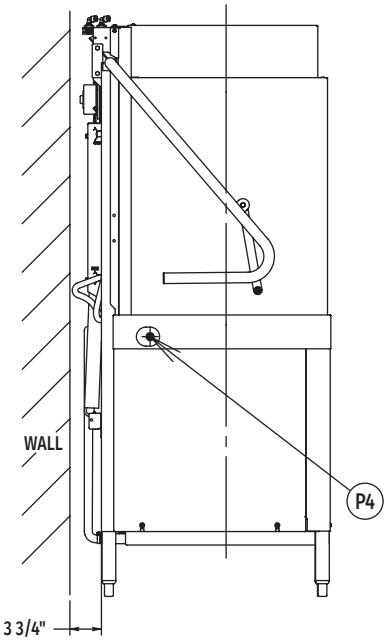
Front View



Right Side View



Top View



Left Side View

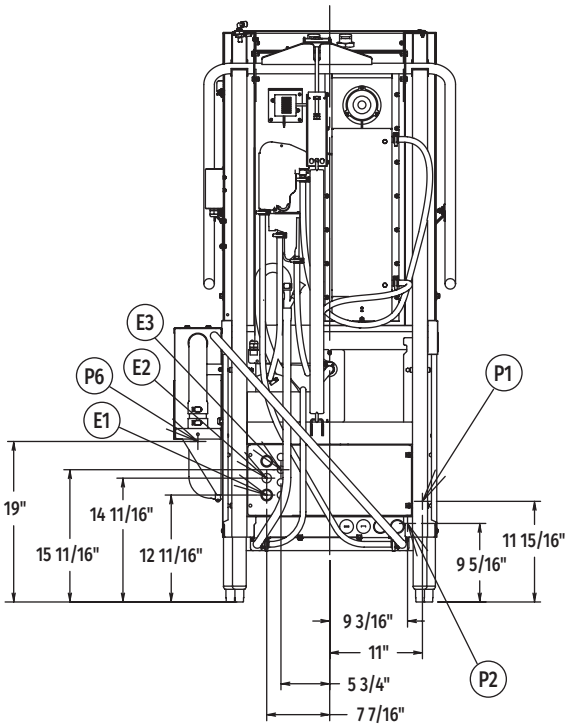
MODEL:
AM16VLT-ADV
E-950440

HOBART

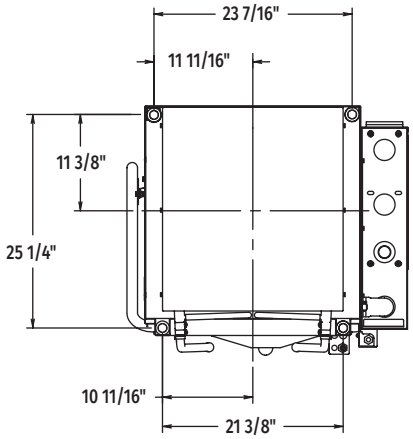
AM16VLT-ADV TALL advansys ELECTRIC

High Temperature Ventless Door-Style Dishwashing Machine

WARNING: Plumbing and electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary, safety codes and National Electrical Code.



Rear View



Bottom View

LEGEND

Electrical Connections	
E1	Electrical connection: wash pump motor & sump heater, 1" or 3/4" conduit hole; 12-11/16" AFF.
E2	Electrical connection: electric booster & controls only or single point electrical connection (3PH only), 1" or 3/4" conduit hole; 14-11/16" AFF.
E3	Electrical connection: detergent & rinse agent feeders, (DPS1 & DPS2) 1.5 amps @ nameplate supply voltage, (RPS1 & RPS2) 1.5 amps @ nameplate supply voltage; 1/2" conduit hole, 15-11/16" AFF.
Plumbing Connections	
P1	Common water connection including booster heater: 55°F water minimum; 15-65 psi recommended; 3/4" female garden hose fitting on 6' long hose supplied with machine; 11-15/16" AFF.
P2	Optional – hot water connection: 110°F water minimum (rapid fill accessory - when ordered); 3/4" female garden hose fitting on 6' long hose 9-5/16" AFF.
P3	Detergent probe sensor: remove cap and stud assembly to access 7/8" hole; 16-3/8" AFF.
P4	Detergent feeder: two locations available. Remove cap and stud assembly to access 7/8" hole; 30-3/4" AFF.
P5	Rinse agent feeder: remove 1/8" NPT pipe plug to access 1/8" NPT tapped hole; 67-5/8" AFF.
P6	Drain connection: includes machine drain & drain water tempering (LH ASR accessory drain location on opposite side), 1-1/2" stainless steel tube fitting 19" AFF.

SPECIFICATIONS

Capacities
- Racks Per Hour (maximum) 36
- Dishes per Hour (average 25 per rack) 950
- Glasses per Hour (average 45 per rack) 1,710
- Wash Tank (U.S. gallons) 10.5

Motor Horsepower
- Rinse Pump 0.18
- Wash Pump 2
- ASR Pump 0.18
- Drain Pump 0.21
- Blower 0.05

Rinse
- Gallons per Rack 0.67
- Gallons per Hour (maximum consumption) 24.12

Peak Rate of Drain Flow
- Gallons per Minute (initial rate with full tank) 18.5

Heating
- Electric Booster (kW) 7.1
- Electric Heating Unit (kW) 5.4

Shipping Weight (approximate) . . . . . 427 lbs.

Crated Dimensions . . . . . 73.75"H x 36.5"W x 36.5"L

HOBART

AM16VLT-ADV TALL advansys ELECTRIC

High Temperature Ventless Door-Style Dishwashing Machine

E1	AM16 with Electric Heat (When Field Converted to Dual Point)		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/1	39.6	50	50
208-240/60/3	26.9	30	30
480/60/3	10.5	15	15

E2	9.5 kW Booster & Controls (When Field Converted to Dual Point)		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/1	43.5	50	50
208-240/60/3	26.8	30	30
480/60/3	13.5	15	15

E2	AM16 Single Point Electrical Service Connection as Shown Below		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/3	53.7	60	60
480/60/3	24.0	30	30

Approximate Heat Gain to Space without Vent Hood	
Type	BTU/Hr.
Latent	5,100
Sensible	5,300

Miscellaneous Notes: All dimensions taken from floor line may increase 7/8" or decrease 3/8" depending on leg adjustment.

Vent hood (if required) to provide a minimum 450 CFM exhaust (ref installation instructions).

Net weight of machine including booster: 410 lbs.
Domestic shipping weight including booster: 430 lbs.

Size of racks – 19-3/4" x 19-3/4".

For optimal performance, Hobart recommends maintaining a dishroom temperature of 65°F (18°C) or higher, as lower temperatures may hinder the machine's capacity to operate effectively (with lower performance as ambient temperature decreases).

Plumbing Notes: Water hammer arrestor (meeting ASSE-1010 standard or equivalent) to be supplied (by others) in common water supply line at service connection.

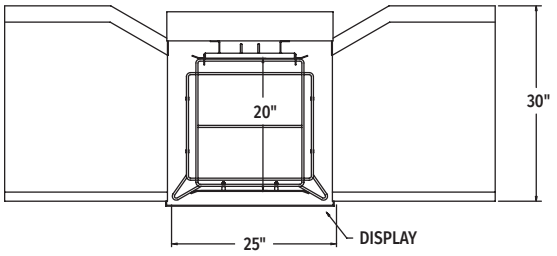
Recommended water hardness to be 3 grains or less for best results.

Recommended building flowing water pressure to the dishwasher at or above 20 PSI. Pressures lower than 20 PSI may affect machine fill/start-up times.

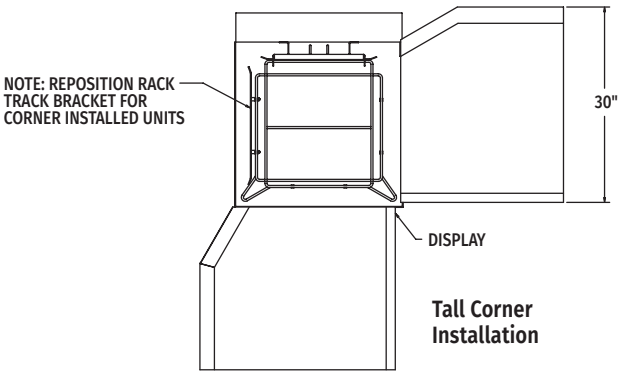
This is a pumped rinse machine. Pressure regulating valve is not necessary on hot or cold lines.

For convenience when cleaning, water tap should be installed near machine with heavy duty hose and squeeze valve.

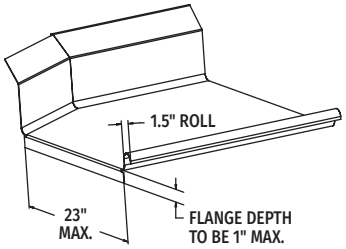
AM16VLT-ADV TABLING CONFIGURATIONS AND TRACK DESIGN



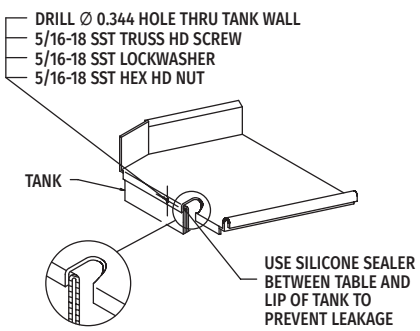
Pass Thru Installation



Tall Corner Installation



Suggested Table Design



As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

Oversized Equipment Quick Reference Guide

Oversized units with crated shipping dimensions greater or equal to 72" in length and/or 90" in height. If delivery is to a facility without a standard height dock, additional shipping charges will apply depending on the service requested.

HOBART

DOOR TYPES
- AM15T
- AM15VLT

CONVEYOR TYPES (CL, FT)
- CL44*e*N-ADV
- CL44*e*NVL
- All 54" Models or Greater
- All FT Models

PREP WASHERS
- PW10*e*R
- PW20*e*R
- PWV*e*R

TURBOWASHERS (TW), TOTEWASHERS (CL64T) WASTE PULPERS (WPS)
- All Models

WRAPPING SYSTEM (NGW)
- All Models

Traulsen

centerline by Traulsen

G, R and A SERIES
- All Roll-In & Roll-Thru Models
- All Three Section Models

UNDERCOUNTERS (UHT, UHD, ULT, TU)
- All 72" Models or Greater

PREP TABLES (UST, USD, UPT, UPD, TS, TB)
- TB - 60" Models or Greater
- TS - 66" Models or Greater
- All 72" Models or Greater

EQUIPMENT STANDS (TE)
- All Models 48" or Greater

UNDERCOUNTERS (CLUC) & PREP TABLES (CLPT)
- All 72" Models or Greater

THE INFORMATION PROVIDED IS TO BE USED AS A QUICK REFERENCE QUIDE ONLY. PLEASE CONSULT ITW FEG CUSTOMER CARE FOR UNITS NOT LISTED OR ANY QUESTIONS SURROUNDING DELIVERY OPTIONS.

HB2913 (10-20)

DESCRIPTION: 3-COMPARTMENT SINK

X CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SINK BOWL COVER

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

SINK BOWL COVER
CONSTRUCTED PER 114000 SPECIFICATIONS
REFER TO FABRICATION DRAWINGS FOR DETAILS
SIZE AND SHAPE PER PLAN

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0290

Item No.

ADA Compliant

This Space for Architect/Engineer Approval

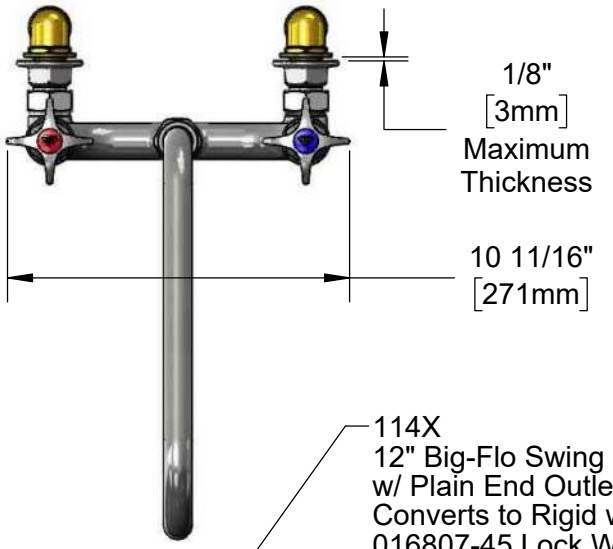
Job Name_____Date_____

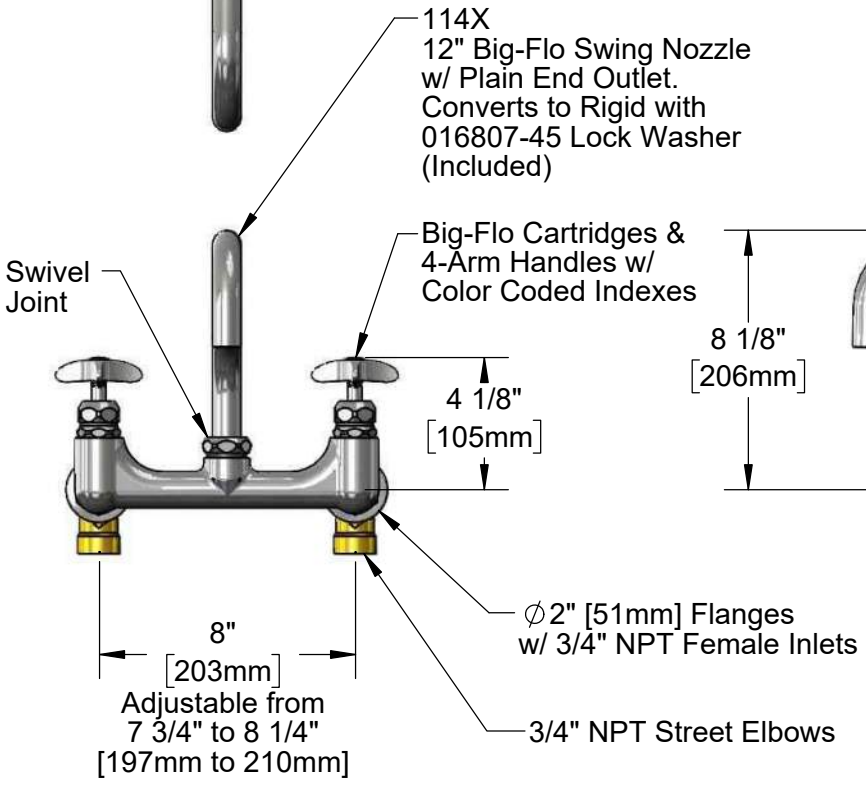
Model Specified_____ Quantity_____

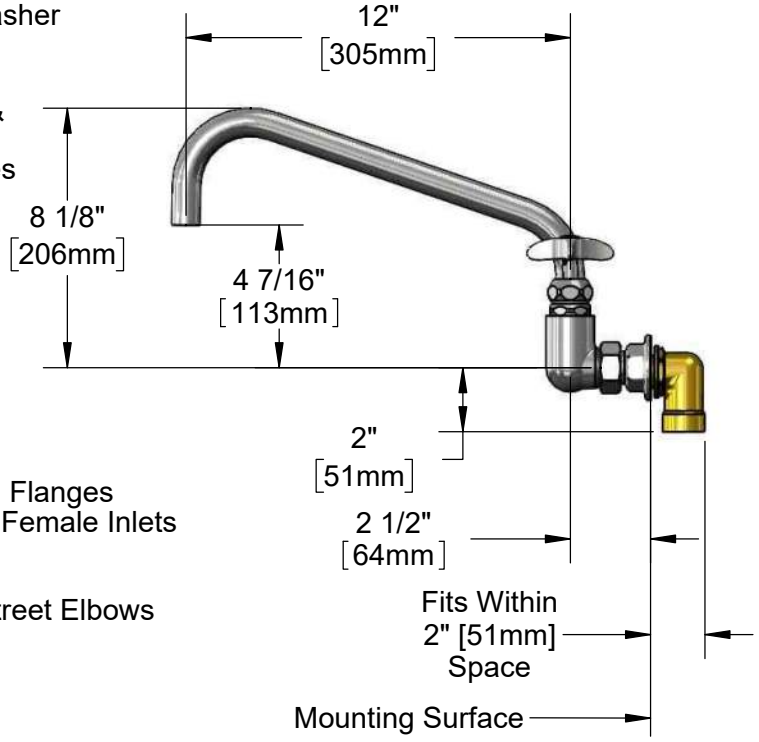
Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____







Rough-In Requirement:
(2) ∅1 1/4" [32mm] Mounting Holes

Product Specifications:
8" Wall Mount Big-Flo Mixing Faucet, Big-Flo Cartridges, 4-Arm Handles, 12" Big-Flo Swing Nozzle & 3/4" NPT Elbow Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn: DMH	Checked: JRM	Approved: JHB	Date: 06/15/18	Scale: 1:4	Sheet: 1 of 2

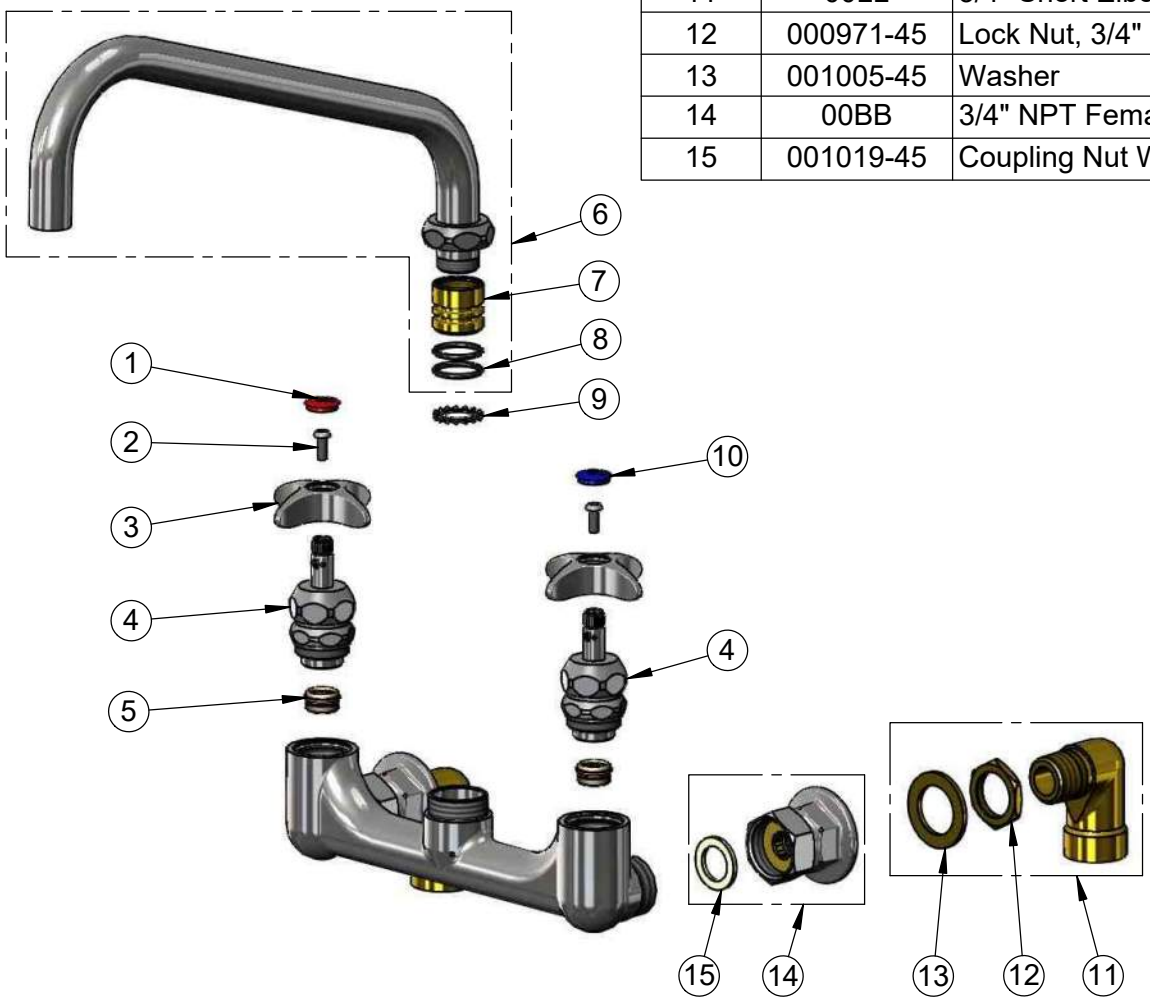
T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No. **B-0290**

Item No.

ITEM NO.	SALES NO.	DESCRIPTION
1	001193-19NS	Red Button Index, Press-in
2	000925-45	Lab Handle Screw
3	002521-45NS	4-Arm Handle (New Style)
4	006482-40NS	Big-Flo Cartridge, RTC
5	000764-20	Seat, Big-Flo
6	114X	12" Big-Flo Swing Nozzle
7	000847-20	Big-Flo Swivel Piece
8	001068-45	O-ring
9	016807-45	Serrated Lock Washer
10	018506-19NS	Blue Button Index, Press-in
11	00LL	3/4" Short Elbow Inlet
12	000971-45	Lock Nut, 3/4" NPSM
13	001005-45	Washer
14	00BB	3/4" NPT Female Eccentric Flange
15	001019-45	Coupling Nut Washer



Product Specifications:
8" Wall Mount Big-Flo Mixing Faucet, Big-Flo Cartridges, 4-Arm Handles, 12" Big-Flo Swing Nozzle & 3/4" NPT Elbow Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
DMH	JRM	JHB	06/15/18	NTS	2 of 2

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Travelers Rest, SC 29690

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Model No.
B-0427

Item No.

This Space for Architect/Engineer Approval

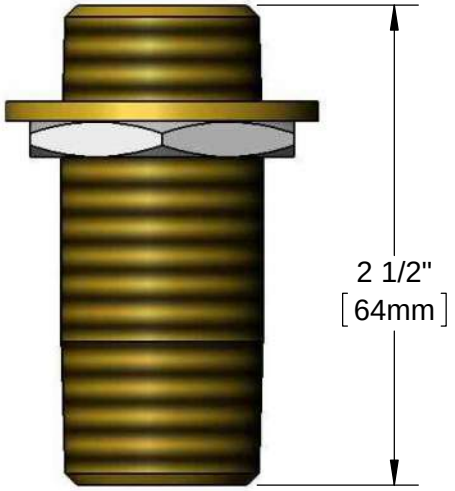
Job Name_____Date_____

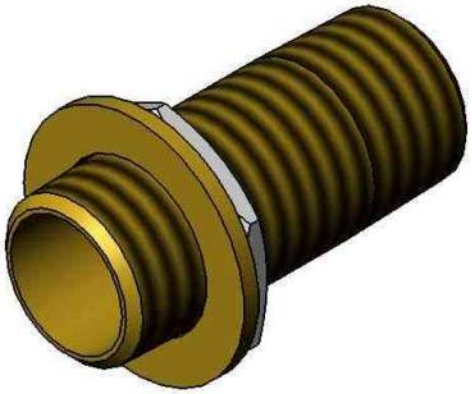
Model Specified_____ Quantity_____

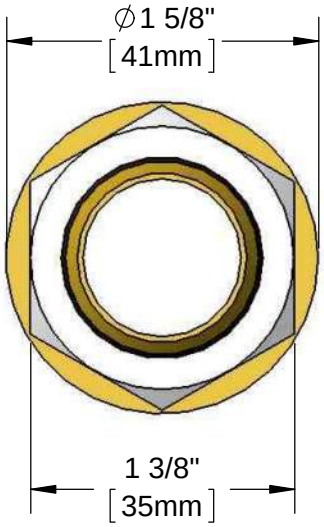
Customer/Wholesaler_____

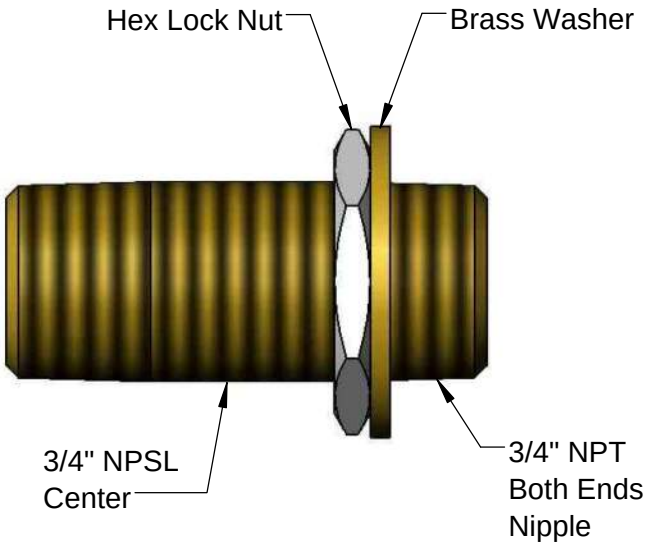
Contractor_____

Architect/Engineer_____









Product Specifications:
3/4" NPT Inlet Supply Nipple Kit

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: JBC	Checked: JRM	Approved: JHB	Date: 07/23/16	Scale: 1:1	Sheet: 1 of 1

PREMIUM PLUMBING PRODUCTS
Encore®
1890 Swarthmore Avenue, PO Box 2020, Lakewood, NJ 08701
Phone: 800-526-3694, 732-363-4700, Fax: 732-364-8110
www.encoreplumbing.com • www.componenthardware.com

PROJECT NAME: _____

LOCATION: _____

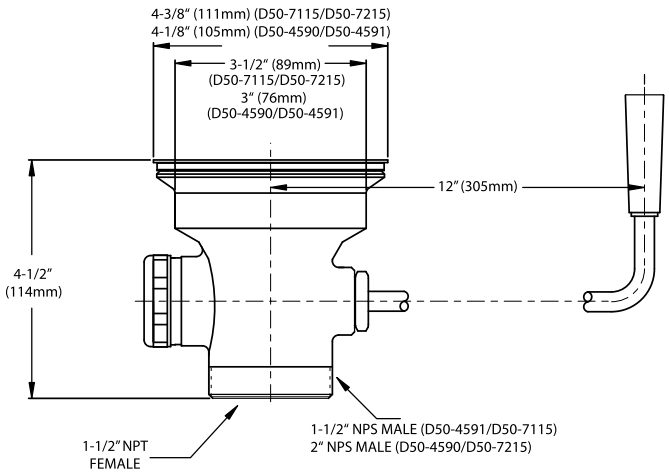
SPECIFIER ITEM NO. _____ **QTY:** _____

ENCORE PART NO. _____

Encore® Twist Handle Waste Outlet with Overflow Assembly

D50-xxxx Series

D50-4590	2” NPS, 3” Dia. Sink Opening
D50-4591	1-1/2” NPS, 3” Dia. Sink Opening
D50-7115	1-1/2” NPS, 3-1/2” Dia. Sink Opening
D50-7215	2” NPS, 3-1/2” Dia. Sink Opening



Dimensions shown in inches (mm) are for reference only and are subject to change.

Flow Rate: Max 20gpm

Approximate shipping weight - 6 lbs
Warranty - 2 years parts

Solid heavy duty cast body is specification and commercial quality

Commercial Quality Features

- Nickel plated cast brass drain body
- Self-centering stainless steel face flange
- Stainless steel twist handle
- Overflow head with stainless steel face plate

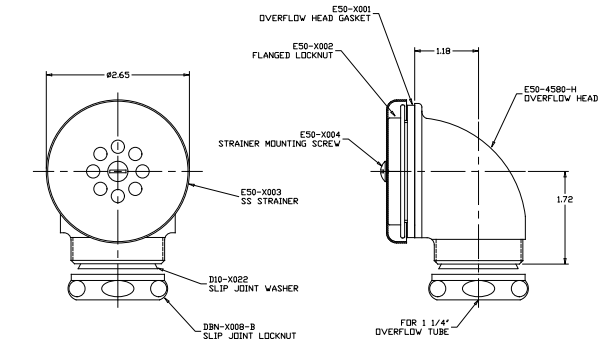
SPECIFICATIONS:

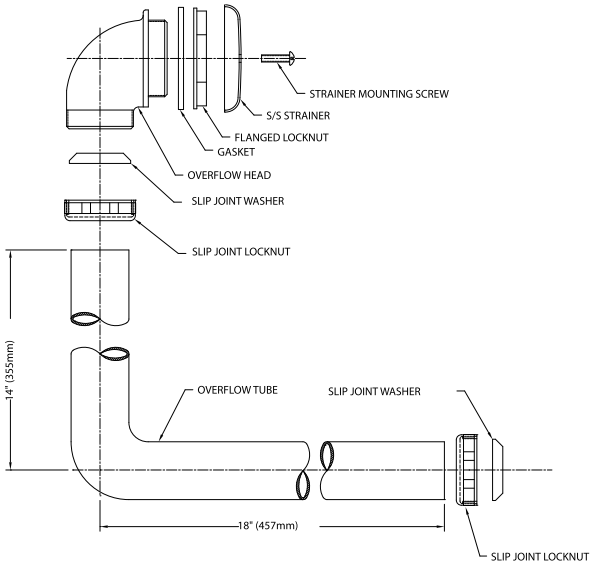
Lever handle waste outlet to be Encore D50 Series in the following configuration:

____	D50-4590	2” NPS, 3” Dia. Sink Opening
____	D50-4591	1-1/2” NPS, 3” Dia. Sink Opening
____	D50-7115	1-1/2” NPS, 3-1/2” Dia. Sink Opening
____	D50-7215	2” NPS, 3-1/2” Dia. Sink Opening

Drain to have nickel plated solid all metal construction. Drain to have self-centering stainless steel face flange with snap-in stainless steel strainer. Drain to be designed for trouble free fast drainage when the stainless steel twist handle is in the open position and has a positive sealing action when closed. Drain to have 1-1/4” overflow assembly which includes 1-1/4” OD elbow tube and overflow head with stainless steel faceplate.

NOTE: Sink cutout hole to be 2” for overflow head assembly





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2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133-14CRBJSX

Item No.

This Space for Architect/Engineer Approval

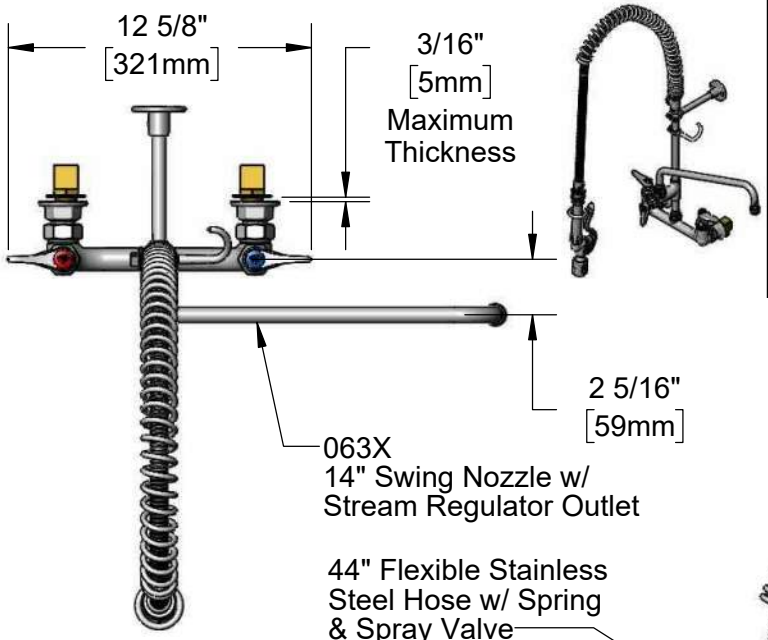
Job Name_____Date_____

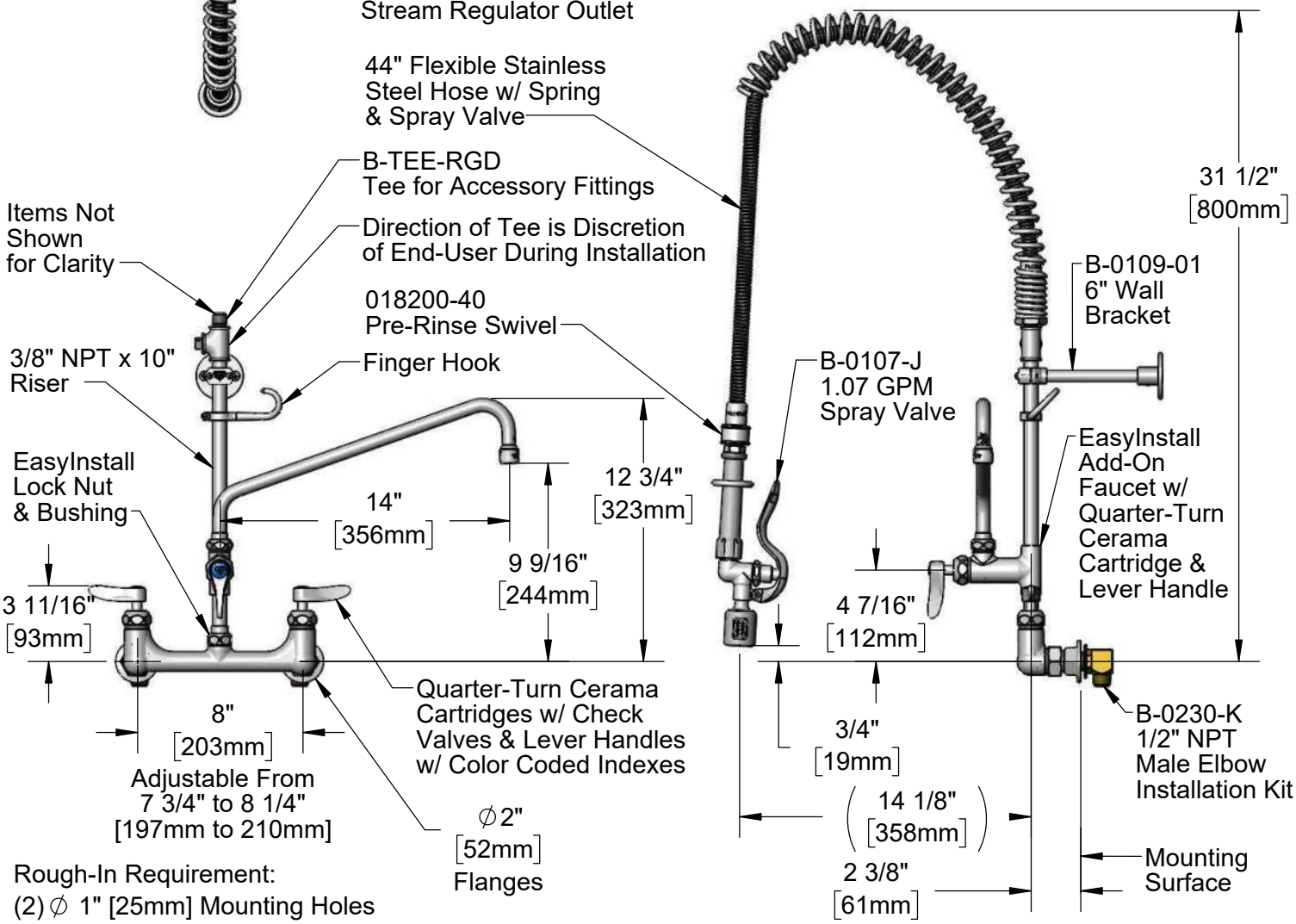
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, Add-On Faucet w/ 14" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.07 GPM Spray Valve w/ Swivel, 6" Wall Bracket, Accessory Fitting Tee & 1/2" NPT Male Elbow Installation Kit

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

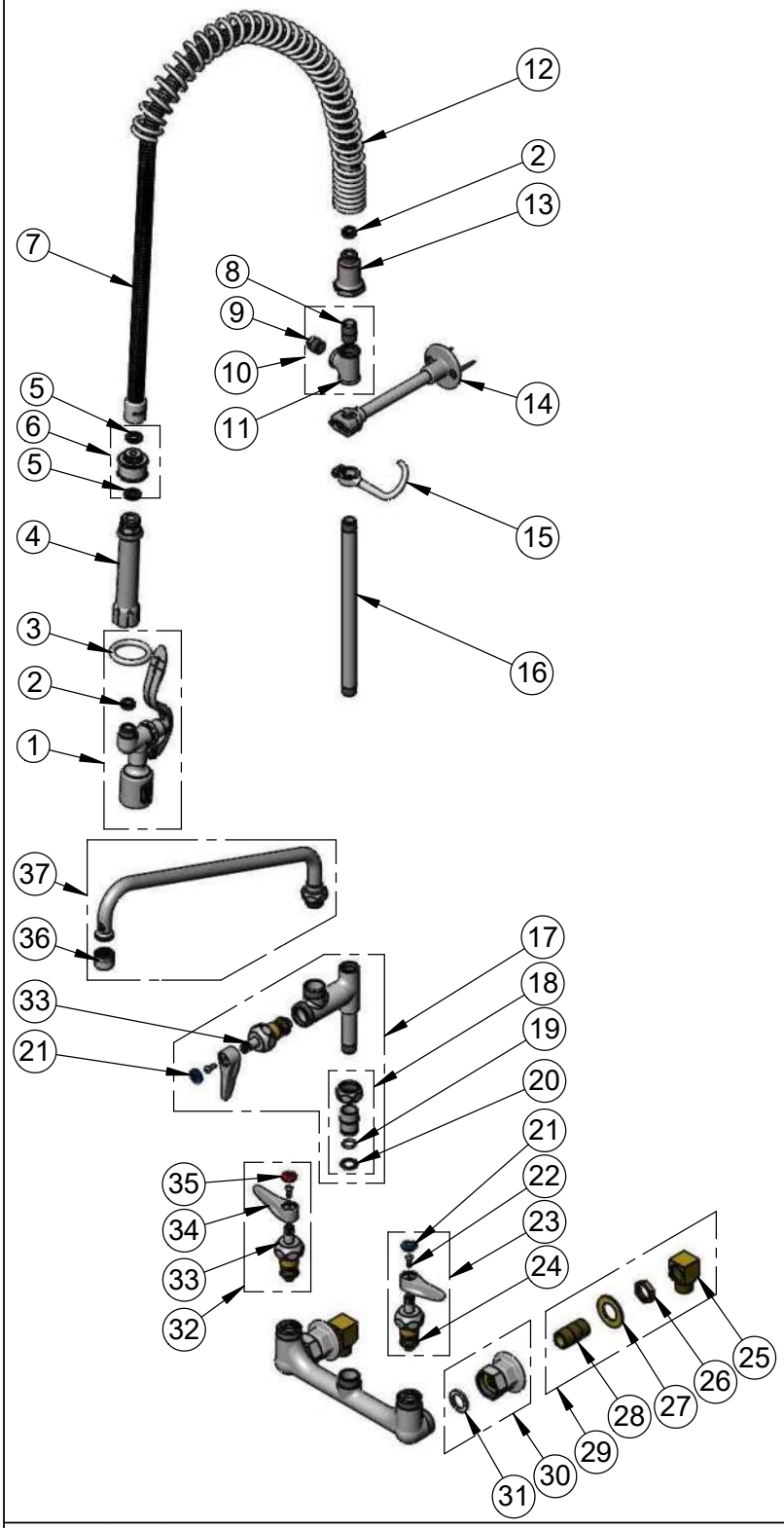
Drawn:	LSA	Checked:	JRM	Approved:	JHB	Date:	09/20/19	Scale:	1:8	Sheet:	1 of 2

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133-14CRBJSX

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107-J	1.07 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	018200-40	Pre-Rinse Swivel
7	B-0044-H2A	44" Flexible Stainless Steel Hose, Less Handle
8	002535-25	3/8" Close Nipple
9	002369-25	3/8" NPT Plug
10	B-TEE-RGD	Rigid Tee
11	001614-40	3/8" NPT Forged Tee
12	000888-45	EasyInstall Overhead Spring
13	000821-40	Spring Body
14	B-0109-01	6" Wall Bracket
15	004R	Finger Hook
16	079X	Nipple, 3/8" NPT x 10"
17	B-0155-CR-LN	Add-On Faucet, Less Nozzle
18	EZ-K	EasyInstall Kit: Nut, Bushing, O-Ring & Lock Washer
19	001065-45	O-ring
20	014200-45	Star Washer, Anti-Rotation
21	018506-19NS	Blue Button Index, Press-in
22	000925-45	Lab Handle Screw
23	012447-25NS	Quarter-Turn Cerama Cartridge, LTC w/ Check Valve, Handle, Index & Screw
24	012395-25NS	Quarter-Turn Cerama Cartridge, LTC w/ Check Valve
25	B-1100-K	1/2" NPT Male Inlet Elbow
26	002954-45	Shank Lock Nut
27	000999-45	Brass Lock Washer
28	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple
29	B-0230-K	Short Elbow Installation Kit
30	00AA	1/2" NPT Female Eccentric Flange
31	001019-45	Coupling Nut Washer
32	012446-25	Quarter-Turn Cerama Cartridge, RTC w/ Check Valve, Handle, Index & Screw
33	012394-25	Quarter-Turn Cerama Cartridge, RTC w/ Check Valve
34	001638-45NS	Lever Handle (New Style)
35	001193-19NS	Red Button Index, Press-in
36	B-PT	Full Flow Stream Regulator, 55/64-27
37	063X	14" Swing Nozzle w/ Stream Regulator Outlet

Product Specifications:
Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, Add-On Faucet w/ 14" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.07 GPM Spray Valve w/ Swivel, 6" Wall Bracket, Accessory Fitting Tee & 1/2" NPT Male Elbow Installation Kit

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
2019 DOE PRSV - Class II

Drawn:	LSA	Checked:	JRM	Approved:	JHB	Date:	09/20/19	Scale:	NTS	Sheet:	2 of 2

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Model No.
B-0230-K

Item No.

This Space for Architect/Engineer Approval

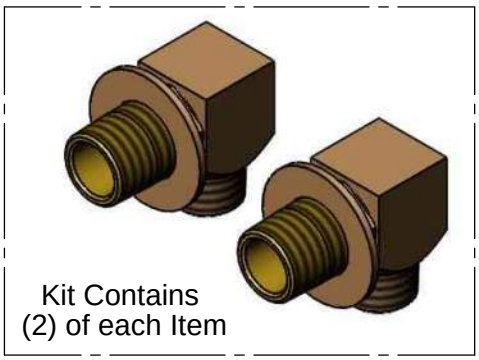
Job Name_____Date_____

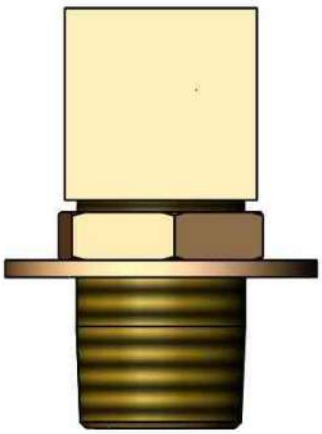
Model Specified_____ Quantity_____

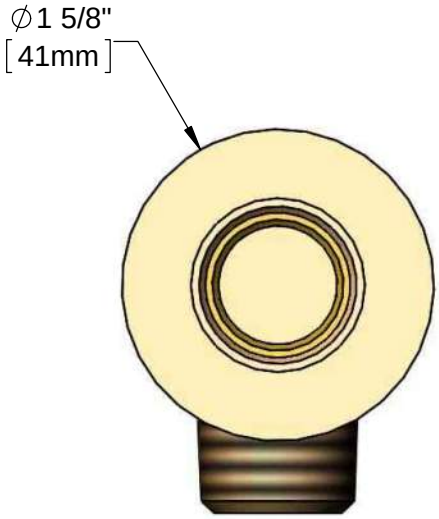
Customer/Wholesaler_____

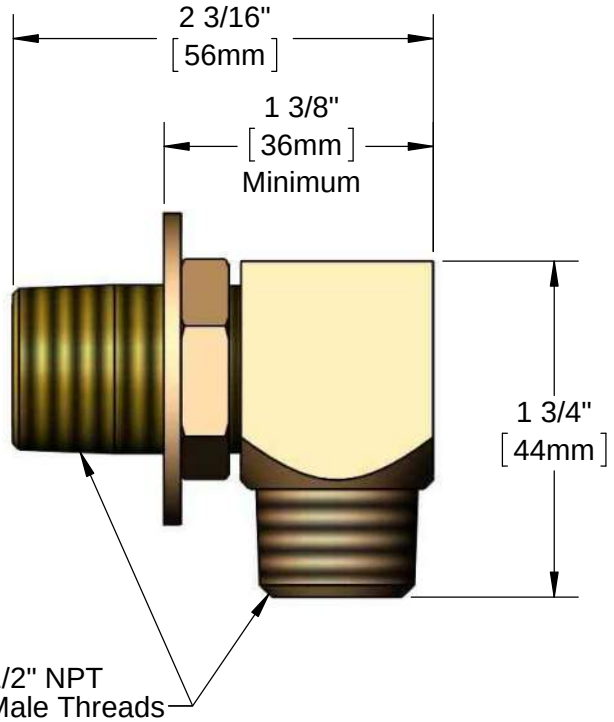
Contractor_____

Architect/Engineer_____









Product Specifications:
1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn: DHL	Checked: JRM	Approved: JHB	Date: 03/13/14	Scale: 1:1	Sheet: 1 of 2

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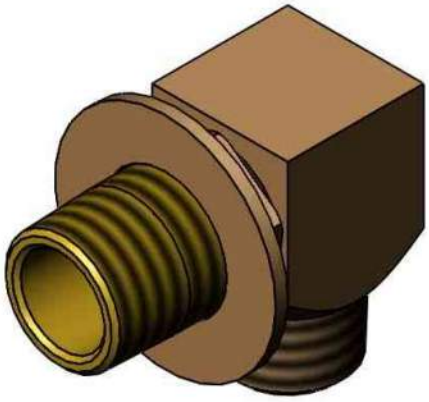
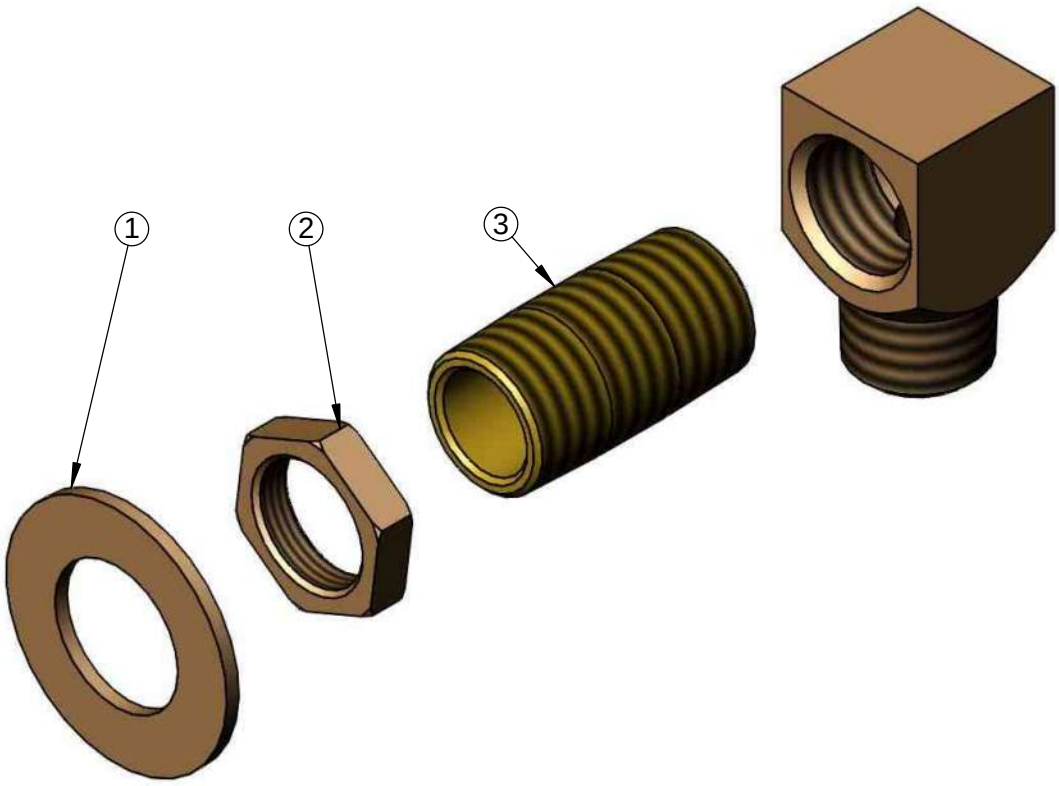
Model No.
B-0230-K

Item No.

ITEM NO.	SALES NO.	DESCRIPTION
1	000999-45	Brass Lock Washer
2	002954-45	Shank Lock Nut
3	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple





Product Specifications:
1/2" NPT Male Elbow Kit w/ Lock Nut & Washer

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NSF 61 - Section 9
NSF 372 (Low Lead Content)

Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
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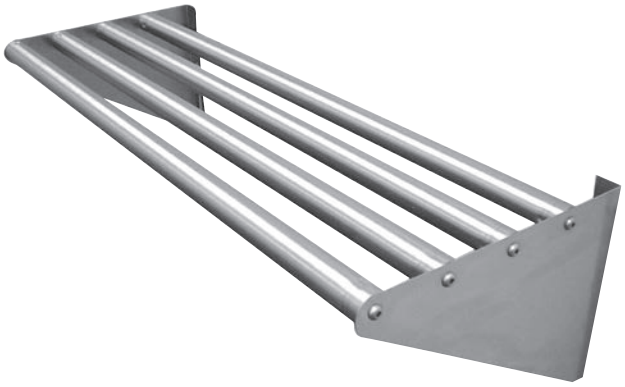
STAINLESS STEEL

TUBULAR WALL MOUNTED KNOCKDOWN DRAINAGE SHELVES



Item #: _____ Qty #: _____

Model #: _____

Project #: _____

Model	Length	Wt.	Cu.
DT-6R-36	15" x 36"	23	2
DT-6R-48	15" x 48"	32	3
DT-6R-60	15" x 60"	39	4
DT-6R-72	15" x 72"	46	5

FEATURES:

15" Deep, horizontal surface area accommodates a variety of drainage applications.

CONSTRUCTION:

Knock Down Design for ease of field installation and lower freight costs.

MATERIAL:

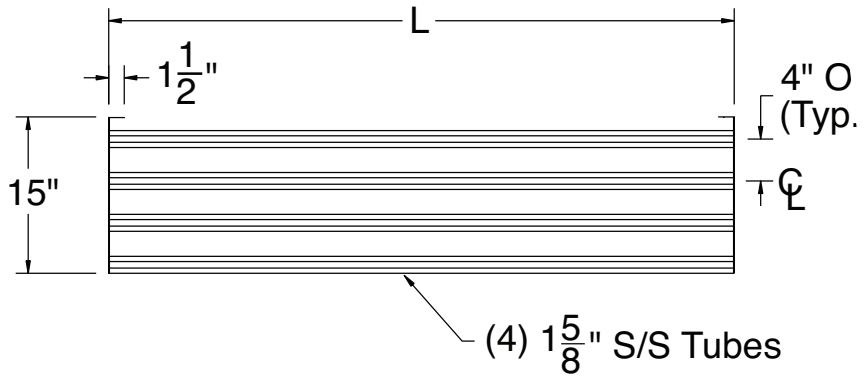
1 5/8" diameter stainless steel type "300" tubing.

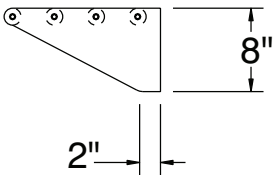
Side brackets type "300" stainless steel.

DETAILS and SPECIFICATIONS

TOL ± .500"

ALL DIMENSIONS ARE TYPICAL





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www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 8:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice. © ADVANCE TABCO, MAY 2017 REF-L

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

HOBART

Project _____

AIA # _____ SIS # _____

Item # _____ Quantity _____ C.S.I. Section 114000

COMMERCIAL DISHWASHERS

LXnR advansys
HIGH TEMPERATURE
Undercounter Dishwashing Machine

c UL us NSF ENERGY STAR

SPECIFIER STATEMENT

Specified unit will be a NSF rated high temperature Advansys™ ventless undercounter dishwasher operating on a cold water supply with steam elimination and energy recovery. Features two-level racking capability, Complete Delime™ with Delime Notification, Auto Dispensing and Booster Guard™, AutoClean, a 17" door opening, snap-in revolving upper and lower rinse arms, three selectable cycle times, 2-stage filtration, up to 30 racks per hour, .62 gallons per cycle, color touchscreen with Wi-Fi and SmartConnect App connectivity, low temperature and chemical alerts, advanced diagnostics and service connection, NSF certified pot and pan mode, detergent, rinse aid and delime pumps. Constructed of stainless steel.

1 year parts and labor warranty.

STANDARD FEATURES

+ Racks per hour – Light 30 / Normal 24 / Heavy 13
+ .62 gallons of water per cycle
+ Two-level racking capability
+ High temperature sanitization unit
+ User-friendly smart touchscreen controls
+ Wi-Fi connectivity
+ SmartConnect App with machine status, temperature logs, error code reporting, and usage analysis
+ Steam elimination and energy recovery
+ AutoClean cycle washes down inside of machine at shutdown
+ NSF certified pot and pan cycle on heavy cycle
+ 17" door opening
+ Temperature and chemical alerts (lockouts available)
+ Sense-A-Temp™ 70°F rise electric booster heater
+ Chemical pumps with auto-prime for detergent and rinse-aid
+ Soft start to protect glassware
+ Advanced diagnostics and service connection
+ Complete Delime™ with Delime Notification, Auto Dispensing and Booster Guard™
+ Deep drawn stainless steel tank
+ Revolving upper and lower anti-clogging interchangeable wash arms
+ Snap-in revolving upper and lower interchangeable rinse arms
+ 2-stage wash tank filtration
+ Energy saver mode
+ Automatic pumped rinse and drain
+ Automatic fill
+ Electric tank heat
+ Combination rack
+ Peg rack (excludes LXnR-2L)
+ Two-level rack kit (LXnR-2L only)

OPTIONS & ACCESSORIES (Available at extra cost)

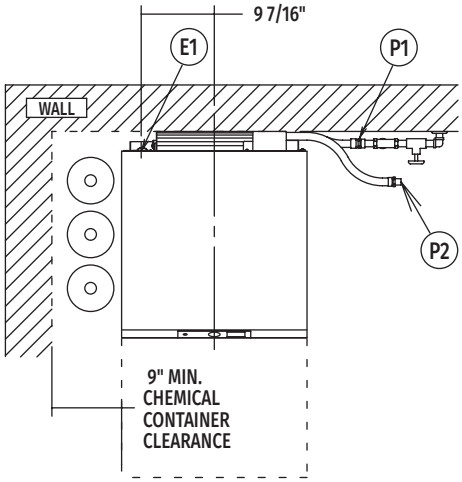
❑ Hobart exclusive two-level racking kit boosts capacity up to 48 racks per hour
❑ Door lock (keeps door locked until condensing cycle is complete)
❑ Power cord kit
❑ 6" stainless steel legs
❑ 17" stainless steel stand with storage
❑ External height adjustable casters
❑ Internal height adjustable casters (3")
❑ Drain water tempering kit
❑ Water hammer arrestor kit
❑ Splash reduction panel
❑ Trim strip
❑ Pressure regulator valve
❑ Pumped drain air gap kit

LXn SERIES – LXnR advansys HIGH TEMPERATURE

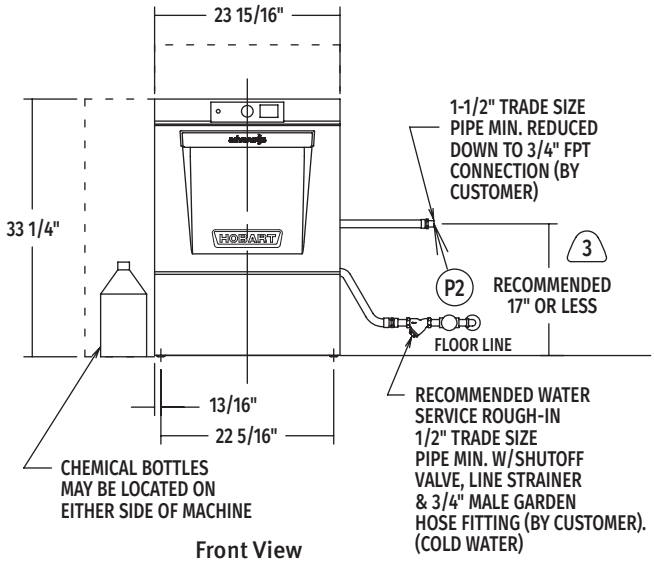
Approved by_____ Date_____ Approved by_____ Date_____

HOBART

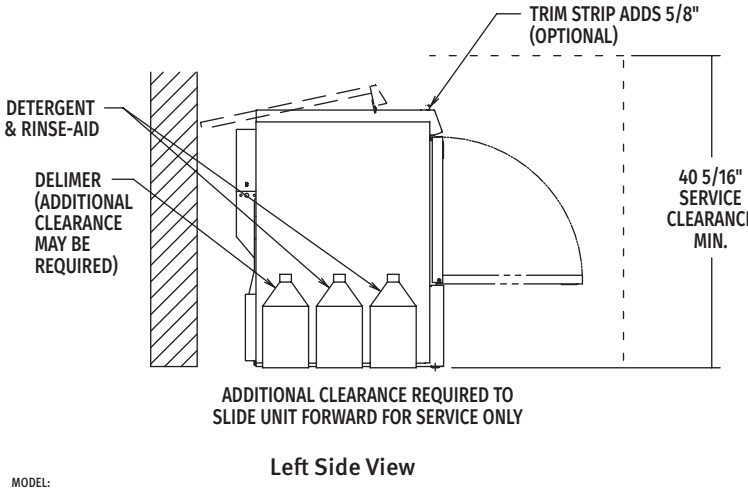
LXnR advansys HIGH TEMPERATURE
Undercounter Dishwashing Machine



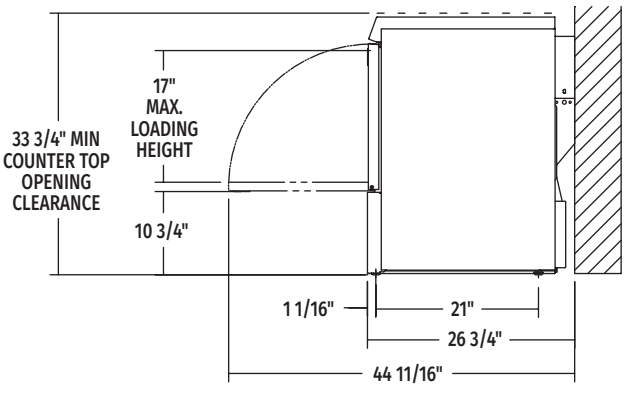
Top View



Front View



Left Side View



Right Side View

MODEL:
LXnR
00-563661
REV: A5

CAD and/or Revit Files Available

HOBART

LX*n*R advansys HIGH TEMPERATURE
Undercounter Dishwashing Machine

LEGEND

Electrical Connections	
E1	Electrical connection: 1-3/8" dia. hole for 1" trade size conduit; 4-5/8" AFF.
Plumbing Connections	
P1	Single fill and rinse connection: 3/4" female garden hose fitting on 6' long hose supplied with machine; 55-80°F (cold) recommended for LX*n*R.
P2	Common drain connection: 5/8" barb fitting with 6' long hose supplied with machine.

WARNING: Electrical and grounding connections must comply with the applicable portions of the National Electrical Code and/or other local electrical codes.

Plumbing connections must comply with applicable sanitary, safety and plumbing codes. Drain and fill line configurations vary, some methods are shown on this drawing.

NOTICE

Required flowing water pressure to the dishmachine is 15-65 PSIG. If pressures higher than 65 PSIG are present, a pressure regulating valve must be installed in the water line to the dishmachine (by others).

Pressure gauge not required on pumped rinse machines.

Important: Chemical containers should be placed no higher than 10" above floor.

If chemical containers are to be placed in cabinet adjacent to machine, a 1/2" dia. hole is required in the cabinet to run chemical supply line.

Notes:

1. All vertical machine dimensions taken from floor may be increased by 1".
2. Moist air escapes from the door. Use only moisture resistant materials adjacent to dishmachine sides and top.
3. A vent hood is not recommended above the undercounter dishmachine since it does not produce excessive vapors.

Plumbing Notes:

1. Water hammer arrestor (meeting ASSE-1010 Standard or equivalent) to be supplied (by others) in common water supply line at service connection.
2. Recommended water hardness to be 3 grains or less for best results.
3. If drain hose is looped above a sink, the loop must not exceed 38" AFF.
4. Backflow prevention provided by NSF-approved air gap device.

Miscellaneous Note:

1. For optimal performance, Hobart recommends maintaining a dishroom temperature of 65°F (18°C) or higher, as lower temperatures may hinder the machine's capacity to operate effectively (with lower performance as ambient temperature decreases).

SPECIFICATIONS

Capacities
- Cycle Time (seconds) . . . . . Light 119 / Normal 148 / Heavy 278
- Racks per Hour . . . . . Light 30 / Normal 24 / Heavy 13
- Tank Capacity – Gallons 2.9

Motor Horsepower
- Wash 0.85
- Rinse 0.19

Water Consumption
- U.S. Gallons per Cycle 0.62
- U.S. Gallons per Hour (maximum use) 18.6
- Peak Drain Flow – U.S. Gallons (gallons per minute). 4.0

Temperatures °F
- Wash 150
- Rinse 180
- Incoming Water Temperature (minimum recommended) . 55-80

Heating
- Tank Heat, electric (kW) 1.8
- Electric Booster (kW) 4.9

Standard 20" x 20" Rack Complement
- Combination 1
- Peg (excludes LX*n*R-2L) 1
- Two Level (LX*n*R-2L only) 1

Shipping Weight (approximate) . . . . . 215 lbs.

Crated Dimensions . . . . . 27"W x 30"L x 40"H

Heat Output, BTU/Hour	
Latent	Sensible
1,100	2,000

(E1) Standard Electrical Options

Tank Heat, Booster, Pump & Controls			
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/1	33.7	40	40
120/208-240(3W)60/1*	34.0	40	40
208-240/60/3	24.9	30	30
220-240/50/1	33.4	40	40
120/208(3W)60/1*,**	23.7	30	30

NOTE: For supply connections, use copper wire only rated at 90°C minimum.

*This system requires three power wires which includes a current carrying neutral, an additional fourth wire must be provided for machine ground.

**Booster and tank heater not energized concurrently.

Dishmachine not provided with internal GFCI protection.

As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

EAGLE GROUP®

Profit from the Eagle Advantage®

Item No.: _____

Project No.: _____

S.I.S. No.: _____

Specification Sheet

Short Form Specifications

Eagle Mop Sink Storage Cabinet, model _____. Heavy duty stainless steel cabinet body. Open back allows for cabinet to envelop wall-mounted service faucet and spray hose bracket. Double-pan 20-gauge stainless steel hinged doors with transverse rod handles. Top sloped at 15˚ angle. Mop sink is heavy duty stainless steel, deep-drawn seamless construction. 8˝-deep bowl with 3˝ radius corners. Drain is 2˝ NPS nickel-plated cast bronze body, with removable snap-on strainer plate. Includes mop holder.

Single- and Double-Width Mop Sink Storage Cabinets

MODELS:

- ❑ ***F1916-VSCS***
- ❑ ***F1916-VSCS-DL***
- ❑ ***F1916-VSCS-DR***

(mop shown not included)

Options / Accessories

❑ Upgrade to type 300 stainless steel

Features on Single- and Double-Width Cabinets

- Heavy gauge type 430 stainless steel construction.
- One half with mop sink, one half cabinet for relevant storage.
- Storage half of cabinet can accommodate portable mop bucket.
- 20 gauge stainless steel hinged double doors with transverse rod handles featuring keyed locks.
- 16˝ x 20˝ x 8˝ (406 x 508 x 203mm) mop sink featuring large radius corners and 3½˝ (89mm) NPS stainless steel drain with 2˝ (51mm) NPS connection.
- Top slanted at a 15˚ angle.
- Sides are louvered along the top for ventilation.
- Two-pole mop holder.
- Service faucet.
- 30˝ (762mm) hose and wall mounted bracket.

Features on Single-Width Cabinet

- 12˝ (305mm)-wide center shelf is heavy gauge type 430 stainless steel.
- 25˝ (635mm) side-to-side.

Features on Double-Width Cabinets

- Three fixed shelves on cabinet side.
- One fixed shelf above mop sink.
- 47½˝ (1207mm) side-to-side.

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 • 800-441-8440 • Fax: 302-653-2065
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www.eaglegrpnews.com
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Certifications / Approvals

NSF

AutoQuotes

KCL

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EG20.04 Rev. 01/23

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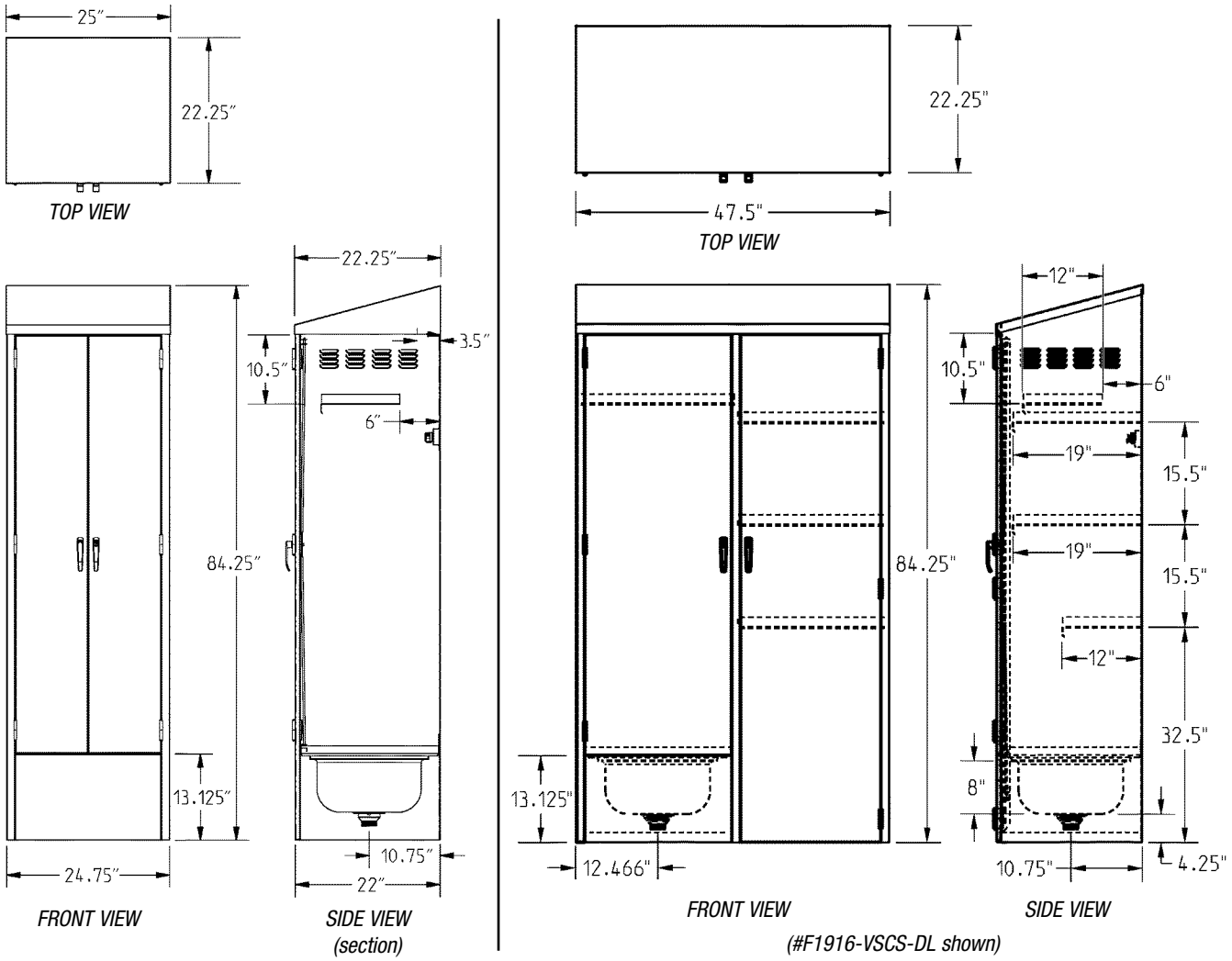
EG20.04 Catalog Specification Sheet No.

Single- and Double-Width Mop Sink Storage Cabinets

EAGLE GROUP®
Profit from the Eagle Advantage®

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Single- and Double-Width Mop Sink Storage Cabinets



description	width in.	width mm	length in.	length mm	weight lbs.	weight kg	model #
single-width cabinet	22¼″	565	25″	635	375	170.1	***F1916-VSCS***
double-width cabinet, mop sink at left	22¼″	565	47½″	1207	544	246.7	***F1916-VSCS-DL***
double-width cabinet, mop sink at right	22¼″	565	47½″	1207	544	246.7	***F1916-VSCS-DR***

EAGLE GROUP
100 Industrial Boulevard, Clayton, DE 19938-8903 USA
Phone: 302-653-3000 or 800-441-8440 • Fax: 302-653-2065
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Rev. 01/23

Spec sheets available for viewing, printing or downloading from our online literature library at our websites

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Travelers Rest, SC 29690

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Model No.
B-0665-CR-BSTRK
Item No.

ADA Compliant

This Space for Architect/Engineer Approval

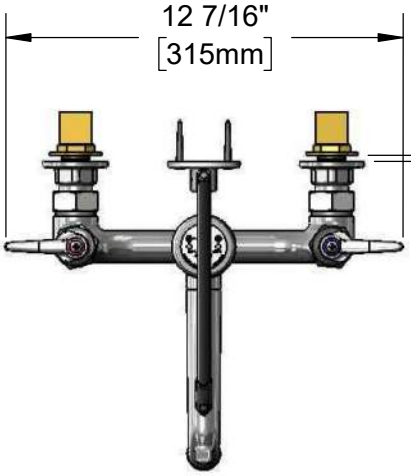
Job Name_____Date_____

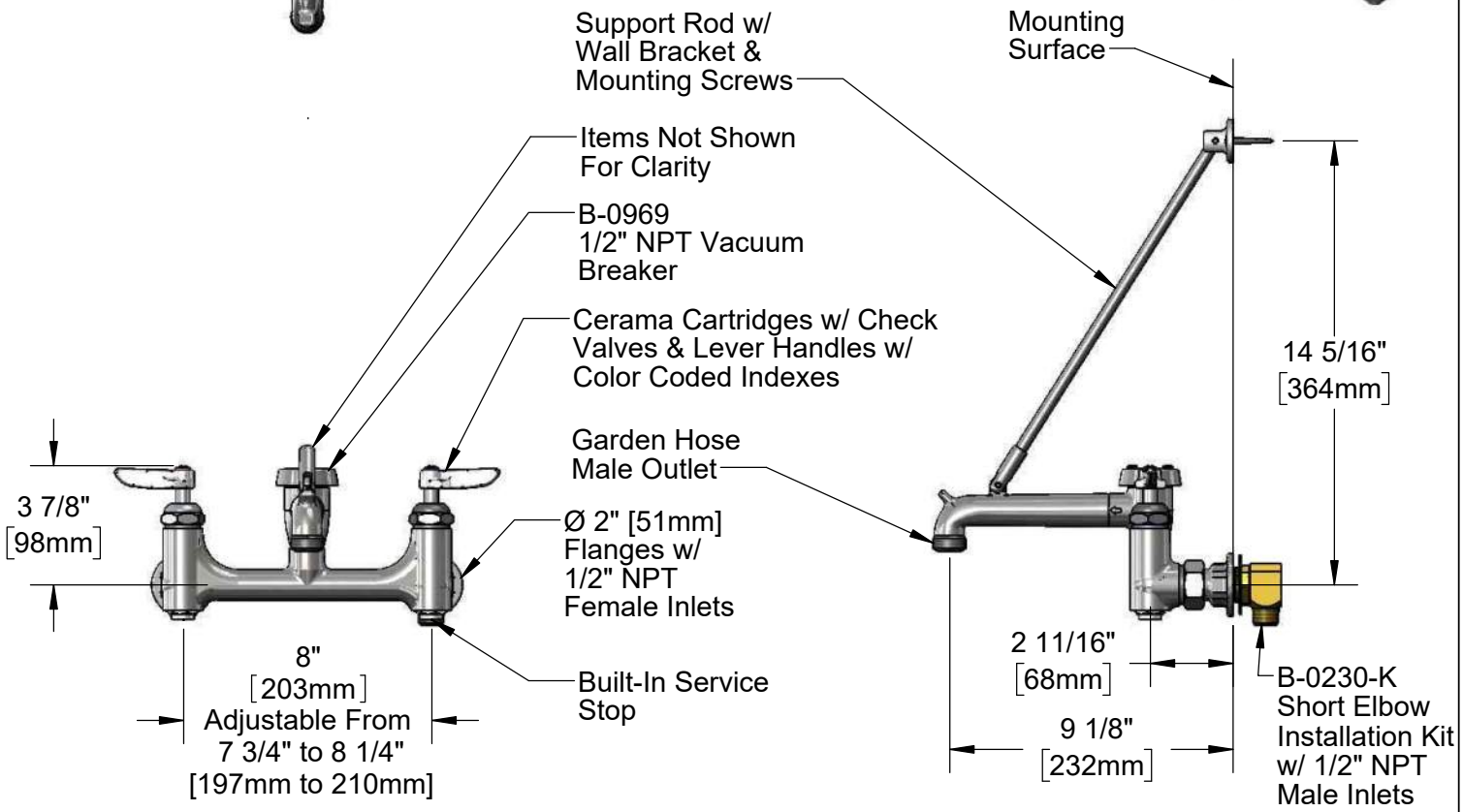
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Rough-In Requirement:
(2) ∅ 1" [25mm] Mounting Holes

Product Specifications:
8" Wall Mount Service Sink Faucet, Cerama Cartridges w/ Check Valves, Lever Handles, Upper Support Rod, Garden Hose Male Outlet, Rough Chrome Finish, Built-In Stops, 1/2" NPT Vacuum Breaker & Short Elbow Installation Kit w/ 1/2" NPT Male Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)
ASSE 1001 (VB)

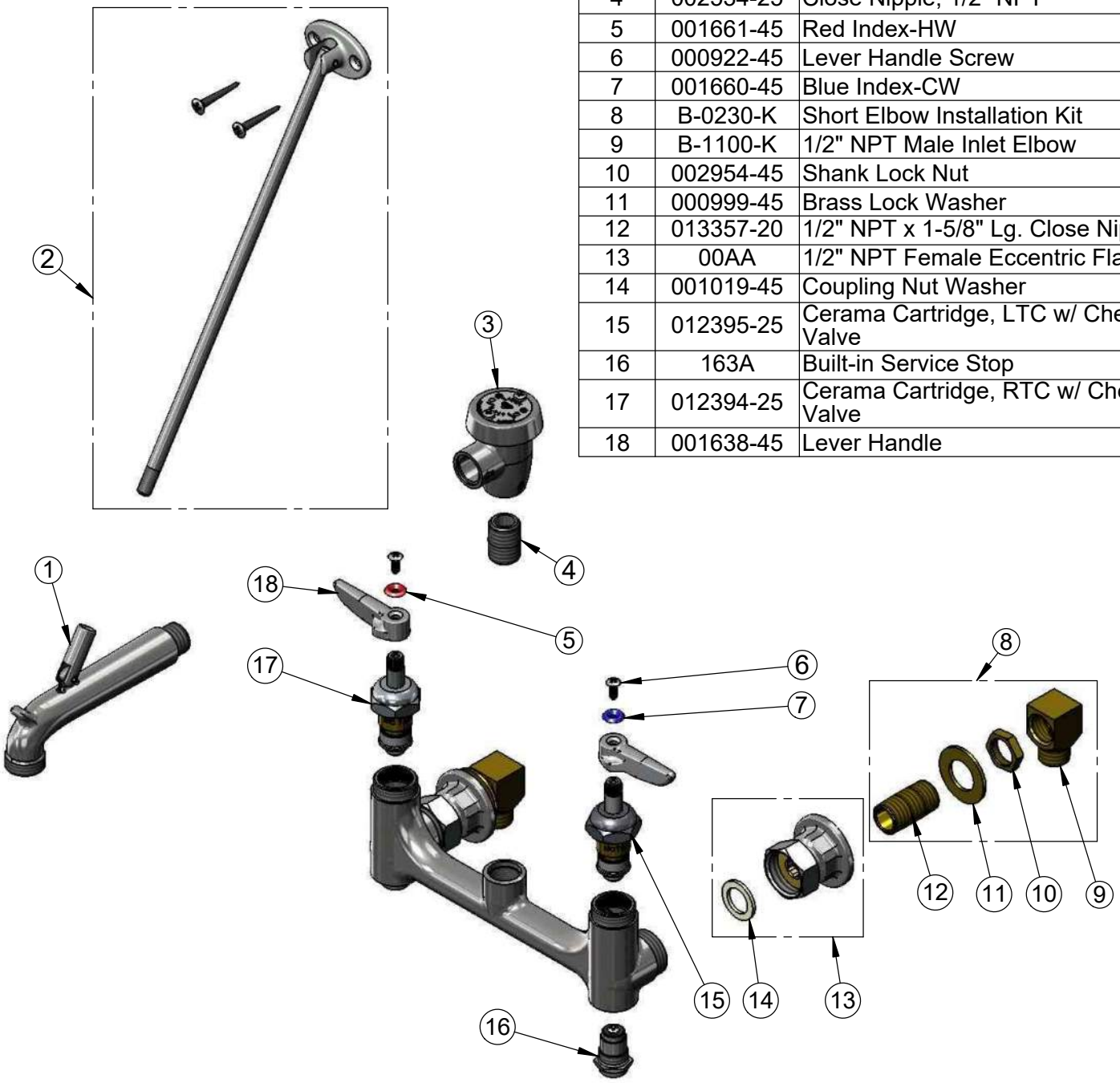
Drawn:	Checked:	Approved:	Date:	Scale:	Sheet:
KJG	MRC	JHB	06/01/18	1:6	1 of 2

T&S BRASS AND BRONZE WORKS, INC.
2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0665-CR-BSTRK
Item No.

ITEM NO.	SALES NO.	DESCRIPTION
1	009545-25	Spout w/ Male GH Outlet & Upper Clevis - Rough Chrome
2	009546-40	Upper Support Rod
3	B-0969	1/2" NPT Vacuum Breaker
4	002534-25	Close Nipple, 1/2" NPT
5	001661-45	Red Index-HW
6	000922-45	Lever Handle Screw
7	001660-45	Blue Index-CW
8	B-0230-K	Short Elbow Installation Kit
9	B-1100-K	1/2" NPT Male Inlet Elbow
10	002954-45	Shank Lock Nut
11	000999-45	Brass Lock Washer
12	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple
13	00AA	1/2" NPT Female Eccentric Flange
14	001019-45	Coupling Nut Washer
15	012395-25	Cerama Cartridge, LTC w/ Check Valve
16	163A	Built-in Service Stop
17	012394-25	Cerama Cartridge, RTC w/ Check Valve
18	001638-45	Lever Handle



Product Specifications:
8" Wall Mount Service Sink Faucet, Cerama Cartridges w/ Check Valves, Lever Handles, Upper Support Rod, Garden Hose Male Outlet, Rough Chrome Finish, Built-In Stops, 1/2" NPT Vacuum Breaker & Short Elbow Installation Kit w/ 1/2" NPT Male Inlets

Product Compliance:
ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)
ANSI A117.1 (ADA)
ASSE 1001 (VB)

Drawn:	KJG	Checked:	MRC	Approved:	JHB	Date:	06/01/18	Scale:	NTS	Sheet:	2 of 2

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

SFT
Shallow Floor Trough

General Information

Project Name: _____

Consultant: _____

Item #: _____

Model #: _____

Quantity: _____

Specifications

SFT Shallow Floor Troughs are 14GA type 300 series stainless steel, with large integral coves and pitched ¼" per foot to a 6½" OD waste outlet with 4" OD tail-piece. Perforated waste basket provided at each drain. Anchor straps welded to the sides secure trough to the floor.

Recessed flange and 1" deep ledge for IMC grating are integral with the unit. Trough is 2" deep overall.

Joints are TIG welded and leak-proof. Exposed surfaces finished brush satin.

Product Guide

Use for food prep facilities where floor thickness limits trough depth to 2".

Integral coves, deep pitch and a large waste cup, assure quick and complete drainage.

Recessed flange supports floor tile and provides a grout pocket.

Setting frame for waterproof membrane and/or integral seep-age flange with "weep" holes can be added for wet floor areas.

Options*

- ☐ **DOD** - 3", 3½", 5", 6", 8" OD Tube (circle one)
- ☐ **WTO** - Waste Tube over 3" Long
- ☐ **AW** - Additional Wastes
- ☐ **WCP** - Waste Cup Strainers
- ☐ **BH** - Beehive Strainers (Each)
- ☐ **OCW** - Off Center Waste (Each)
- ☐ **ST12** - Scrap Tray Up to 18" Wide
- ☐ **PWT** - Perforated Waste Pipe
- ☐ **SF-2** - Special Size Setting Flange 2" Deep
- ☐ **SF-4** - Special Size Setting Flange 2" to 4" Deep
- ☐ **OWT** - Oversize Waste Tube
- ☐ **FSG** - Seepage Flange w/ Weep Holes
- ☐ **ST20** - Scrap Tray 20" Long
- ☐ **DSE** -Drain on the End
- ☐ **ROD** - Rim on Drain
- ☐ **BSPC** - Basket Strainer w/ Han-dle & Chain
- ☐ **BXD** - Box Type Drain
- ☐ **BSX** - Beehive Strainer for Box Drain

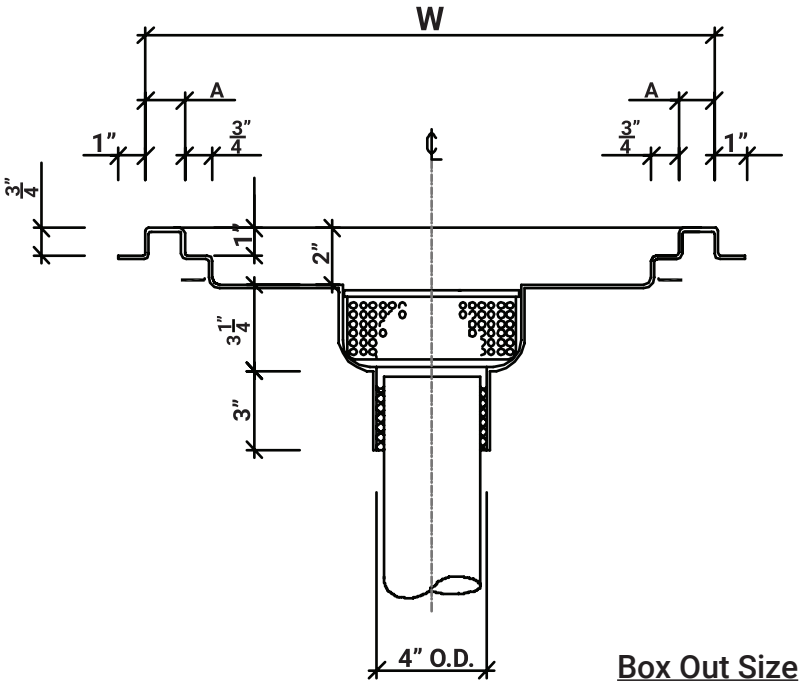
***See Price List for Complete Options**

SFT-10 1121

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

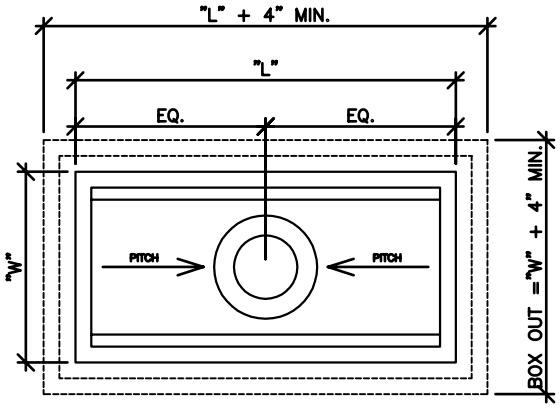
SFT
Shallow Floor Trough

DRAWINGS



A = 1" for Troughs up to 15" Wide
A = 1 1/2" for Troughs over 15" Wide

Box Out Size



Trough Area

- Width (PIT) = Width ("W") + 4" Minimum
- Length (PIT) = Length ("L") + 4" Minimum
- Depth (PIT) = Depth of Trough + 1/2" + Finish Floor
- Size of Rough-In Hole For Drains 7½ Ø Minimum

SHALLOW FLOOR TROUGHS

Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)
☐ SFT-1224	12" x 24"	☐ SFT-1824	18" x 24"	☐ SFT-2424	24" x 24"	☐ SFT-3024	30" x 24"
☐ SFT-1230	12" x 30"	☐ SFT-1830	18" x 30"	☐ SFT-2430	24" x 30"	☐ SFT-3030	30" x 30"
☐ SFT-1236	12" x 36"	☐ SFT-1836	18" x 36"	☐ SFT-2436	24" x 36"	☐ SFT-3036	30" x 36"
☐ SFT-1248	12" x 48"	☐ SFT-1848	18" x 48"	☐ SFT-2448	24" x 48"	☐ SFT-3048	30" x 48"
☐ SFT-1260	12" x 60"	☐ SFT-1860	18" x 60"	☐ SFT-2460	24" x 60"	☐ SFT-3060	30" x 60"
☐ SFT-1272	12" x 72"	☐ SFT-1872	18" x 72"	☐ SFT-2472	24" x 72"	☐ SFT-3072	30" x 72"
☐ SFT-1284	12" x 84"	☐ SFT-1884	18" x 84"	☐ SFT-2484	24" x 84"	☐ SFT-3084	30" x 84"
☐ SFT-1296	12" x 96"	☐ SFT-1896	18" x 96"	☐ SFT-2496	24" x 96"	☐ SFT-3096	30" x 96"
☐ SFT-12108	12" x 108"	☐ SFT-18108	18" x 108"	☐ SFT-24108	24" x 108"	☐ SFT-30108	30" x 108"
☐ SFT-12120	12" x 120"	☐ SFT-18120	18" x 120"	☐ SFT-24120	24" x 120"	☐ SFT-30120	30" x 120"

Note - Standard troughs up to 96" have one (1) waste at center. Over 96", troughs have two (2) wastes equidistant.

Specifications subject to change without notice.

SFT-10 1121

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: Lockers

- ☐ CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- x NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - x GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

NIKEC, LOCKERS

Scotsman
UNDERCOUNTER UNITS

UC2724 - 270 lb Cube Ice Machine

Self-Contained Undercounter Ice Machine with Storage

Features and Benefits

Space Saving Design:

- Only 24" wide, this ice maker can be placed it the tightest locations
- Front breathing - No side clearance required for flexible placement
- Recessed utility chase provides clearance for tight installs
- Optional floor mount kit lowers height to 33.5"

Ease of Use:

- Removable external air filter for easy cleaning
- Unit specific QR code for quick access to service manuals, cleaning guides and warranty history
- Ergonomic slide back door allows easy access to ice in the bin
- Power cord, NEMA 5-15P plug, ice scoop and adjustable legs are included for quick and easy installation

Reliability:

- Heavy duty, rust-free front panel and corrosion-resistant aluminum alloy side panels for maximum lifespan
- 3 Year parts and labor warranty
- Designed, engineered and assembled in the USA

High Production:

- Produces up to 282 lb (128 kg) per day and stores 80 lb (36 kg), maximizing ice output despite its small footprint

Environmentally Friendly:

- Meets new US federal energy efficiency requirements
- Meets US Safe Drinking Act low lead requirements
- Non-ozone depleting R-134A refrigerant

Front accessible external air filter for easy cleaning

Recessed utility chase provides clearance for tight installs

Ergonomic slide-back door allows easy access to ice in the bin

Unit specific QR code for quick access to service manuals, cleaning guides and warranty history

24 Hour Volume Production

Air Cooled			Water Cooled		
70°F/21°C 50°F/10°C	Air Water	90°F/32°C 70°F/21°C	70°F/21°C 50°F/10°C	Air Water	90°F/32°C 70°F/21°C
282/128 lb/kg		202/92 lb/kg	266/121 lb/kg		219/99 lb/kg

Cube Ice

Common ice form, ideal for mixed drinks.

Small Cube
7/8" x 7/8" x 3/8"
(2.22 x 2.22 x .95 cm)

Medium Cube
7/8" x 7/8" x 7/8"
(2.22 x 2.22 x 2.22 cm)

Certification

agion Nature's antimicrobial · AHRI CERTIFIED · REVIT BY Scotsman · DESIGNED ENGINEERED ASSEMBLED USA · E.S. EVERY SCOTSMAN EXCEEDING STANDARDS 2018 DOE · CERTIFIED ISO 9001:2015 · c UL us · NSF

Warranty

- 3 years parts and labor on all components
- 5 years parts on the compressor
- Warranty valid in North, South & Central America for commercial installations
- Contact factory for warranty in other regions
- Residential Applications: 1 year parts and labor

UC2724 - 270 lb Self-Contained Ice Machine

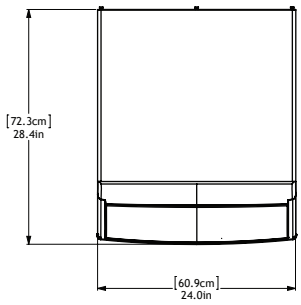
Scotsman
UNDERCOUNTER UNITS

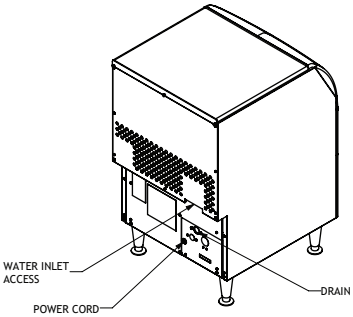
101 Corporate Woods Parkway, Vernon Hills, IL 60061
1-800-SCOTSMAN • Fax: 847-913-9844 • www.scotsman-ice.com • customer.relations@scotsman-ice.com

UC2724 - 270 lb Cube Ice Machine

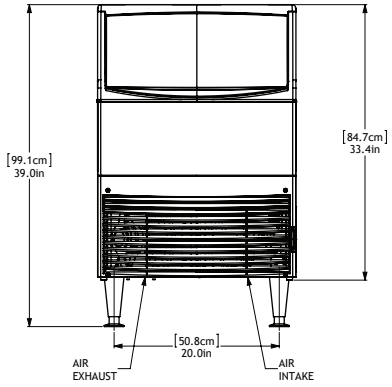
Self-Contained Undercounter Ice Machine with Storage

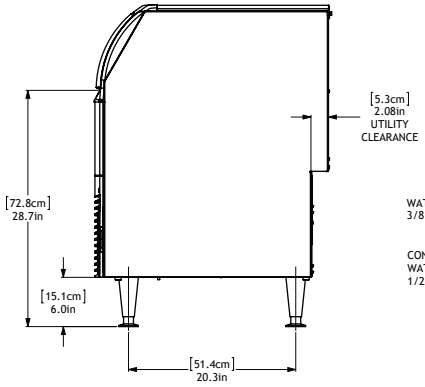
UC2724 - 270 lb Self-Contained Ice Machine

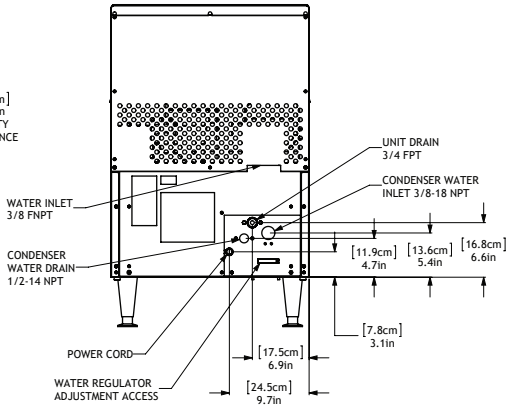




Front breathing and no side clearance required, allowing for flexible placement







Specifications

	Model Number (Cube Size: medium or small)	Condenser Unit	Storage Capacity lb/kg	Basic Electrical Volts/Hz/Phase	Max. Fuse Size or HACR Circuit Breaker (amps)	Circuit Wires	Min. Circuit Ampacity	Energy Consumption kWh/100 lb (45.4 kg) 90˚F(32˚C)/70˚F(21˚C)	Water Usage Gallons/100 lb (liters/45.4 kg) Potable 90˚F(32˚C)	Water Usage Gallons/100 lb (liters/45.4 kg) Condenser 70˚F(21˚C)
med.	UC2724MA-1	Air	80/36	115/60/1	15	2	Cord	7.05	23.8/90.6	-
med.	UC2724MW-1	Water	80/36	115/60/1	15	2	Cord	5.68	26.1/99.4	112/426.5
sm.	UC2724SA-1	Air	80/36	115/60/1	15	2	Cord	7.05	23.8/90.6	-
sm.	UC2724SW-1	Water	80/36	115/60/1	15	2	Cord	5.68	26.1/99.4	112/426.5

All Models

Dimensions (W x D x H):

Unit: 24" X 28.5" X 39" (61.0 x 72.4 x 99.1 cm)

Height includes 6" (15.24 cm) adjustable legs

Shipping Carton: 29" x 39" x 39" (73.7 x 99.1 x 99.1 cm)

Shipping Weight: 175 lb / 79.4 kg

BTUs per hour: 5,000

Refrigerant: R-134A

Accessories

Model Number	Description
KLP8S	Kit, Leg 6", Stainless Steel
KBC1	Kit, Casters
KUFM24	Floor mount kit. Lowers height to 33.5"

Scotsman recommends all ice machines have water filtration. See Scotsman water filter specification sheet for details.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)
Electrical Voltage	-5%	+10%

Specifications and design are subject to change without notice.

an Ali Group Company

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The Spirit of Excellence

Scotsman UNDERCOUNTER UNITS

SIS-SS-UC-UC2724 03-21

AquaDefense System®

Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems

SSM3-P

AP3-P

Features

SSM Plus

- Extends the life of your Scotsman machine and provides cleaner, more consistent ice.
- Now with AquaArmor with AgION®, a silver-based anti-microbial compound that reduces the growth of bacteria, microorganisms, algae, mold and slime on ice machine surfaces, preventing premature clogging.
- Ultrafine half-micron filtration, combined with food-grade polyphosphate, assures that chlorine, off-tastes, odors and particles stay out of your ice.
- Filtration can reduce unscheduled water-related maintenance calls by as much as 40%.
- Easy to install and maintain.

AquaPatrol Plus®

- Leaves chlorine in water to keep machine cleaner longer.
- Polyphosphate feed to inhibit scale build up.
- Easy to install and maintain.
- Tighter pore size now eliminates more undesirable compounds.
- New smaller footprint gives operations more flexibility.

NSF International Standards

Standard No. 42: Aesthetic Effects

- Chemical Unit
  - Chlorine reduction, class 1
  - Taste and odor reduction
- Mechanical Filtration Unit
  - Particle reduction, class 1
    - 99.9% reduction of particles
    - 1/2 micron and larger sizes

Standard No. 53: Health Effects

- Mechanical Filtration Unit
  - Turbidity reduction
  - Cyst reduction
  - Asbestos reduction

The SSM and AquaPatrol Plus filter and replacement cartridge have been tested and listed by NSF only for the functions listed above. Check for compliance with state and local law and regulations. Do not use where the water is micro-biologically unsafe, or with water of unknown quality without adequate disinfection before or after the unit. Can be used on water that may contain filterable cysts.

Water Filters

Certification

DESIGNED ENGINEERED ASSEMBLED IN THE USA · CERTIFIED ISO 9001:2015 · REVIT by Scotsman · c UL us · agion · NSF

Warranty

- 5 years on manifold parts only
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

Scotsman®
101 Corporate Woods Parkway, Vernon Hills, IL 60061
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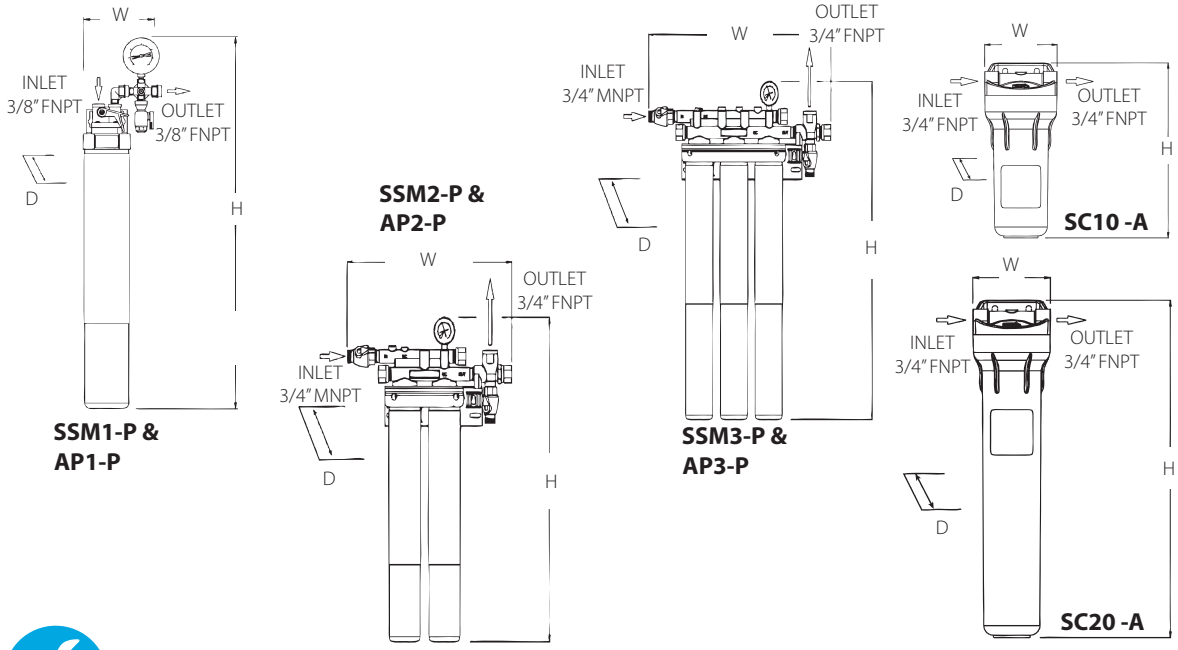
Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems



Specifications

	Model Number	Dimensions W	D	H	Description	Maximum Flow (gallons/minute)
SSM Plus	SSM1-P	5.6	4.75	30.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	1.67
	SSM2-P	16.6	5.5	29.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	3.34
	SSM3-P	21	5.5	29.26	Triple System for Cubers over 1,300 lb (544 kg)	5.01
AquaPatrol Plus®	AP1-P	5.6	4.75	21.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	2.1
	AP2-P	16.6	5.5	19.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	4.2
	AP3-P	21	5.5	19.26	Triple System for Cubers over 1,300 lb (544 kg)	6.3
Coarse Pre-Filters	SC10-A	5.16	5.5	12.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	5
	SC20-A	5.16	5.5	22.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	10

Shipping

Model Number	Dimensions	Weight (lb/kg)
SSM1-P:	21" x 10" x 6"	7/3
SSM2-P:	26" x 16" x 13"	11/5
SSM3-P:	26" x 16" x 13"	16/7
AP1-P:	10" x 21" x 6"	7/3
AP2-P:	16" x 26" x 13"	11/5
AP3-P:	16" x 26" x 13"	16/7
SC10-A:	6" x 6" x 17"	5/2
SC20-A:	6" x 6" x 26"	11/5

Accessories

Model Number	Description
SC10RC40	SC10 Replacement Filter (package of 40)
SC20RC20	SC20 Replacement Filter (package of 20)
SSMRC1	Replacement Cartridge for SSM Plus (package of 1)
SSMRC6	Replacement Cartridge for SSM Plus (package of 6)
APRC6-P	Replacement Cartridge for AquaPatrol Plus® (package of 6)
APRC1-P	Replacement Cartridge for AquaPatrol Plus® (package of 1)

Scotsman recommends all ice machines have water filtration.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)

Specifications and design are subject to change without notice.

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Scotsman®

AquaDefense System®

Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems

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AP3-P

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- Mechanical Filtration Unit
  - Particle reduction, class 1
    - 99.9% reduction of particles
    - 1/2 micron and larger sizes

Standard No. 53: Health Effects

- Mechanical Filtration Unit
  - Turbidity reduction
  - Cyst reduction
  - Asbestos reduction

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Water Filters

Certification

DESIGNED ENGINEERED ASSEMBLED IN THE USA · CERTIFIED ISO 9001:2015 · REVIT by Scotsman · c UL us · agion · NSF

Warranty

- 5 years on manifold parts only
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

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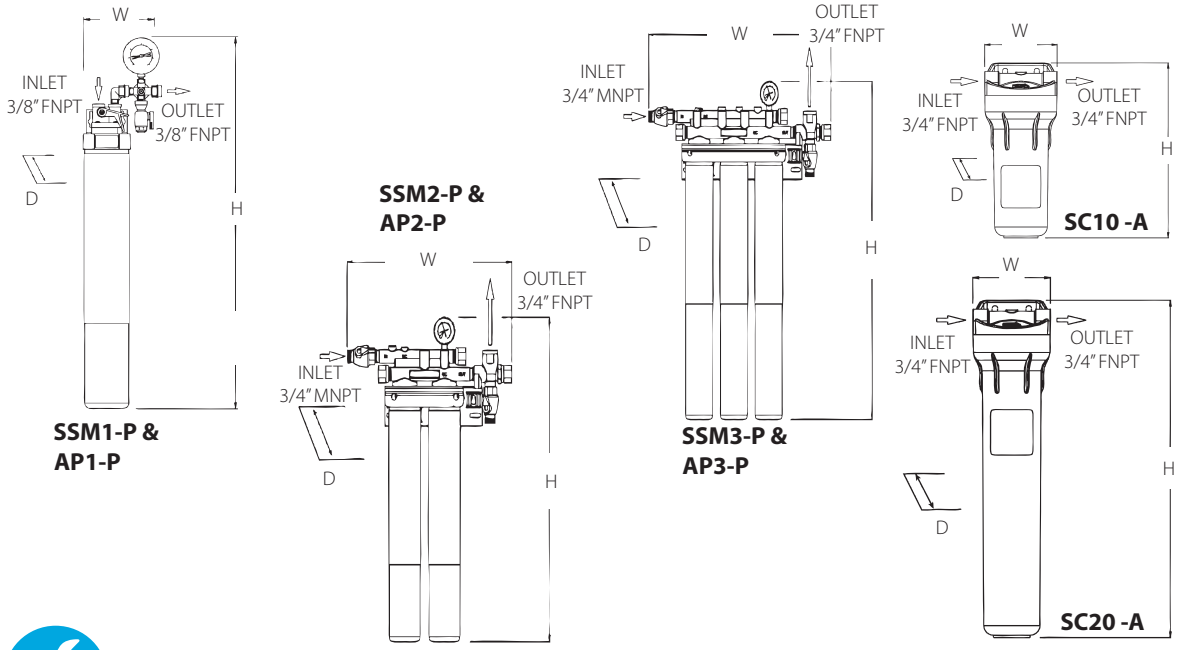
Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems



Specifications

	Model Number	Dimensions W	D	H	Description	Maximum Flow (gallons/minute)
SSM Plus	SSM1-P	5.6	4.75	30.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	1.67
	SSM2-P	16.6	5.5	29.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	3.34
	SSM3-P	21	5.5	29.26	Triple System for Cubers over 1,300 lb (544 kg)	5.01
AquaPatrol Plus®	AP1-P	5.6	4.75	21.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	2.1
	AP2-P	16.6	5.5	19.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	4.2
	AP3-P	21	5.5	19.26	Triple System for Cubers over 1,300 lb (544 kg)	6.3
Coarse Pre-Filters	SC10-A	5.16	5.5	12.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	5
	SC20-A	5.16	5.5	22.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	10

Shipping

Model Number	Dimensions	Weight (lb/kg)
SSM1-P:	21" x 10" x 6"	7/3
SSM2-P:	26" x 16" x 13"	11/5
SSM3-P:	26" x 16" x 13"	16/7
AP1-P:	10" x 21" x 6"	7/3
AP2-P:	16" x 26" x 13"	11/5
AP3-P:	16" x 26" x 13"	16/7
SC10-A:	6" x 6" x 17"	5/2
SC20-A:	6" x 6" x 26"	11/5

Accessories

Model Number	Description
SC10RC40	SC10 Replacement Filter (package of 40)
SC20RC20	SC20 Replacement Filter (package of 20)
SSMRC1	Replacement Cartridge for SSM Plus (package of 1)
SSMRC6	Replacement Cartridge for SSM Plus (package of 6)
APRC6-P	Replacement Cartridge for AquaPatrol Plus® (package of 6)
APRC1-P	Replacement Cartridge for AquaPatrol Plus® (package of 1)

Scotsman recommends all ice machines have water filtration.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)

Specifications and design are subject to change without notice.

101 Corporate Woods Parkway, Vernon Hills, IL 60061
1-800-SCOTSMAN • Fax: 847-913-9844 • www.scotsman-ice.com • customer.relations@scotsman-ice.com

Scotsman®

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

SFT
Shallow Floor Trough

General Information

Project Name: _____

Consultant: _____

Item #: _____

Model #: _____

Quantity: _____

Specifications

SFT Shallow Floor Troughs are 14GA type 300 series stainless steel, with large integral coves and pitched ¼" per foot to a 6½" OD waste outlet with 4" OD tail-piece. Perforated waste basket provided at each drain. Anchor straps welded to the sides secure trough to the floor.

Recessed flange and 1" deep ledge for IMC grating are integral with the unit. Trough is 2" deep overall.

Joints are TIG welded and leak-proof. Exposed surfaces finished brush satin.

Product Guide

Use for food prep facilities where floor thickness limits trough depth to 2".

Integral coves, deep pitch and a large waste cup, assure quick and complete drainage.

Recessed flange supports floor tile and provides a grout pocket.

Setting frame for waterproof membrane and/or integral seep-age flange with "weep" holes can be added for wet floor areas.

Options*

- ☐ **DOD** - 3", 3½", 5", 6", 8" OD Tube (circle one)
- ☐ **WTO** - Waste Tube over 3" Long
- ☐ **AW** - Additional Wastes
- ☐ **WCP** - Waste Cup Strainers
- ☐ **BH** - Beehive Strainers (Each)
- ☐ **OCW** - Off Center Waste (Each)
- ☐ **ST12** - Scrap Tray Up to 18" Wide
- ☐ **PWT** - Perforated Waste Pipe
- ☐ **SF-2** - Special Size Setting Flange 2" Deep
- ☐ **SF-4** - Special Size Setting Flange 2" to 4" Deep
- ☐ **OWT** - Oversize Waste Tube
- ☐ **FSG** - Seepage Flange w/ Weep Holes
- ☐ **ST20** - Scrap Tray 20" Long
- ☐ **DSE** -Drain on the End
- ☐ **ROD** - Rim on Drain
- ☐ **BSPC** - Basket Strainer w/ Han-dle & Chain
- ☐ **BXD** - Box Type Drain
- ☐ **BSX** - Beehive Strainer for Box Drain

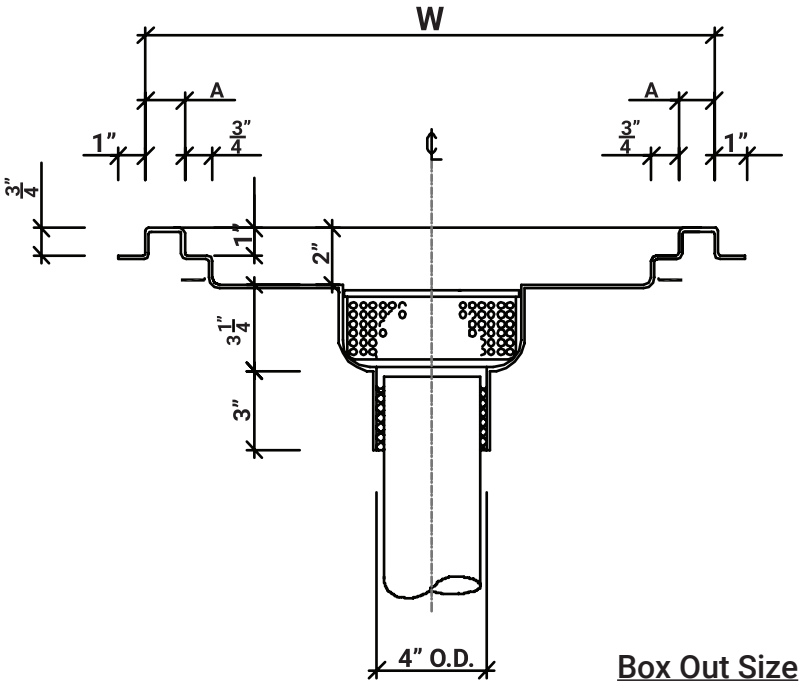
***See Price List for Complete Options**

SFT-10 1121

IMC/TEDDY
DECADES OF FINE CRAFTSMANSHIP

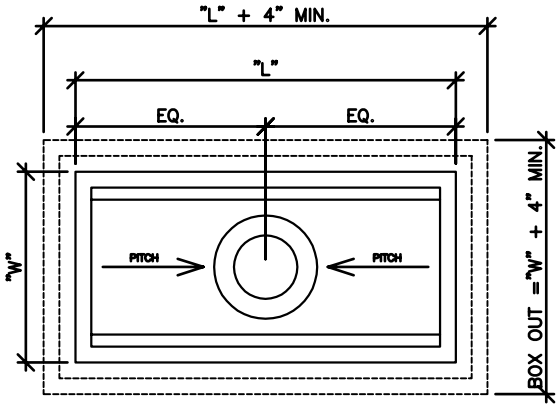
SFT
Shallow Floor Trough

DRAWINGS



A = 1" for Troughs up to 15" Wide
A = 1 1/2" for Troughs over 15" Wide

Box Out Size



Trough Area

- Width (PIT) = Width ("W") + 4" Minimum
- Length (PIT) = Length ("L") + 4" Minimum
- Depth (PIT) = Depth of Trough + 1/2" + Finish Floor
- Size of Rough-In Hole For Drains 7½ Ø Minimum

SHALLOW FLOOR TROUGHS

Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)	Model	Size (W x L)
□ SFT-1224	12" x 24"	□ SFT-1824	18" x 24"	□ SFT-2424	24" x 24"	□ SFT-3024	30" x 24"
□ SFT-1230	12" x 30"	□ SFT-1830	18" x 30"	□ SFT-2430	24" x 30"	□ SFT-3030	30" x 30"
□ SFT-1236	12" x 36"	□ SFT-1836	18" x 36"	□ SFT-2436	24" x 36"	□ SFT-3036	30" x 36"
□ SFT-1248	12" x 48"	□ SFT-1848	18" x 48"	□ SFT-2448	24" x 48"	□ SFT-3048	30" x 48"
□ SFT-1260	12" x 60"	□ SFT-1860	18" x 60"	□ SFT-2460	24" x 60"	□ SFT-3060	30" x 60"
□ SFT-1272	12" x 72"	□ SFT-1872	18" x 72"	□ SFT-2472	24" x 72"	□ SFT-3072	30" x 72"
□ SFT-1284	12" x 84"	□ SFT-1884	18" x 84"	□ SFT-2484	24" x 84"	□ SFT-3084	30" x 84"
□ SFT-1296	12" x 96"	□ SFT-1896	18" x 96"	□ SFT-2496	24" x 96"	□ SFT-3096	30" x 96"
□ SFT-12108	12" x 108"	□ SFT-18108	18" x 108"	□ SFT-24108	24" x 108"	□ SFT-30108	30" x 108"
□ SFT-12120	12" x 120"	□ SFT-18120	18" x 120"	□ SFT-24120	24" x 120"	□ SFT-30120	30" x 120"

Note - Standard troughs up to 96" have one (1) waste at center. Over 96", troughs have two (2) wastes equidistant.

Specifications subject to change without notice.

SFT-10 1121

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

ADVANCE TABCO®
SMART FABRICATION™

ALUMINUM

DUNNAGE RACKS

STATIONARY DUNNAGE RACKS

Item #: _____ Qty #: _____
Model #: _____
Project #: _____

12" HEIGHT

MODEL #	Width "W"	Length "L"	No. of Legs	Height "H"	Clearance "C"	Wt.
DUN-2036	20"	36"	4	12"	10 1/4"	10 lbs.
DUN-2048	20"	48"	4	12"	10 1/4"	12 lbs.
DUN-2060	20"	60"	6	12"	10 1/4"	16 lbs.
DUN-2436	24"	36"	4	12"	10 1/4"	11 lbs.
DUN-2448	24"	48"	4	12"	10 1/4"	13 lbs.
DUN-2460	24"	60"	6	12"	10 1/4"	17 lbs.

8" HEIGHT

MODEL #	Width "W"	Length "L"	No. of Legs	Height "H"	Clearance "C"	Wt.
DUN-2036-8	20"	36"	4	8"	6 1/4"	10 lbs.
DUN-2048-8	20"	48"	4	8"	6 1/4"	11 lbs.
DUN-2060-8	20"	60"	6	8"	6 1/4"	12 lbs.
DUN-2436-8	24"	36"	4	8"	6 1/4"	9 lbs.
DUN-2448-8	24"	48"	4	8"	6 1/4"	12 lbs.
DUN-2460-8	24"	60"	6	8"	6 1/4"	13 lbs.

FEATURES:

Heavy duty welded construction.

1-3/4" square tubing.

1500 lb. Load Capacity (Evenly distributed load).

CONSTRUCTION:

Fully welded 1-3/4" square aluminum tube assembly.

Legs are 1-3/4" square tubing with Plastic Feet.

MATERIAL:

6063-T52 extruded aluminum tube.

MOBILE DUNNAGE RACKS

FEATURES:

Heavy duty welded construction.

1-3/4" square tubing.

6" Heavy Duty Casters.

Includes Handle.

2000 lb. Rolling Load Capacity (Evenly distributed load).

CONSTRUCTION:

Fully welded 1-3/4" square aluminum tube assembly.

6" diameter casters bolted to Base of Mobile Dunnage Rack.

Handle secures to rack with Locking Set Screws.

MATERIAL:

6063-T52 extruded aluminum tube.

MODEL #	Width	Length	Wt.
DUN-2036C	20"	36"	35 lbs.
DUN-2048C	20"	48"	40 lbs.
DUN-2060C	20"	60"	45 lbs.

Replacement	Model #	Wt.	Qty
Mobile Dunnage Rack Handle	DUNH-1	7 lbs.	

ADVANCE TABCO®
SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 8:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or **Fax:** 631-242-6900

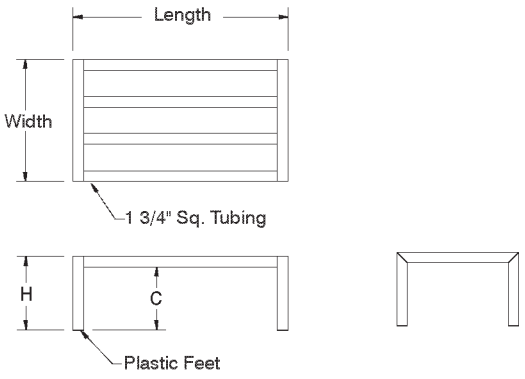
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

REF-R

DIMENSIONS and SPECIFICATIONS

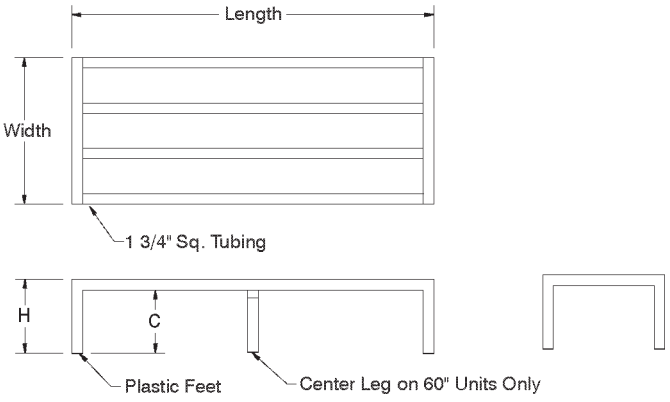
TOL ± .500” ALL DIMENSIONS ARE TYPICAL

STATIONARY DUNNAGE RACKS

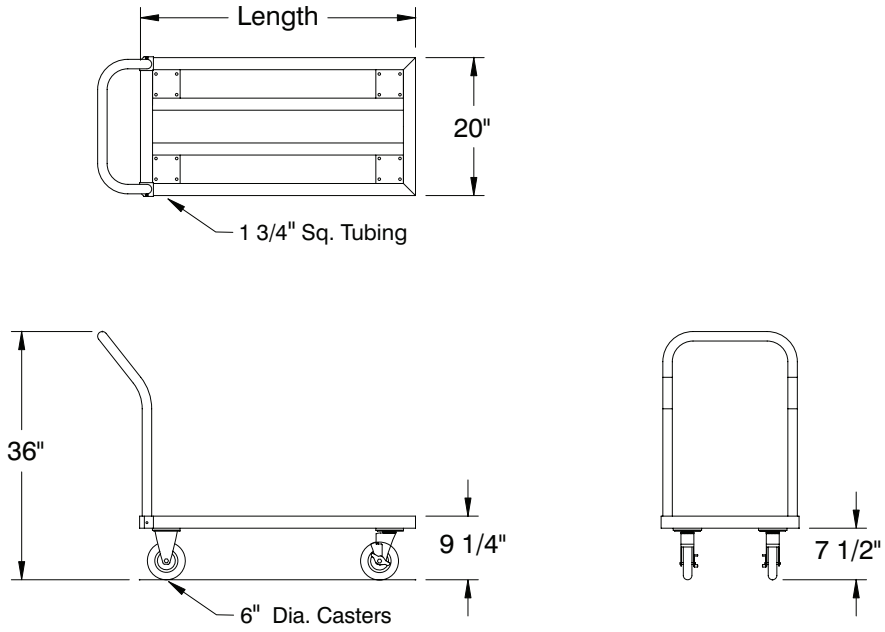


WIDTH = 20” or 24”

60” LENGTH RACKS HAVE 6 LEGS



MOBILE DUNNAGE RACKS



LENGTH = 36”, 48” or 60”

ADVANCE TABCO
SMART FABRICATION™

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

REF-R 200 Heartland Boulevard, Edgewood, NY 11717-8380

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We put space to work.

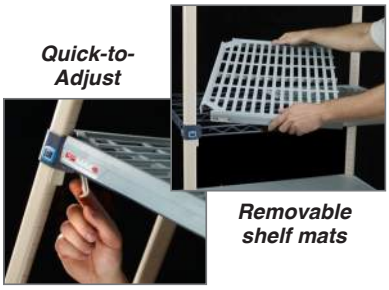
Item # _____

Job _____

MetroMax Q® Polymer / Wire Shelving

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames and steel posts have an epoxy coating over an electroplated substrate. Shelves and epoxy coated posts offer a 15 year warranty against rust and corrosion. Optional corrosion proof polymer posts are available. Microban® antimicrobial product protection is built into the frames, shelf mats, and posts. Shelf has a rigid four-sided frame with center truss(es). Robust corner provides complete 360° capture of the wedge and post for added stability. Stationary units have maximum capacity of 2,000 lbs. (907kg) evenly distributed. Mobile units (with stem casters) offer a maximum total unit load of 900 lbs. (408kg). Units assemble easily — shelves mount on four one-piece wedges along grooved, numbered posts and adjust on 1" (25mm) increments.

- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations.
  800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm)
  600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer
  Stationary unit: 2000lbs (907kg) evenly distributed.
  Mobile unit (with stem casters): Up to 900lbs. (408kg).
  Multiply the caster load rating by 3 to determine actual rating.
- **Rust & Corrosion Resistant:** Corrosion resistant shelves and posts offer a 15 year warranty against rust and corrosion.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection** is built into the shelf mats, frames, and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts — Raised beads on the back of each wedge snap into the grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf mounts on four wedges, A unit can be assembled without tools in minutes.
- **Interchangeable:** Part of the MetroMax platform, MetroMax Q shelves are compatible on the same shelving units with MetroMax i and MetroMax 4 shelves.
- **Open Grid and Solid Mat Options:** MetroMax Q is available with open grid mats. Open grid shelves promote air circulation and light penetration. For 21" (530mm) deep MetroMax Q, solid mat overlays are available. For 18" and 24" (457 and 610mm) depths, MetroMax i or MetroMax 4 solid shelves may be added when solid shelves are required.
- **NSF Listed** for all environments.
- **Optional Accessories** are on spec sheet 9.25.



Quick-to-Adjust

Removable shelf mats

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.

Supports good HACCP processes

All Metro Catalog Sheets are available on our website: **www.metro.com**

InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705
Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

L02-178
Printed in U.S.A. 4/17

Information and specifications are subject to change without notice. Please confirm at time of order.

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9.21

Job _____

MetroMax Q®
POLYMER / WIRE SHELVING

METRO®
We put space to work.

Material Specifications:

- **Shelf frames and epoxy-coated posts:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection The adjustable foot is reinforced nylon.
- **Shelf Mats:** Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- **Shelf Wedge Connector:** Reinforced nylon.
- **Temperature range:** -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning. Visit metro.com/service-support for cleaning guidelines.

Replacement MetroMax Q Wedges
Cat. No. MQ9985
Bag of 4
(included with each shelf)

Standard Interchangeable Shelves

- Part number includes shelf with removable mats and one bag of wedges

Shelf with Grid Mat Model No.	Nominal Size Width (in.)	Nominal Size Width (mm)	Nominal Size Length (in.)	Nominal Size Length (mm)	Actual Size Width (in.)	Actual Size Width (mm)	Actual Size Length (in.)	Actual Size Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MQ1824G	18	457	24	610	18 3/8	467	23 13/16	605	6.2	2.8
MQ1830G	18	457	30	762	18 3/8	467	29 13/16	757	8.0	3.6
MQ1836G	18	457	36	914	18 3/8	467	35 13/16	910	9.7	4.4
MQ1842G	18	457	42	1067	18 3/8	467	41 13/16	1062	11.4	5.2
MQ1848G	18	457	48	1219	18 3/8	467	47 13/16	1215	13.2	6.0
MQ1854G	18	457	54	1372	18 3/8	467	53 13/16	1367	15.0	6.8
MQ1860G	18	457	60	1524	18 3/8	467	59 13/16	1519	16.7	7.6
MQ1872G	18	457	72	1829	18 3/8	467	71 13/16	1824	20.0	9.1
MQ2124G	21	530	24	610	21 3/8	543	23 13/16	605	8.0	3.6
MQ2130G	21	530	30	762	21 3/8	543	29 13/16	757	9.7	4.4
MQ2136G	21	530	36	914	21 3/8	543	35 13/16	910	11.4	5.2
MQ2142G	21	530	42	1067	21 3/8	543	41 13/16	1062	12.8	5.8
MQ2148G	21	530	48	1219	21 3/8	543	47 13/16	1215	14.5	6.6
MQ2154G	21	530	54	1372	21 3/8	543	53 13/16	1367	16.7	7.6
MQ2160G	21	530	60	1524	21 3/8	543	59 13/16	1519	18.5	8.4
MQ2172G	21	530	72	1829	21 3/8	543	71 13/16	1824	21.7	9.9
MQ2424G	24	610	24	610	24 3/8	619	23 13/16	605	9.7	4.4
MQ2430G	24	610	30	762	24 3/8	619	29 13/16	757	11.4	5.2
MQ2436G	24	610	36	914	24 3/8	619	35 13/16	910	13.1	6.0
MQ2442G	24	610	42	1067	24 3/8	619	41 13/16	1062	14.1	6.4
MQ2448G	24	610	48	1219	24 3/8	619	47 13/16	1215	15.8	7.1
MQ2454G	24	610	54	1372	24 3/8	619	53 13/16	1367	18.5	8.4
MQ2460G	24	610	60	1524	24 3/8	619	59 13/16	1519	20.3	9.2
MQ2472G	24	610	72	1829	24 3/8	619	71 13/16	1824	23.5	10.7

Heavy-Duty Dunnage Shelves

- Weight capacity per shelf evenly distributed: 1,200 lbs. (544kg) on shelves up to and including 48" (1219mm) long; 900 lbs. (408kg) for shelves 60" (1524mm) long.
- Dunnage shelves are recommended for use on units with four posts, not on an add-on unit with two posts.

Grid Mat Model No.	Nominal Width (in.)	Nominal Width (mm)	Nominal Length (in.)	Nominal Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MHP2436G	24	610	36	914	21	9.5
MHP2448G	24	610	48	1220	27	12.2
MHP2460G	24	610	60	1524	33	15.0

Solid Shelf Options:

MetroMax i and MetroMax 4 solid shelves may be used with MetroMax Q shelves on the same unit. See spec sheets 9.20 & 9.22 for model numbers.

Posts

- Corrosion resistant epoxy-coated steel option.
- Corrosion proof polymer option.

STATIONARY POST WITH LEVELING FOOT

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13PE	1.0	0.5	MX13P	0.5	0.2	13	370	14 3/16	360
MQ27PE	2.0	0.9	MX27P	0.9	0.4	27	685	28 3/16	716
MQ33PE	2.5	1.1	MX33P	1.0	0.5	33	875	34 3/16	868
MQ54PE	4.0	1.8	MX54P	1.6	0.7	54	1370	54 3/16	1376
MQ63PE	4.5	2.0	MX63P	1.8	0.8	63	1585	62 3/16	1580
MQ74PE	5.5	2.5	MX74P	2.3	1.0	74	1690	74 3/16	1884
MQ86PE	6.5	2.9	MX86P	2.5	1.4	86	2195	86 3/16	2189

MOBILE POST FOR STEM CASTER

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13UPE	1.0	0.5	MX13UP	0.5	0.2	13	370	13 3/16	335
MQ27UPE	2.0	0.9	MX27UP	0.9	0.4	27	685	27 3/16	691
MQ33UPE	2.5	1.1	MX33UP	1.0	0.5	33	875	33 3/16	843
MQ54UPE	4.0	1.8	MX54UP	1.6	0.7	54	1370	53 3/16	1351
MQ63UPE	4.5	2.0	MX63UP	1.8	0.8	63	1585	61 3/16	1554
MQ74UPE	5.5	2.5	MX74UP	2.3	1.0	74	1690	73 3/16	1859
MQ86UPE	6.5	2.9	MX86UP	3.0	1.4	86	2195	85 3/16	2164

*Stationary posts include an adjustable leveling foot to compensate for uneven floors. Leveling foot can be adjusted 1" (25mm).
Special height cut posts are available. Consult your Metro representative.

Epoxy-coated steel post

Polymer post

an Ali Group Company
GROUP
The Spirit of Excellence

METRO®

We put space to work.®

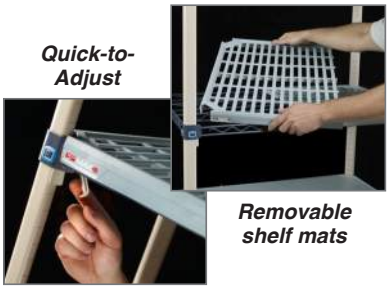
Item # _____

Job _____

MetroMax Q® Polymer / Wire Shelving

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames and steel posts have an epoxy coating over an electroplated substrate. Shelves and epoxy coated posts offer a 15 year warranty against rust and corrosion. Optional corrosion proof polymer posts are available. Microban® antimicrobial product protection is built into the frames, shelf mats, and posts. Shelf has a rigid four-sided frame with center truss(es). Robust corner provides complete 360° capture of the wedge and post for added stability. Stationary units have maximum capacity of 2,000 lbs. (907kg) evenly distributed. Mobile units (with stem casters) offer a maximum total unit load of 900 lbs. (408kg). Units assemble easily — shelves mount on four one-piece wedges along grooved, numbered posts and adjust on 1" (25mm) increments.

- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations.
  800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm)
  600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer
  Stationary unit: 2000lbs (907kg) evenly distributed.
  Mobile unit (with stem casters): Up to 900lbs. (408kg).
  Multiply the caster load rating by 3 to determine actual rating.
- **Rust & Corrosion Resistant:** Corrosion resistant shelves and posts offer a 15 year warranty against rust and corrosion.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection** is built into the shelf mats, frames, and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts — Raised beads on the back of each wedge snap into the grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf mounts on four wedges, A unit can be assembled without tools in minutes.
- **Interchangeable:** Part of the MetroMax platform, MetroMax Q shelves are compatible on the same shelving units with MetroMax i and MetroMax 4 shelves.
- **Open Grid and Solid Mat Options:** MetroMax Q is available with open grid mats. Open grid shelves promote air circulation and light penetration. For 21" (530mm) deep MetroMax Q, solid mat overlays are available. For 18" and 24" (457 and 610mm) depths, MetroMax i or MetroMax 4 solid shelves may be added when solid shelves are required.
- **NSF Listed** for all environments.
- **Optional Accessories** are on spec sheet 9.25.



Quick-to-Adjust

Removable shelf mats

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.

Supports good HACCP processes

All Metro Catalog Sheets are available on our website: **www.metro.com**

METRO®

InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705

Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

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Information and specifications are subject to change without notice. Please confirm at time of order.

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9.21

Job _____

MetroMax Q®
POLYMER / WIRE SHELVING

We put space to work.

Material Specifications:

- **Shelf frames and epoxy-coated posts:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection The adjustable foot is reinforced nylon.
- **Shelf Mats:** Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- **Shelf Wedge Connector:** Reinforced nylon.
- **Temperature range:** -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning. Visit metro.com/service-support for cleaning guidelines.

Replacement MetroMax Q Wedges
Cat. No. MQ9985
Bag of 4
(included with each shelf)

Standard Interchangeable Shelves

- Part number includes shelf with removable mats and one bag of wedges

Shelf with Grid Mat Model No.	Nominal Size Width (in.)	Nominal Size Width (mm)	Nominal Size Length (in.)	Nominal Size Length (mm)	Actual Size Width (in.)	Actual Size Width (mm)	Actual Size Length (in.)	Actual Size Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MQ1824G	18	457	24	610	18 3/8	467	23 13/16	605	6.2	2.8
MQ1830G	18	457	30	762	18 3/8	467	29 13/16	757	8.0	3.6
MQ1836G	18	457	36	914	18 3/8	467	35 13/16	910	9.7	4.4
MQ1842G	18	457	42	1067	18 3/8	467	41 13/16	1062	11.4	5.2
MQ1848G	18	457	48	1219	18 3/8	467	47 13/16	1215	13.2	6.0
MQ1854G	18	457	54	1372	18 3/8	467	53 13/16	1367	15.0	6.8
MQ1860G	18	457	60	1524	18 3/8	467	59 13/16	1519	16.7	7.6
MQ1872G	18	457	72	1829	18 3/8	467	71 13/16	1824	20.0	9.1
MQ2124G	21	530	24	610	21 3/8	543	23 13/16	605	8.0	3.6
MQ2130G	21	530	30	762	21 3/8	543	29 13/16	757	9.7	4.4
MQ2136G	21	530	36	914	21 3/8	543	35 13/16	910	11.4	5.2
MQ2142G	21	530	42	1067	21 3/8	543	41 13/16	1062	12.8	5.8
MQ2148G	21	530	48	1219	21 3/8	543	47 13/16	1215	14.5	6.6
MQ2154G	21	530	54	1372	21 3/8	543	53 13/16	1367	16.7	7.6
MQ2160G	21	530	60	1524	21 3/8	543	59 13/16	1519	18.5	8.4
MQ2172G	21	530	72	1829	21 3/8	543	71 13/16	1824	21.7	9.9
MQ2424G	24	610	24	610	24 3/8	619	23 13/16	605	9.7	4.4
MQ2430G	24	610	30	762	24 3/8	619	29 13/16	757	11.4	5.2
MQ2436G	24	610	36	914	24 3/8	619	35 13/16	910	13.1	6.0
MQ2442G	24	610	42	1067	24 3/8	619	41 13/16	1062	14.1	6.4
MQ2448G	24	610	48	1219	24 3/8	619	47 13/16	1215	15.8	7.1
MQ2454G	24	610	54	1372	24 3/8	619	53 13/16	1367	18.5	8.4
MQ2460G	24	610	60	1524	24 3/8	619	59 13/16	1519	20.3	9.2
MQ2472G	24	610	72	1829	24 3/8	619	71 13/16	1824	23.5	10.7

Heavy-Duty Dunnage Shelves

- Weight capacity per shelf evenly distributed: 1,200 lbs. (544kg) on shelves up to and including 48" (1219mm) long; 900 lbs. (408kg) for shelves 60" (1524mm) long.
- Dunnage shelves are recommended for use on units with four posts, not on an add-on unit with two posts.

Grid Mat Model No.	Nominal Width (in.)	Nominal Width (mm)	Nominal Length (in.)	Nominal Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MHP2436G	24	610	36	914	21	9.5
MHP2448G	24	610	48	1220	27	12.2
MHP2460G	24	610	60	1524	33	15.0

Solid Shelf Options:

MetroMax i and MetroMax 4 solid shelves may be used with MetroMax Q shelves on the same unit. See spec sheets 9.20 & 9.22 for model numbers.

Posts

- Corrosion resistant epoxy-coated steel option.
- Corrosion proof polymer option.

STATIONARY POST WITH LEVELING FOOT

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13PE	1.0	0.5	MX13P	0.5	0.2	13	370	14 3/16	360
MQ27PE	2.0	0.9	MX27P	0.9	0.4	27	685	28 3/16	716
MQ33PE	2.5	1.1	MX33P	1.0	0.5	33	875	34 3/16	868
MQ54PE	4.0	1.8	MX54P	1.6	0.7	54	1370	54 3/16	1376
MQ63PE	4.5	2.0	MX63P	1.8	0.8	63	1585	62 3/16	1580
MQ74PE	5.5	2.5	MX74P	2.3	1.0	74	1690	74 3/16	1884
MQ86PE	6.5	2.9	MX86P	2.5	1.4	86	2195	86 3/16	2189

MOBILE POST FOR STEM CASTER

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13UPE	1.0	0.5	MX13UP	0.5	0.2	13	370	13 3/16	335
MQ27UPE	2.0	0.9	MX27UP	0.9	0.4	27	685	27 3/16	691
MQ33UPE	2.5	1.1	MX33UP	1.0	0.5	33	875	33 3/16	843
MQ54UPE	4.0	1.8	MX54UP	1.6	0.7	54	1370	53 3/16	1351
MQ63UPE	4.5	2.0	MX63UP	1.8	0.8	63	1585	61 3/16	1554
MQ74UPE	5.5	2.5	MX74UP	2.3	1.0	74	1690	73 3/16	1859
MQ86UPE	6.5	2.9	MX86UP	3.0	1.4	86	2195	85 3/16	2164

*Stationary posts include an adjustable leveling foot to compensate for uneven floors. Leveling foot can be adjusted 1" (25mm).
Special height cut posts are available. Consult your Metro representative.

Epoxy-coated steel post

Polymer post

MetroMax Q® Polymer / Wire Shelving

an Ali Group Company
GROUP
The Spirit of Excellence

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: Walk In Cooler / Freezer

- x CUSTOM FABRICATED
- ☐ EXISTING
  - ☐ WHERE SHOWN
  - ☐ RELOCATED
  - ☐ MODIFIED
- ☐ SPARE NUMBER
- ☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:
  - ☐ OWNER
  - ☐ SUPPLIER/VENDOR
  - ☐ GENERAL CONTRACTOR
  - ☐ MILLWORK TRADE
  - ☐ OTHER _____

COMMENTS:

RMI WALK IN COOLER / FREEZER COMBINATION
REFER TO MFG SHOP DRAWING

DESCRIPTION: EVAPORATOR COIL, COOLER

X CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC)
FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:
AIRDYNE

DESCRIPTION: EVAPORATOR COIL, FREEZER

X CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

AIRDYNE

METRO®

We put space to work.®

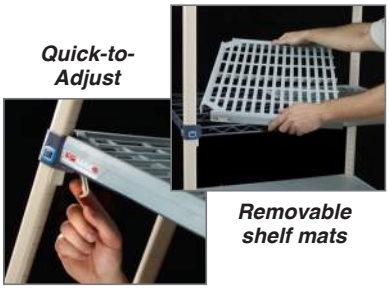
Item # _____

Job _____

MetroMax Q® Polymer / Wire Shelving

Quick-to-adjust, corrosion resistant shelving constructed of removable polymer open grid shelf mats, wire shelf frames, and corner releases. Shelf frames and steel posts have an epoxy coating over an electroplated substrate. Shelves and epoxy coated posts offer a 15 year warranty against rust and corrosion. Optional corrosion proof polymer posts are available. Microban® antimicrobial product protection is built into the frames, shelf mats, and posts. Shelf has a rigid four-sided frame with center truss(es). Robust corner provides complete 360° capture of the wedge and post for added stability. Stationary units have maximum capacity of 2,000 lbs. (907kg) evenly distributed. Mobile units (with stem casters) offer a maximum total unit load of 900 lbs. (408kg). Units assemble easily — shelves mount on four one-piece wedges along grooved, numbered posts and adjust on 1" (25mm) increments.

- **Forever Strong:** Proven corner connection and four-sided shelf frame with center truss(es) assures stability and strength in stationary, mobile, and high-density track shelving configurations.
  800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1219mm)
  600 lbs. (272kg) per shelf for lengths of 54" (1372mm) or longer
  Stationary unit: 2000lbs (907kg) evenly distributed.
  Mobile unit (with stem casters): Up to 900lbs. (408kg).
  Multiply the caster load rating by 3 to determine actual rating.
- **Rust & Corrosion Resistant:** Corrosion resistant shelves and posts offer a 15 year warranty against rust and corrosion.
- **Easy to Clean and Maintain:** Polymer mats can be easily removed and cleaned in a sink or commercial washer / dish machine.
- **Microban® Antimicrobial Product Protection** is built into the shelf mats, frames, and posts to inhibit the growth of bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban product protection keeps the product "cleaner between cleanings".
- **Quick-to-Adjust:** Patented corner release allows shelves to be adjusted without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Efficient Use of Space:** Shelves adjust on 1" (25mm) increments along the post to maximize the use of available vertical space.
- **Fast, Easy Assembly:** Shelves are ready to use right out of the box. One-piece wedges securely attach to the posts — Raised beads on the back of each wedge snap into the grooves on the post. Window on wedge aligns with numbers on the post to locate the desired shelf position. Shelf mounts on four wedges, A unit can be assembled without tools in minutes.
- **Interchangeable:** Part of the MetroMax platform, MetroMax Q shelves are compatible on the same shelving units with MetroMax i and MetroMax 4 shelves.
- **Open Grid and Solid Mat Options:** MetroMax Q is available with open grid mats. Open grid shelves promote air circulation and light penetration. For 21" (530mm) deep MetroMax Q, solid mat overlays are available. For 18" and 24" (457 and 610mm) depths, MetroMax i or MetroMax 4 solid shelves may be added when solid shelves are required.
- **NSF Listed** for all environments.
- **Optional Accessories** are on spec sheet 9.25.



Quick-to-Adjust

Removable shelf mats

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban® Products Company, Huntersville, NC. Microban® product protection does not by itself protect a user from food borne illness. Product must be routinely cleaned.

Supports good HACCP processes

All Metro Catalog Sheets are available on our website: **www.metro.com**

METRO®

InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705

Product Information. U.S. and Canada: 1.800.992.1776
Outside U.S. and Canada: www.metro.com/contactus

L02-178
Printed in U.S.A. 4/17

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9.21

Job _____

MetroMax Q®
POLYMER / WIRE SHELVING

METRO®
We put space to work.

Material Specifications:

- **Shelf frames and epoxy-coated posts:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection The adjustable foot is reinforced nylon.
- **Shelf Mats:** Injection-molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- **Shelf Wedge Connector:** Reinforced nylon.
- **Temperature range:** -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning. Visit metro.com/service-support for cleaning guidelines.

Replacement MetroMax Q Wedges
Cat. No. MQ9985
Bag of 4
(included with each shelf)

Standard Interchangeable Shelves

- Part number includes shelf with removable mats and one bag of wedges

Shelf with Grid Mat Model No.	Nominal Size Width (in.)	Nominal Size Width (mm)	Nominal Size Length (in.)	Nominal Size Length (mm)	Actual Size Width (in.)	Actual Size Width (mm)	Actual Size Length (in.)	Actual Size Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MQ1824G	18	457	24	610	18 3/8	467	23 13/16	605	6.2	2.8
MQ1830G	18	457	30	762	18 3/8	467	29 13/16	757	8.0	3.6
MQ1836G	18	457	36	914	18 3/8	467	35 13/16	910	9.7	4.4
MQ1842G	18	457	42	1067	18 3/8	467	41 13/16	1062	11.4	5.2
MQ1848G	18	457	48	1219	18 3/8	467	47 13/16	1215	13.2	6.0
MQ1854G	18	457	54	1372	18 3/8	467	53 13/16	1367	15.0	6.8
MQ1860G	18	457	60	1524	18 3/8	467	59 13/16	1519	16.7	7.6
MQ1872G	18	457	72	1829	18 3/8	467	71 13/16	1824	20.0	9.1
MQ2124G	21	530	24	610	21 3/8	543	23 13/16	605	8.0	3.6
MQ2130G	21	530	30	762	21 3/8	543	29 13/16	757	9.7	4.4
MQ2136G	21	530	36	914	21 3/8	543	35 13/16	910	11.4	5.2
MQ2142G	21	530	42	1067	21 3/8	543	41 13/16	1062	12.8	5.8
MQ2148G	21	530	48	1219	21 3/8	543	47 13/16	1215	14.5	6.6
MQ2154G	21	530	54	1372	21 3/8	543	53 13/16	1367	16.7	7.6
MQ2160G	21	530	60	1524	21 3/8	543	59 13/16	1519	18.5	8.4
MQ2172G	21	530	72	1829	21 3/8	543	71 13/16	1824	21.7	9.9
MQ2424G	24	610	24	610	24 3/8	619	23 13/16	605	9.7	4.4
MQ2430G	24	610	30	762	24 3/8	619	29 13/16	757	11.4	5.2
MQ2436G	24	610	36	914	24 3/8	619	35 13/16	910	13.1	6.0
MQ2442G	24	610	42	1067	24 3/8	619	41 13/16	1062	14.1	6.4
MQ2448G	24	610	48	1219	24 3/8	619	47 13/16	1215	15.8	7.1
MQ2454G	24	610	54	1372	24 3/8	619	53 13/16	1367	18.5	8.4
MQ2460G	24	610	60	1524	24 3/8	619	59 13/16	1519	20.3	9.2
MQ2472G	24	610	72	1829	24 3/8	619	71 13/16	1824	23.5	10.7

Heavy-Duty Dunnage Shelves

- Weight capacity per shelf evenly distributed: 1,200 lbs. (544kg) on shelves up to and including 48" (1219mm) long; 900 lbs. (408kg) for shelves 60" (1524mm) long.
- Dunnage shelves are recommended for use on units with four posts, not on an add-on unit with two posts.

Grid Mat Model No.	Nominal Width (in.)	Nominal Width (mm)	Nominal Length (in.)	Nominal Length (mm)	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
MHP2436G	24	610	36	914	21	9.5
MHP2448G	24	610	48	1220	27	12.2
MHP2460G	24	610	60	1524	33	15.0

Solid Shelf Options:
MetroMax i and MetroMax 4 solid shelves may be used with MetroMax Q shelves on the same unit. See spec sheets 9.20 & 9.22 for model numbers.

Posts

- Corrosion resistant epoxy-coated steel option.
- Corrosion proof polymer option.

STATIONARY POST WITH LEVELING FOOT

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13PE	1.0	0.5	MX13P	0.5	0.2	13	370	14 3/16	360
MQ27PE	2.0	0.9	MX27P	0.9	0.4	27	685	28 3/16	716
MQ33PE	2.5	1.1	MX33P	1.0	0.5	33	875	34 3/16	868
MQ54PE	4.0	1.8	MX54P	1.6	0.7	54	1370	54 3/16	1376
MQ63PE	4.5	2.0	MX63P	1.8	0.8	63	1585	62 3/16	1580
MQ74PE	5.5	2.5	MX74P	2.3	1.0	74	1690	74 3/16	1884
MQ86PE	6.5	2.9	MX86P	2.5	1.4	86	2195	86 3/16	2189

MOBILE POST FOR STEM CASTER

Epoxy-Coated Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Nominal Height (in.)	Nominal Height (mm)	Actual Height (in.)	Actual Height (mm)
MQ13UPE	1.0	0.5	MX13UP	0.5	0.2	13	370	13 3/16	335
MQ27UPE	2.0	0.9	MX27UP	0.9	0.4	27	685	27 3/16	691
MQ33UPE	2.5	1.1	MX33UP	1.0	0.5	33	875	33 3/16	843
MQ54UPE	4.0	1.8	MX54UP	1.6	0.7	54	1370	53 3/16	1351
MQ63UPE	4.5	2.0	MX63UP	1.8	0.8	63	1585	61 3/16	1554
MQ74UPE	5.5	2.5	MX74UP	2.3	1.0	74	1690	73 3/16	1859
MQ86UPE	6.5	2.9	MX86UP	3.0	1.4	86	2195	85 3/16	2164

*Stationary posts include an adjustable leveling foot to compensate for uneven floors. Leveling foot can be adjusted 1" (25mm).
Special height cut posts are available. Consult your Metro representative.

Epoxy-coated steel post

Polymer post

an Ali Group Company
GROUP
The Spirit of Excellence

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: TRASH CONTAINER

CUSTOM FABRICATED

EXISTING

- WHERE SHOWN
- RELOCATED
- MODIFIED

SPARE NUMBER

X NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC)
FURNISHED BY:

- OWNER
- SUPPLIER/VENDOR
- GENERAL CONTRACTOR
- X MILLWORK TRADE
- OTHER _____

COMMENTS:

TRASH CONTAINER

NIKEC

G.A. SYSTEMS, Inc.

Refer to Manufacturer's Drawing

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Speedee Serv® Speedline Merchandising Cabinet

PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

Top is 16 gauge 304 stainless steel #4 finish. Front and back edges are turned down 102° and turned back 90° eliminating the gap between the top and the base of the cabinet. The ends are turned down 90° flush with cabinet base, this eliminates any open space between G.A. Systems cabinets. The top is secured to the base with 4 stainless steel flush head screws. One 3/4" diameter pin is welded at each end of the top. Each pin has two 5/16" diameter holes. The lower hole is used to join adjacent G.A. Systems cabinets.

Body of cabinet is fabricated of 1" square 18 gauge stainless steel and cold rolled tubing to form the top and bottom frames. Each is welded to 1-1/2" square 18 gauge stainless steel corner posts. Each corner post is capped. All joints are welded with all exposed welds being ground and polished. 20 gauge galvanized body panels are welded to tubing super structure.

Exterior front, back and ends are trimmed with 22 gauge stainless steel #4 finish trim to accept laminated color panels. Laminate is applied to 1/8" board for additional strength.

Bottom is fully enclosed. There is a 3-3/4" clearance from the bottom of the cabinet to the floor. Plate type 3" swivel non-marking casters with brakes. Cabinet heights are ADA compliant.

Sliding doors are available on cabinets 48" long or longer. The doors have stainless steel flush mounted handes on the front side and are finished with high pressure laminate and slide smoothly on an upper and lower track.

Stainlees steel hinge door is available on cabinets under 48" long. The hinge door is fabricated of 18 gauge stainless steel #4 finish. The hinge door has two flag hinges with a stainless steel pull handle.

Standard Features

- ☐ Locking pins, one at each end
- ☐ Plate type 3" swivel non-marking casters with brakes

Options

- ☐ No pins
- ☐ Top heavier gauge (support weight if needed)
- ☐ Solid Surface Top (in lieu of stainless steel top)

Accessories

- ☐ Tray Slide Stainless Steel
- ☐ Tray Slide Solid Surface
- ☐ Double Sided Sneeze Guard Glass
- ☐ Double Sided Sneeze Guard Acrylic
- ☐ Single Sided Sneeze Guard Glass
- ☐ Single Sided Sneeze Guard Acrylic
- ☐ Single Sided Self Serving Sneeze Guard Acrylic
- ☐ Merchandise Display Rack Single
- ☐ Merchandise Display Rack Double
- ☐ Merchandise Display Rack Half
- ☐ Display Shelf Double (stainless steel)
- ☐ Single Display Shelf (glass)
- ☐ Cash Shelf 15"
- ☐ Cash Shelf 20"
- ☐ Cash Shelf 24"
- ☐ Tray Shelf 12"
- ☐ Tray Shelf 15"
- ☐ Tray Shelf 18"
- ☐ Toe Kick
- ☐ Heated Display
- ☐ Intermediate Shelf / C0385
- ☐ Premium High Pressure Laminate
- ☐ Graphic Panels Stand-off
- ☐ Graphic Panels Vinyl
- ☐ Work Shelf
- ☐ Lid slide insert (D5430 / C0159 only)
- ☐ Doors Sliding / C0380
- ☐ Doors Hinge / C0701

Intertek
4003279
Conforms to NSF Std. #2

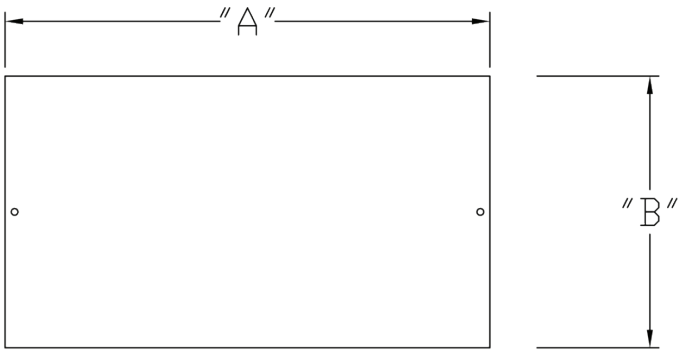
Rev 07/2019

G.A. SYSTEMS, Inc.

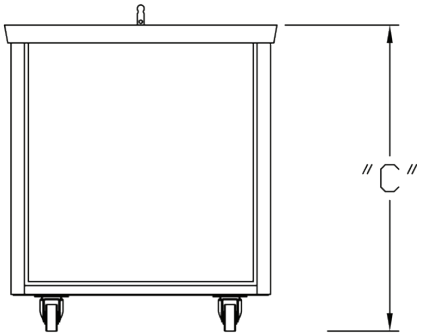
Refer to Manufacturer's Drawing

SPECIALIZING IN CAFETERIA SERVING LINES

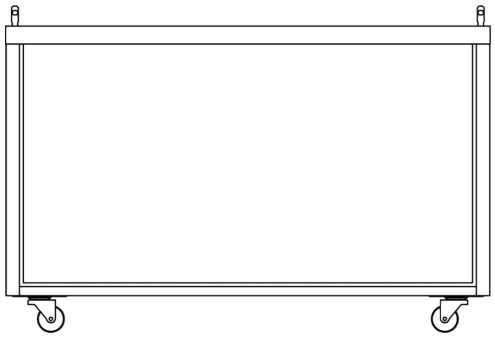
Speedline Merchandising Cabinet



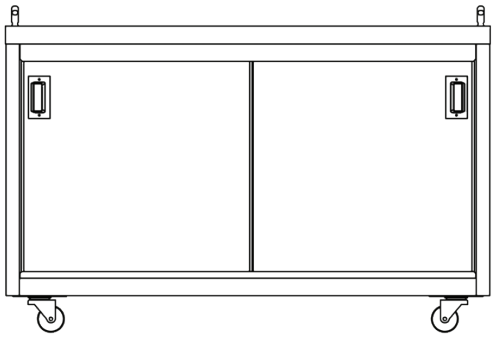
TOP VIEW



END VIEW



BACK VIEW



FRONT VIEW

Rev 07/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Speedline Merchandising Cabinet

Dimensions

Standard Height

ITEM	MODEL	A = LL	B = WW	C = H	Wt Lbs
C1138	D1830	18"	30-3/8"	34"	
C1147	D1930	19"	30-3/8"	34"	
C0408	D2030	20"	30-3/8"	34"	
C0462	D2430	24"	30-3/8"	34"	
C1064	D2436	24"	36-3/8"	34"	
C0938	D2730	27"	30-3/8"	34"	
C0459	D3030	30"	30-3/8"	34"	
C0674	D3230	32"	30-3/8"	34"	
C1066	D3430	34"	30-3/8"	34"	
C0154	D3630	36"	30-3/8"	34"	
C1031	D3636	36"	36-3/8"	34"	
C0179	D3648	36"	48"	34"	
C0478	D4030	40"	30-3/8"	34"	
C0406	D4130	41"	30-3/8"	34"	
C1029	D4230	42"	30-3/8"	34"	
C0322	D4430	44"	30-3/8"	34"	
C0155	D4830	48"	30-3/8"	34"	100
C0156	D4836	48"	36-3/8"	34"	125
C0670	D5330	53"	30-3/8"	34"	
C0159	D5430	54"	30-3/8"	34"	100
C0160	D5436	54"	36-3/8"	34"	150
C0163	D6030	60"	30-3/8"	34"	
C0110	D6330	63"	36-3/8"	34"	
C0985	D6336	63"	36-3/8"	34"	
C0983	D6830	68"	30-3/8"	34"	
C0530	D7230	72"	30-3/8"	34"	
C0964	D7236	72"	36-3/8"	34"	
C1033	D7630	76"	30-3/8"	34"	
C0773	D7830	78"	30-3/8"	34"	
C0454	D7936	79"	36-3/8"	34"	
C0671	D8130	81"	30-3/8"	34"	
C0774	D8430	84"	30-3/8"	34"	
C0611	D9130	91"	30-3/8"	34"	
C1021	D9630	96"	30-3/8"	34"	
C0790	D11430	114"	30-3/8"	34"	
C0963	D13830	138"	30-3/8"	34"	

Elementary Height

ITEM	MODEL	A = LL	B = WW	C = H	Wt Lbs
C1116	ED2430	24"	30-3/8"	31-1/2"	
C1201	ED2436	24"	36-3/8"	31-1/2"	
C1103	ED3030	30"	30-3/8"	31-1/2"	
C1180	ED3636	36"	36-3/8"	31-1/2"	
C1104	ED4430	44"	30-3/8"	31-1/2"	
C0157	ED4830	48"	30-3/8"	31-1/2"	100
C0158	ED4836	48"	36-3/8"	31-1/2"	125
C0161	ED5430	54"	30-3/8"	31-1/2"	125
C0162	ED5436	54"	36-3/8"	31-1/2"	150
C0687	ED6030	60"	30-3/8"	31-1/2"	
C1210	ED6330	63"	30-3/8"	31-1/2"	
C0514	ED6830	68"	30-3/8"	31-1/2"	

Rev 07/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Limited Warranty

G.A. Systems, Inc. warrants to the original purchase all equipment manufactured and/or sold to be free from all defects in material and workmanship under normal use and service. Its obligations under this warranty shall be limited to repairing or replacing any part of the said product. F.O.B. factory, which proves thus defective within one (1) year from date of sale, and which upon G.A. Systems, Inc.'s examination, discloses to its satisfaction to be thus defective. No claims will be accepted for any part becoming defective from damage in transit, improper installation, misuse, neglect, abnormal use, alteration, accident, fire or other casualty, or act of God. We will not assume any responsibility for labor chargers, travel, refrigerant, replacement parts purchased, or other expenses incurred outside of our factory. Neither will we be liable for food spoilage, loss of use of the equipment, inconvenience, or other consequential damage of any kind.

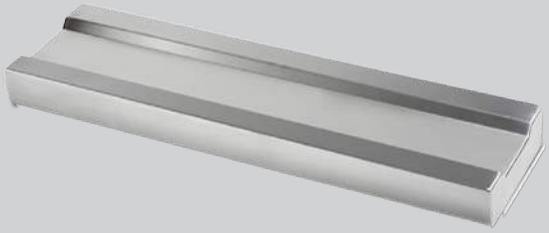
Rev 08/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Tray Slide
Stainless Steel



PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

Fabricated of 18 gauge stainless steel.

Fold down and removable lift off design.

Tray Slide is an accessory which can be added to any G.A. Systems cabinet or existing counter top.

Standard Features

- ☐ Fold down when not in use
- ☐ Two piece lift off assembly
- ☐ Shelves easily removed for cleaning
- ☐ Smooth trouble-free operation
- ☐ Chrome plated die cast bracket with 14 gauge zinc plate steel mounts included

Options

- ☐ Lights / LGT001
- ☐ Fixed Bracket

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Tray Slide Stainless Steel

ITEM	MODEL	LENGTH	WIDTH	HEIGHT
C0785	TRS19	19"	8-5/8"	2"
C1188	TRS20	20"	8-5/8"	2"
C0463	TRS24	24"	8-5/8"	2"
C0939	TRS28	28"	8-5/8"	2"
C0189	TRS30	30"	8-5/8"	2"
C0489	TRS30-12	30"	12"	2"
C0108	TRS31	31"	8-5/8"	2"
C1017	TRS31-12	31"	12"	2"
C0294	TRS31-7	31"	7"	2"
C1114	TRS31 CORNER	31"	8-5/8"	2"
C0484	TRS32	32"	8-5/8"	2"
C0190	TRS36	36"	8-5/8"	2"
C0295	TRS36-7	36"	7"	2"
C0440	TRS37	37"	8-5/8"	2"
C1077	TRS40	40"	8-5/8"	2"
C0325	TRS41	41"	8-5/8"	2"
C0270	TRS42	42"	8-5/8"	2"
C0407	TRS42-12	42"	12"	2"
C1105	TRS44	44"	8-5/8"	2"
C0464	TRS46	46"	8-5/8"	2"
C0197	TRS48	48"	8-5/8"	2"
C0360	TRS49	49"	8-5/8"	2"
C0196	TRS50	50"	8-5/8"	2"
C0296	TRS50-12	50"	12"	2"
C0292	TRS50-7	50"	7"	2"
C0367	TRS50-10	50"	10"	2"
C0562	TRS52	52"	8-5/8"	2"
C0262	TRS53	53"	8-5/8"	2"
C0257	TRS53-12	53"	12"	2"
C0198	TRS54	54"	8-5/8"	2"

ITEM	MODEL	LENGTH	WIDTH	HEIGHT
C0293	TRS54-7	54"	7"	2"
C0191	TRS55	55"	8-5/8"	2"
C0256	TRS55-12	55"	12"	2"
C0192	TRS57	57"	8-5/8"	2"
C0643	TRS60	60"	8-5/8"	2"
C0481	TRS60-12	60"	12"	2"
C0106	TRS63	63"	8-5/8"	2"
C0255	TRS63-12	63"	8-5/8"	2"
C1004	TRS64	64"	8-5/8"	2"
C0193	TRS66	66"	8-5/8"	2"
C0362	TRS66-10	66"	10"	2"
C0194	TRS68	68"	8-5/8"	2"
C0583	TRS69	69"	8-5/8"	2"
C0402	TRS69-12	69"	12"	2"
C0552	TRS70	70"	8-5/8"	2"
C0195	TRS72	72"	8-5/8"	2"
C0564	TRS74	74"	8-5/8"	2"
C1124	TRS75	75"	8-5/8"	2"
C0103	TRS76	76"	8-5/8"	2"
C0415	TRS77	77"	8-5/8"	2"
C0786	TRS78	78"	8-5/8"	2"
C0343	TRS79	79"	8-5/8"	2"
C0627	TRS80	80"	8-5/8"	2"
C0787	TRS84	84"	8-5/8"	2"
C0513	TRS86	86"	8-5/8"	2"
C0486	TRS88-12	88"	12"	2"
C1167	TRS96	96"	8-5/8"	2"
C0690	TRS102	102"	8-5/8"	2"
C0784	TRS104	104"	8-5/8"	2"

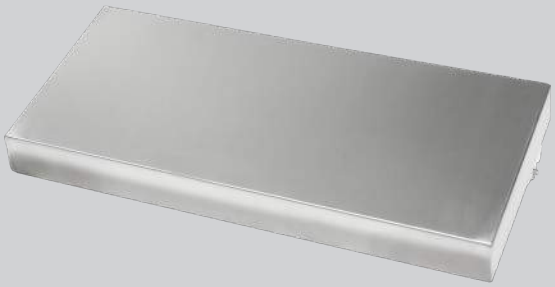
Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Tray Shelf



PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

It is constructed of 18 gauge stainless steel and meets standards of sanitation set forth by NSF.

G.A. Systems Tray Shelf is an accessory that can be added to the end of any G.A. Systems cabinet. It has the ability to lift off and fold down.

Standard Features

- ☐ Zinc plated steel drop shelf brackets (2)
- ☐ Fold down when not in use
- ☐ Two piece lift-off assemble

Dimensions

ITEM	MODEL	WIDTH	LENGTH	HEIGHT
C0102	TS12	29"	12"	2"
C0181	TS1236	35"	12"	2"
C0182	TS15	29"	15"	2"
C0183	TS1536	35"	15"	2"
C0937	TS18	29"	18"	2"
C1145	TS1836	35"	18"	2"

TS18 as shown on H5 Speedline Heated Cabinet.

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Refrigerated Salad Bar Drop In

PROJECT: _____

ITEM #: _____

MODEL: _____

Standard Features

- ☐ Installs in your new or existing counter
- ☐ Control panel with 3' standard conduit length
- ☐ Compressor located on left
- ☐ 404A refrigerant
- ☐ Hard wire connection
- ☐ Twist counter locking system

Specifications

Food well is constructed with 18 gauge 304 stainless steel #4 finish. The outer walls are 20 gauge galvanized and is foam insulated. The food well is 8" deep and has a 2" recessed edge that supports the pan adapters and allows cold airflow over food pan. No screws are used in the construction of the well.

Refrigerated system is cold wall refrigeration, utilizing a 1/2 HP compressor operating on 404A refrigerant. The temperature is preset at the factory and frost will form on the top and recessed edge.

Drop ins are also available in a slimline configuration and custom sizes.

Custom size 42" L x 7" W

Options

- ☐ Cord and plug; specify length
- ☐ Control panel conduit length; specify length
- ☐ Adapter bar set
- ☐ Compressor located on right
- ☐ Custom sizes available for your counter

Accessories

- ☐ Pan adapters
- ☐ Crock inserts
- ☐ Small adapter bar
- ☐ Large adapter bar

Note: When installing in existing or new counter, provide adequate airflow for maximum performance and to avoid damaging the compressor.

Intertek 4003279

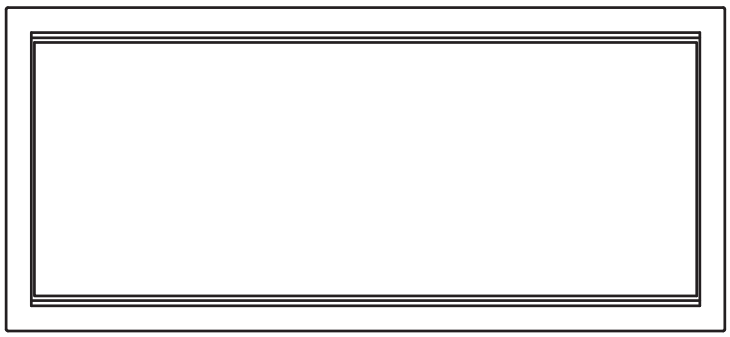
Sanitation Listed
Conforms to Std. NSF #7
Commercial Refrigerators
and Storage Freezers

Rev 04/2019

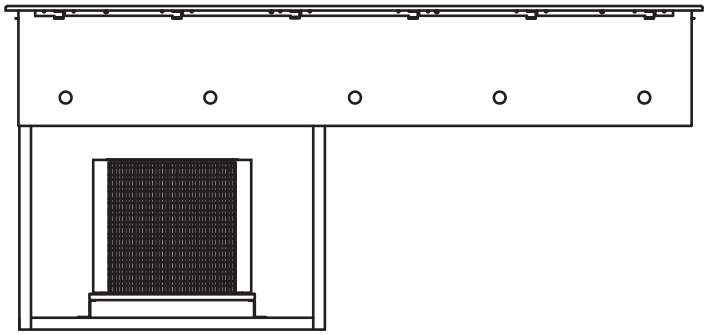
G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

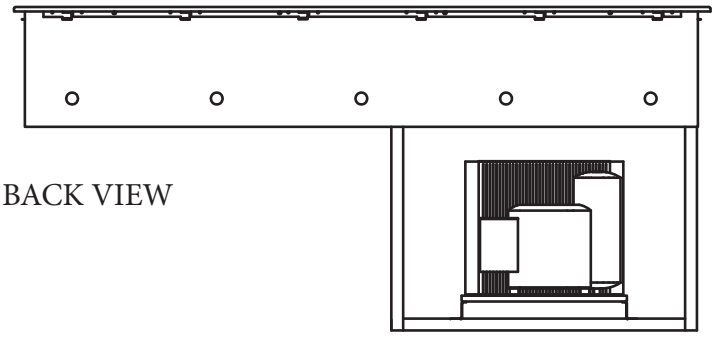
Refrigerated Salad Bar Drop In



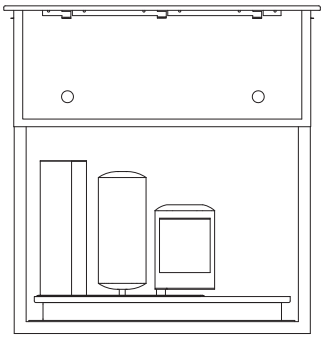
TOP VIEW



FRONT VIEW



BACK VIEW



END VIEW

COUNTER CUTOUT

ITEM	MODEL	LENGTH	WIDTH
C0971	SB2DI	32"	25-5/8"
C0972	SB2DISL	"	25-5/8"
C0974	SB3DI	47"	25-5/8"
C1130	SB4DI	61"	25-5/8"
C1137	SB5DI	76"	25-5/8"

CONTROLS CUTOUT

LENGTH	HEIGHT
6"	5-1/2"

ITEM	MODEL	LENGTH	WIDTH	HEIGHT	PAN CAPACITY	VOLT	Hz.	REQUIREMENT	CORD	PLUG
C0971	SB2DI	33-1/4"	26-1/2"	27-7/8"	2	120	60	1Ø 15 AMP	6'	NEMA 5-15
C0972	SB2DISL			27-7/8"	2	120	60	1Ø 15 AMP	6'	NEMA 5-15
C0974	SB3DI	48-1/4"	26-1/2"	27-7/8"	3	120	60	1Ø 15 AMP	6'	NEMA 5-15
C1130	SB4DI	62-1/4"	26-1/2"	27-7/8"	4	120	60	1Ø 15 AMP	6'	NEMA 5-15
C1137	SB5DI	77-1/4"	26-1/2"	27-7/8"	5	120	60	1Ø 15 AMP	6'	NEMA 5-15

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Pan Adapter Speedline

AD2

AD1

PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

The pan adapters are constructed of 18 gauge 304 stainless steel #4 finish and are designed to fit into G.A. Systems speedline cabinet food well.

The pan adapters rest on the upper ledge of the speedline cabinets and the food pan flange rest on top of the pan adapter.

The AD1 pan adapter (shown above) holds one standard 12" x 20" food pan.

The AD2 pan adapter (shown above) holds two standard 12" x 20" food pans.

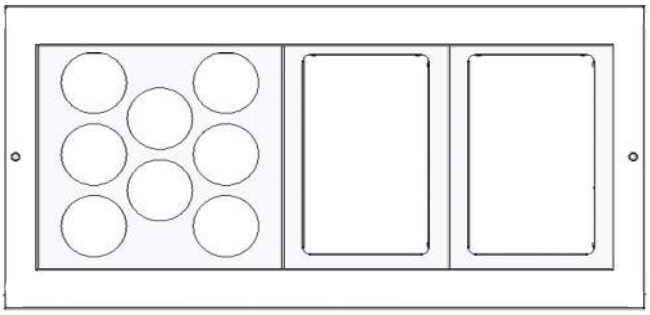
Crock adapters are also available, see graph table and drawings below. For custom adapters contact G.A. Systems.

Dimensions

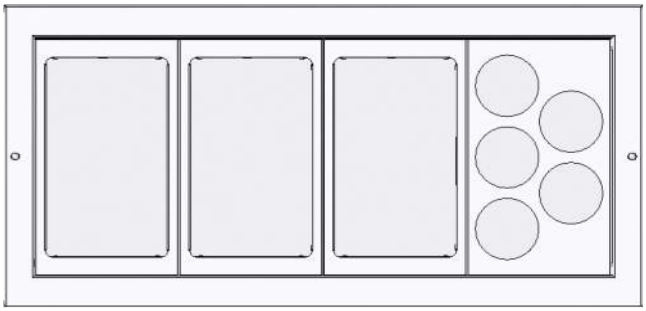
ITEM	MODEL	LENGTH	WIDTH	HEIGHT
C0221	AD1	15-5/8"	23-13/16"	7/8"
C0236	AD1 HC53	15-1/4"	23-13/16"	7/8"
C0220	AD136	15-5/8"	29-3/4"	7/8"
C0810	AD136 SOLID	15-5/8"	29-3/4"	7/8"
C0522	AD136 HC5336	15-1/4"	29-3/4"	7/8"
C0222	AD2	29"	29-13/16"	7/8"
C0288	AD2 SOLID	29"	29-13/16"	7/8"
C0237	AD2 HC53/HC68	29-1/4"	23-13/16"	7/8"
C0233	AD236	29"	29-13/16"	7/8"
C0545	AD236 SOLID	29"	29-13/16"	7/8"
C0523	AD236 HC5336	29"	29-3/4"	7/8"
C0524	AD236 HC6836	29"	29-3/4"	7/8"
C0233	CR5	15-5/8"	23-13/16"	7/8"
C0234	CR8	29"	29-3/4"	7/8"

Accessories

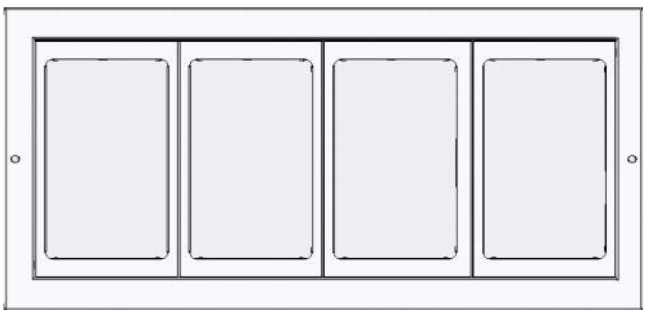
- ☐ Small adapter bar / C0419
- ☐ Large adapter bar / C0667



CR8 AD2



AD2 AD1 CR5



AD2 AD2

Rev 04/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Limited Warranty

G.A. Systems, Inc. warrants to the original purchase all equipment manufactured and/or sold to be free from all defects in material and workmanship under normal use and service. Its obligations under this warranty shall be limited to repairing or replacing any part of the said product. F.O.B. factory, which proves thus defective within one (1) year from date of sale, and which upon G.A. Systems, Inc.'s examination, discloses to its satisfaction to be thus defective. No claims will be accepted for any part becoming defective from damage in transit, improper installation, misuse, neglect, abnormal use, alteration, accident, fire or other casualty, or act of God. We will not assume any responsibility for labor chargers, travel, refrigerant, replacement parts purchased, or other expenses incurred outside of our factory. Neither will we be liable for food spoilage, loss of use of the equipment, inconvenience, or other consequential damage of any kind.

Rev 08/2019

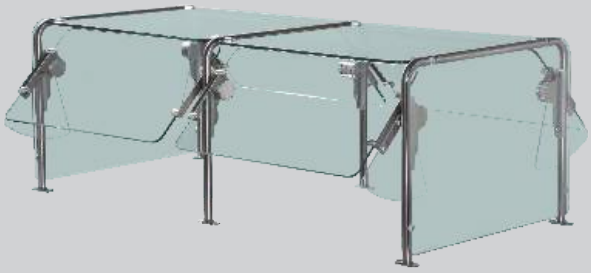
Refer to Manufacturer's Drawing

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

SPEC SHEET

Quick Click Adjustable Glass Double Sided Sneeze Guard



PROJECT: _____

ITEM #: _____

MODEL: _____

Specifications

Quick Click Adjustable Glass Double Sided Sneeze Guard is fabricated with 1" round stainless steel tubing. Top and front are covered with 3/8" thick tempered glass and ends are covered with 3/16" thick tempered glass with 1" radius polished edges.

Tuck away wings pop out end panels meet NSF standards and tuck away when not in use for an unobtrusive sleek profile. Front and back glass adjusts to 4 different positions and allows the tuck away wings to come out.

Standard Features

- ☐ 1" round stainless steel tubing
- ☐ Top mount
- ☐ Stainless steel brushed finish
- ☐ Independent angular adjustable
- ☐ Hardware included
- ☐ 3/8" thick tempered glass with polished edges
  *3/8" thick glass maximum span 60"

Options

- ☐ Under mount
- ☐ Powder coated finish
- ☐ Heat strips / C0329
- ☐ Heat strips with lights
- ☐ Lights / LGT001
- ☐ Stainless steel top

NSF Standards

The maximum vertical distance between the finish floor and the bottom leading edge of a food shield shall be 52 inches (1321 mm).

The maximum vertical distance between the food display area and bottom leading edge of a food shield shall be 15 inches (381mm).

The minimum horizontal distance between the front of counter top equipment and the bottom leading edge of a food shield shall be 7 inches (178 mm).

The sum of a food shield's protected horizonal plane (X) and it protected vertical plane (Y) shall be greater than or equal to 20 inches (508mm). Either X or Y may equal 0 inches (0mm).

MODEL	LL	WW	H (Y)
DSNLL30G	LL"	29"	22"
DSNLL36G	LL"	35"	22"

Intertek
4003279

Conforms to NSF Std. #2
Patented US 10,415,285

Rev 09/2019

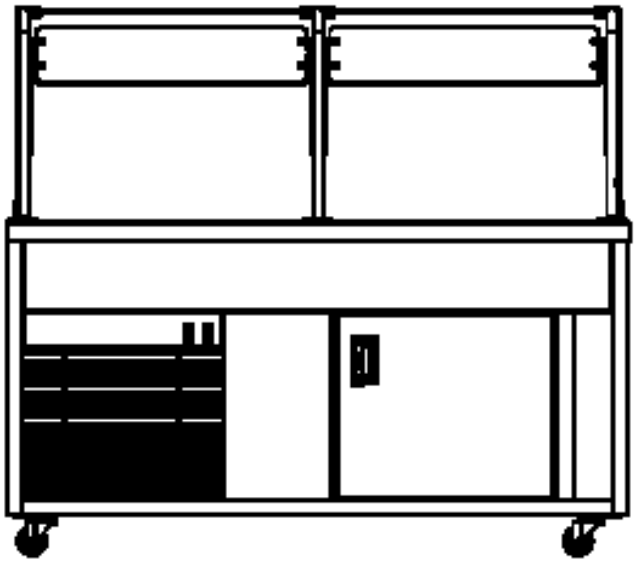
G.A. SYSTEMS, Inc.

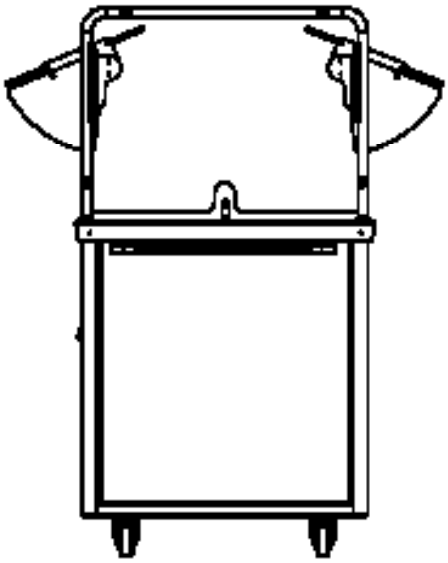
Refer to Manufacturer's Drawing

SPECIALIZING IN CAFETERIA SERVING LINES

Quick Click Adjustable Glass Double Sided Sneeze Guard

Standard Widths
- 29" for 30-5/8" Cabinets
- 35" for 36-5/8" Cabinets





Dimensions

ITEM	MODEL	LENGTH	WIDTH	HEIGHT
C1111	DSN2430G	24"	29"	22"
C0715	DSN3130G	31"	29"	22"
C0716	DSN3630G	36"	29"	22"
C0827	DSN3736G	37"	35"	22"
C0717	DSN3730G	37"	29"	22"
C1134	DSN3930G	39"	29"	22"
C0841	DSN4836G	48"	35"	22"
C0718	DSN4830G	48"	29"	22"
C0719	DSN5030G	50"	29"	22"
C0926	DSN5236G	52"	35"	22"
C0883	DSN5336G	53"	35"	22"
C0720	DSN5330G	53"	29"	22"
C0846	DSN5436G	54"	35"	22"
C0721	DSN5430G	54"	29"	22"
C0722	DSN5530G	55"	29"	22"
C0812	DSN6036G	60"	35"	22"
C1020	DSN6030G	60"	29"	22"

ITEM	MODEL	LENGTH	WIDTH	HEIGHT
C0819	DSN6336G	63"	35"	22"
C0723	DSN6330G	63"	29"	22"
C0875	DSN6836G	68"	35"	22"
C0724	DSN6830G	68"	29"	22"
C0779	DSN7230G	72"	29"	22"
C0725	DSN7630G	76"	29"	22"
C0726	DSN7730G	77"	29"	22"
C0932	DSN8636G	86"	35"	22"
C0727	DSN8630G	86"	29"	22"
C1019	DSN8830G	88"	29"	22"
C1166	DSN9630G	96"	29"	22"

Intertek
4003279

Conforms to NSF Std. #2
Patented US 10,415,285

Rev 09/2019

G.A. SYSTEMS, Inc.

SPECIALIZING IN CAFETERIA SERVING LINES

Limited Warranty

G.A. Systems, Inc. warrants to the original purchase all equipment manufactured and/or sold to be free from all defects in material and workmanship under normal use and service. Its obligations under this warranty shall be limited to repairing or replacing any part of the said product. F.O.B. factory, which proves thus defective within one (1) year from date of sale, and which upon G.A. Systems, Inc.'s examination, discloses to its satisfaction to be thus defective. No claims will be accepted for any part becoming defective from damage in transit, improper installation, misuse, neglect, abnormal use, alteration, accident, fire or other casualty, or act of God. We will not assume any responsibility for labor chargers, travel, refrigerant, replacement parts purchased, or other expenses incurred outside of our factory. Neither will we be liable for food spoilage, loss of use of the equipment, inconvenience, or other consequential damage of any kind.

Rev 08/2019

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: BEVERAGE COUNTER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

SPARE NUMBER

X NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

X MILLWORK TRADE

OTHER _____

COMMENTS:

meridian®

HID312 - Touch-Free Ice & Water Dispenser

Nugget Ice Machine / Dispenser

HID312A-1 with optional KLP24A legs

Sealed, maintenance-free bearings ensure maximum reliability and contribute to a long machine life

The Meridian® Difference

Sanitation:

- Touch-free, infrared dispensing of ice and water eliminates the need to physically touch the dispenser for more sanitary operation
- AgION® and other antimicrobial compounds are molded into key components to help inhibit the growth of microbes, bacteria, mold and algae
- Fully removable bin, spouts, air filter, sink, and grill allow for easy cleaning and maintenance
- Sealed refrigeration system minimizes outside airborne contamination
- Front accessible, removable air filter makes cleaning more convenient

Reliability & Ease of Use:

- Sealed, maintenance-free bearings reduce preventative maintenance and ensure maximum reliability
- Produces Scotsman's chewable H² Nugget Ice which is slow-melting and designed for reliable dispensing
- Space-maximizing design – the industry's smallest operational footprint relative to capacity, featuring specially designed contoured sides for enhanced breathability
- SmoothStream™ water dispensing technology reduces splashing to keep the machine and surrounding areas clean
- Unit-specific QR code for quick access to service manuals and warranty history
- Durable stainless-steel evaporator and exterior panels, plus larger sink opening and dispensing area
- Enhanced service features - Intuitive LED diagnostic lights reduce service time and convenient USB drive allows for fast software updates
- Industry-leading energy and water efficiency along with quieter operation

Touch-free infrared sensor dispensing option, providing more sanitary operation

User controlled antimicrobial push-button dispensing option, providing quick and efficient operation

24 Hour Volume Production

Air Cooled		
70˚F/21˚C 50˚F/10˚C	Air Water	90˚F/32˚C 70˚F/21˚C
260/118 lb/kg		225/102 lb/kg

Specifications

Model Number	Condenser Unit	Dispensing Method	Storage Capacity lb/kg	Basic Electrical Volts/Hz/Phase	Max. Fuse Size or HACR Circuit Breaker (amps)	Min. Circuit Amps	Energy Consumption kWh/100 lb 90˚F(32˚C)/70˚F(21˚C)	Water Usage Gallons/100 lb (liters/45.4 kg) Potable 90˚F(32˚C)/70˚F(21˚C)	Condenser
HID312A-1	Air	Touch-Free Sensor	12/5.4	115/60/1	15	Cord	4.90	12/45.5	-
HID312AB-1	Air	Button Activated	12/5.4	115/60/1	15	Cord	4.90	12/45.5	-
HID312AW-1*	Air	Touch-Free Sensor	12/5.4	115/60/1	15	Cord	4.90	12/45.5	-

*Wall mount configuration. Does not have or accept a drip tray. Unit designed to be installed over existing sink.

H² Nugget Ice

Chewable, slow-melting ice that allows for more reliable dispensing.

3/4" x 5/16" x 3/8" (1.9 x 0.8 x 0.95 cm)

Certification

Warranty

- 3 years parts and labor.
- 5 years parts on the compressor and condenser.
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

HID312 - Touch-free Ice Machine / Dispenser

Scotsman®

101 Corporate Woods Parkway, Vernon Hills, IL 60061
1-800-SCOTSMAN Fax: 847-913-9844 www.scotsman-ice.com customer.relations@scotsman-ice.com

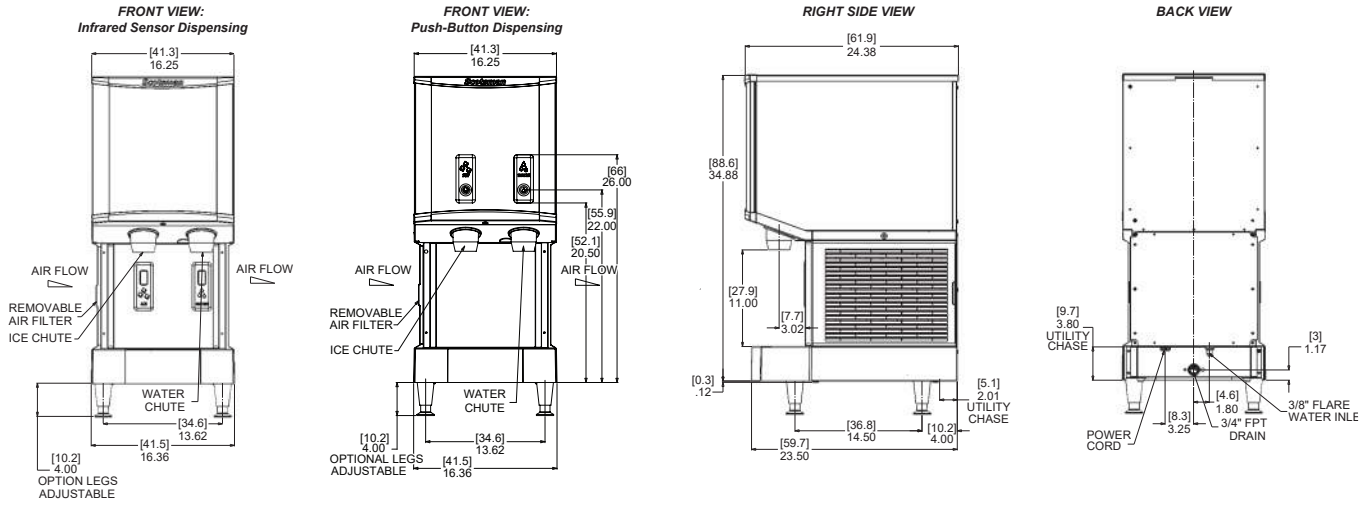
HID312 - Touch-Free Ice & Water Dispenser

Nugget Ice Machine / Dispenser

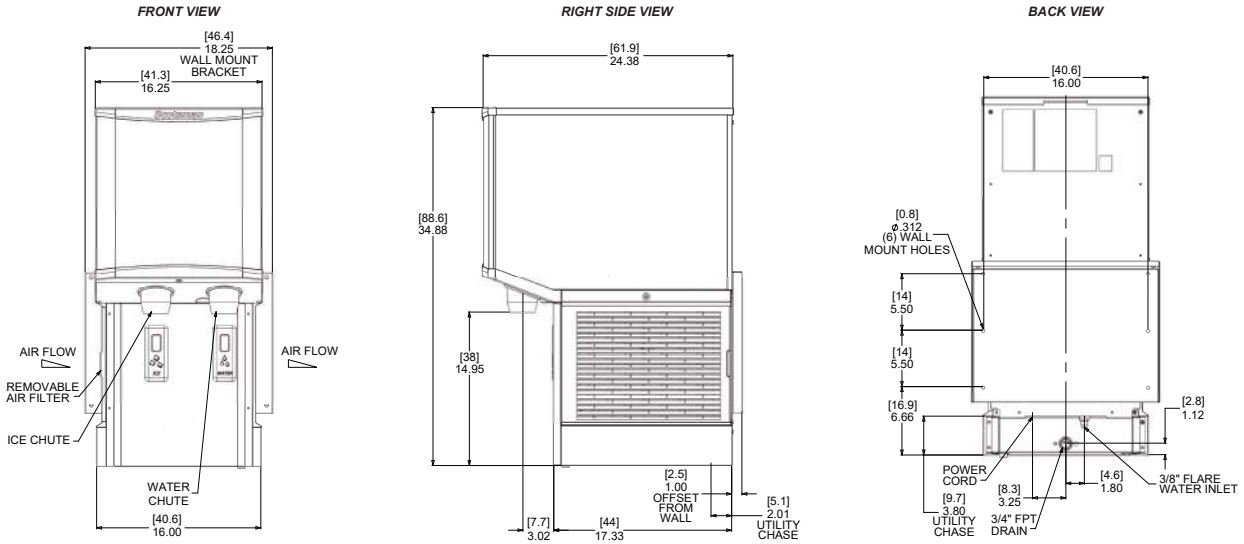
HID312 - Touch-free Ice Machine / Dispenser

Without Wall Mount: HID312A(B)

Installation Note: Allow 6" space at left, back and right side for ventilation and utility connections. All models include 7.5' power cord with NEMA 5-15P plug.



With Wall Mount: HID312AW



All Models

Dimensions (W x D x H):

Unit:
- HID312A(B)-1: 16.25" x 24.38" x 35"
- HID312AW-1: 18.25" x 24.38" x 35"

Shipping Carton:
- HID312A(B)-1: 24.25" x 27.13" x 41.5"
- HID312AW-1: 24.25" x 27.13" x 41.5"

Shipping Weight:	HID312A(B)-1: 183 lb/ 83 kg HID312AW-1: 188 lb/ 85 kg
BTUs per hour:	3,200
Refrigerant:	R-134A

Accessories

Model Number	Description
KLP24A	4" Adjustable legs, box of 4, plastic with metallic foot.
HST16-A	Machine stand for HID312, with locking reversible door and shelf.
HST16B-A	Machine stand for HID312, basic version.

Scotsman recommends all ice machines have water filtration. See Scotsman water filter specification sheet for details.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Potable Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)
Electrical Voltage	-5%	+10%

Specifications and design are subject to change without notice.

an Ali Group Company

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- 1-800-SCOTSMAN Fax: 847-913-9844
- www.scotsman-ice.com customer.relations@scotsman-ice.com

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The Spirit of Excellence

SIS-SS-MRD-HID312_02-21

AquaDefense System®

Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems

SSM3-P

AP3-P

Features

SSM Plus

- Extends the life of your Scotsman machine and provides cleaner, more consistent ice.
- Now with AquaArmor with AgION®, a silver-based anti-microbial compound that reduces the growth of bacteria, microorganisms, algae, mold and slime on ice machine surfaces, preventing premature clogging.
- Ultrafine half-micron filtration, combined with food-grade polyphosphate, assures that chlorine, off-tastes, odors and particles stay out of your ice.
- Filtration can reduce unscheduled water-related maintenance calls by as much as 40%.
- Easy to install and maintain.

AquaPatrol Plus®

- Leaves chlorine in water to keep machine cleaner longer.
- Polyphosphate feed to inhibit scale build up.
- Easy to install and maintain.
- Tighter pore size now eliminates more undesirable compounds.
- New smaller footprint gives operations more flexibility.

NSF International Standards

Standard No. 42: Aesthetic Effects

- Chemical Unit
  - Chlorine reduction, class 1
  - Taste and odor reduction
- Mechanical Filtration Unit
  - Particle reduction, class 1
    - 99.9% reduction of particles
    - 1/2 micron and larger sizes

Standard No. 53: Health Effects

- Mechanical Filtration Unit
  - Turbidity reduction
  - Cyst reduction
  - Asbestos reduction

The SSM and AquaPatrol Plus filter and replacement cartridge have been tested and listed by NSF only for the functions listed above. Check for compliance with state and local law and regulations. Do not use where the water is micro-biologically unsafe, or with water of unknown quality without adequate disinfection before or after the unit. Can be used on water that may contain filterable cysts.

Water Filters

Certification

DESIGNED ENGINEERED ASSEMBLED IN THE USA · CERTIFIED ISO 9001:2015 · REVIT by Scotsman · c UL us · agion · NSF

Warranty

- 5 years on manifold parts only
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

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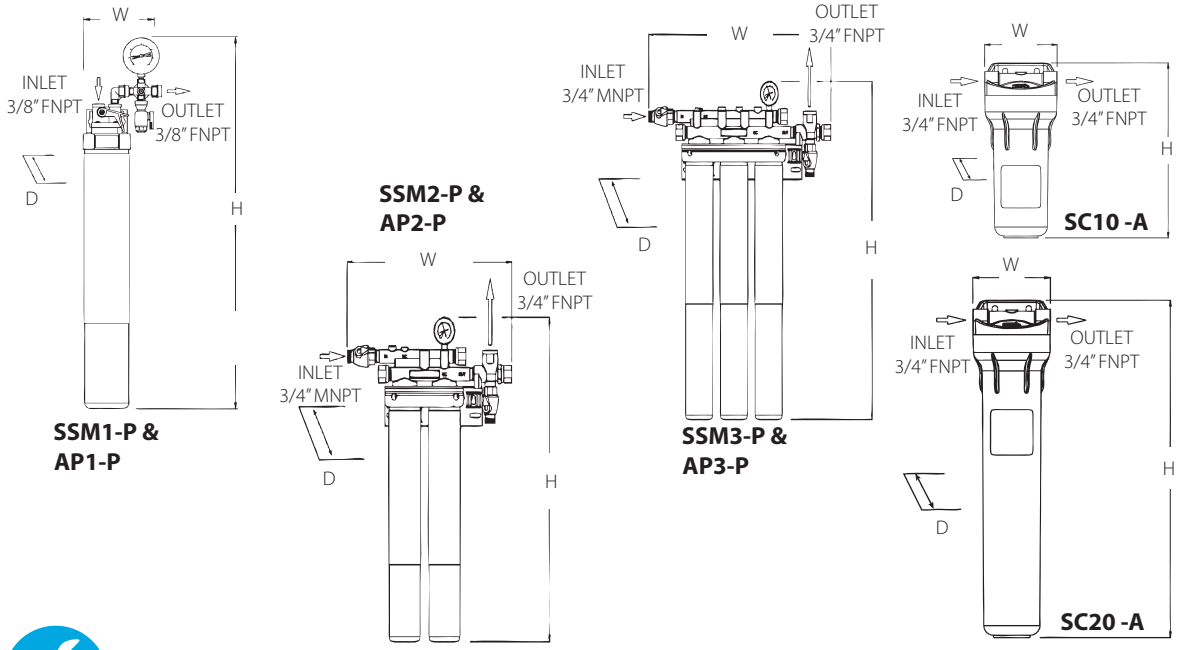
Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems



Specifications

	Model Number	Dimensions W	D	H	Description	Maximum Flow (gallons/minute)
SSM Plus	SSM1-P	5.6	4.75	30.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	1.67
	SSM2-P	16.6	5.5	29.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	3.34
	SSM3-P	21	5.5	29.26	Triple System for Cubers over 1,300 lb (544 kg)	5.01
AquaPatrol Plus®	AP1-P	5.6	4.75	21.5	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	2.1
	AP2-P	16.6	5.5	19.26	Double System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	4.2
	AP3-P	21	5.5	19.26	Triple System for Cubers over 1,300 lb (544 kg)	6.3
Coarse Pre-Filters	SC10-A	5.16	5.5	12.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	5
	SC20-A	5.16	5.5	22.44	Single System for Cubers up to 650 lb (295 kg) and flakers, nuggets and nugget dispensers up to 1,200 lb (544 kg).	10

Shipping

Model Number	Dimensions	Weight (lb/kg)
SSM1-P:	21" x 10" x 6"	7/3
SSM2-P:	26" x 16" x 13"	11/5
SSM3-P:	26" x 16" x 13"	16/7
AP1-P:	10" x 21" x 6"	7/3
AP2-P:	16" x 26" x 13"	11/5
AP3-P:	16" x 26" x 13"	16/7
SC10-A:	6" x 6" x 17"	5/2
SC20-A:	6" x 6" x 26"	11/5

Accessories

Model Number	Description
SC10RC40	SC10 Replacement Filter (package of 40)
SC20RC20	SC20 Replacement Filter (package of 20)
SSMRC1	Replacement Cartridge for SSM Plus (package of 1)
SSMRC6	Replacement Cartridge for SSM Plus (package of 6)
APRC6-P	Replacement Cartridge for AquaPatrol Plus® (package of 6)
APRC1-P	Replacement Cartridge for AquaPatrol Plus® (package of 1)

Scotsman recommends all ice machines have water filtration.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)

Specifications and design are subject to change without notice.

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Scotsman®

AquaDefense System®

Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems

SSM3-P

AP3-P

Features

SSM Plus

- Extends the life of your Scotsman machine and provides cleaner, more consistent ice.
- Now with AquaArmor with AgION®, a silver-based anti-microbial compound that reduces the growth of bacteria, microorganisms, algae, mold and slime on ice machine surfaces, preventing premature clogging.
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- Easy to install and maintain.

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The SSM and AquaPatrol Plus filter and replacement cartridge have been tested and listed by NSF only for the functions listed above. Check for compliance with state and local law and regulations. Do not use where the water is micro-biologically unsafe, or with water of unknown quality without adequate disinfection before or after the unit. Can be used on water that may contain filterable cysts.

Water Filters

Certification

DESIGNED ENGINEERED ASSEMBLED IN THE USA · CERTIFIED ISO 9001:2015 · REVIT by Scotsman · c UL us · agion · NSF

Warranty

- 5 years on manifold parts only
- Warranty valid in North, South & Central America for commercial installations.
- Contact factory for warranty in other regions.
- Residential Applications: 1 year parts and labor

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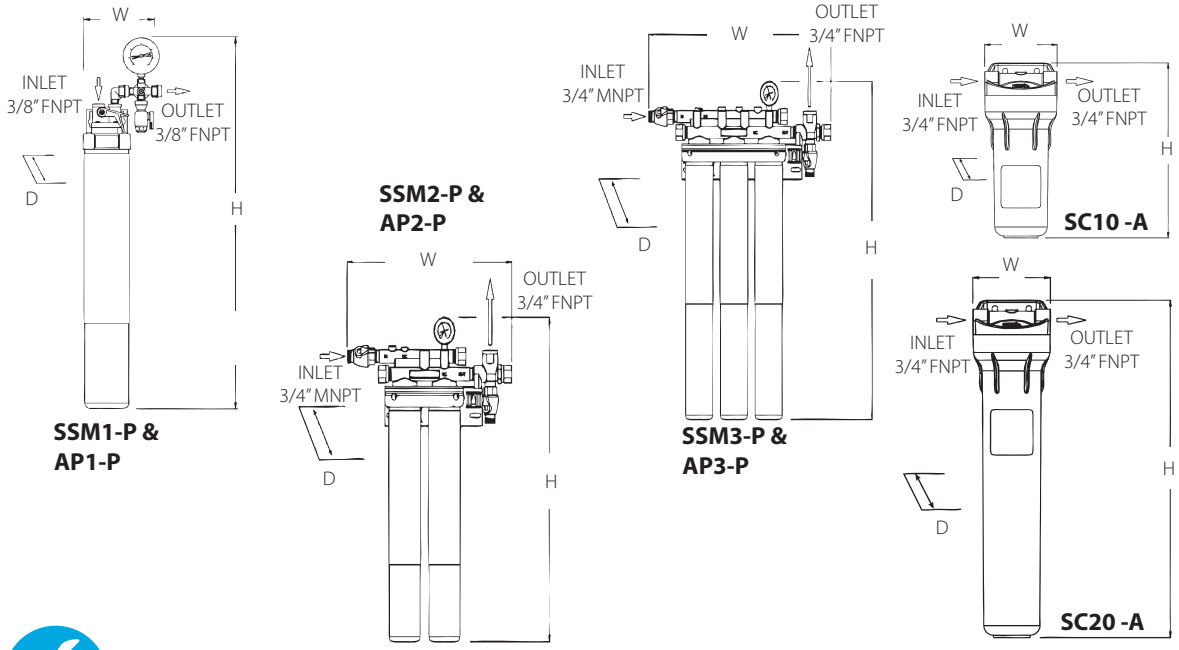
Water Filters

SSM Plus and Aqua Patrol Plus® Water Filtration Systems



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AP2-P:	16" x 26" x 13"	11/5
AP3-P:	16" x 26" x 13"	16/7
SC10-A:	6" x 6" x 17"	5/2
SC20-A:	6" x 6" x 26"	11/5

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Model Number	Description
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SC20RC20	SC20 Replacement Filter (package of 20)
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APRC1-P	Replacement Cartridge for AquaPatrol Plus® (package of 1)

Scotsman recommends all ice machines have water filtration.

Operating Requirements

	Minimum	Maximum
Air Temperatures	50°F (10°C)	100°F (38°C)
Water Temperatures	40°F (4.4°C)	100°F (38°C)
Water Pressures	20 PSIG (1.4 bar)	80 PSIG (5.5 bar)

Specifications and design are subject to change without notice.

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Scotsman®

COFFEE BREWING SYSTEMS

CBS-2250 NG Brewers

1.5 GALLON BREWING SYSTEM

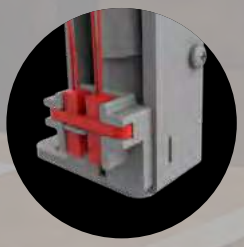
Shown with **D449 6.0L / 1.5G LUXUS® Thermal Dispenser**

CAPACITIVE TOUCHSCREEN DISPLAY

The NG line features a capacitive LED touchscreen display. Set brew times, program recipe buttons and more with just the touch of a finger. It's as easy as a smartphone.

LED STATUS BAR

Quickly identify where your machine is at in the brewing process from anywhere in the room. The LED Status Bar changes color during the brewing process to let you know when it's ready to brew, brewing, almost done and ready to serve.



BREW BASKET LOCKS

Brew baskets lock in place during the brewing process for added safety and quality control.

FETCO®

EXTRACTOR NG™

DISPENSERS

CBS-2250 NG Brewers

DISPENSERS

D449

6.0 Liter / 1.5 Gallon LUXUS® Thermal Dispenser
L4D-15

NSF

D480

6.0 Liter / 1.5 Gallon LUXUS® Sight Gauge Dispenser
LGD-15

NSF

D009

6.0 Liter / 1.5 Gallon LUXUS® Portable Thermal Dispenser
TPD-15

NSF

All dispensers **SOLD SEPARATELY**.

D450

8.0 Liter / 2.0 Gallon LUXUS® Thermal Dispenser
L4D-20

NSF

FOR USE WITH CBS-1253 PLUS BREWER

D481

8.0 Liter / 2.0 Gallon LUXUS® Sight Gauge Dispenser
LGD-20

NSF

FOR USE WITH CBS-1253 PLUS BREWER

BREW BASKET DESIGN

Advanced brew basket design provides a deeper bed depth and superior thermal insulation for better extraction.

CASCADING SPRAY DOME

Patented design provides even saturation of the coffee bed for maximum extraction. Lime resistant design makes for less service calls.

ECO MODE

Reduces tank temperature during periods of non-operation to cut down on electricity usage.

EXTRACTOR NG™

ACCESSORIES

CBS-2250 NG Brewers

NOTE

Coffee brewers are available with **Plastic** or **Metal** brew basket options. Material type is of personal preference and does not affect flavor profile, however if you are looking for color identification the plastic brew baskets are the best option.

BREW BASKETS AND PAPER FILTERS

Item Number	Brew Basket	Coffee Capacity	Filter Size	Filter SKU	Filter/Case
All configurations	Standard **Plastic** / Stainless Steel	Up to 12oz / 340g	15" x 5.5"	F001	500/cs

B001280B1

16" x 6"
Stainless Steel
Brew Basket

B015280BN2BK

16" x 6"
Plastic Brew
Basket

F001

15" x 5.5"
Paper Filters

Contact Customer Service or your Sales Person for more options.

COLORED BREW BASKET HANDLE INSERTS

1023.00180.00
Blue Insert

1023.00190.00
Red Insert

1023.00191.00
Green Insert

1023.00192.00
Orange Insert

WATER FILTRATION SYSTEM

Filtration System	Item Number	Item Description	Rated Capacity	Working Pressure	Weight
Everpure®	A039	In-Line System	113,563 liters	10-125 psi [0.7-8.6 bar], non-shock	6.0 lbs / 2.7 kg
Everpure®	A075	Replacement Cartridge	113,563 liters	10-125 psi [0.7-8.6 bar], non-shock	6.0 lbs / 2.7 kg
BWT Bestmax	A138	In-Line System	3,002 liters	29-116 psi [2-8 bar], non-shock	11.0 lbs / 5.0 kg
BWT Bestmax	A139	Replacement Cartridge	3,002 liters	29-116 psi [2-8 bar], non-shock	11.0 lbs / 5.0 kg
BWT Bestmax	A140	In-Line System	4,562 liters	29-116 psi [2-8 bar], non-shock	11.0 lbs / 5.0 kg
BWT Bestmax	A141	Replacement Cartridge	4,562 liters	29-116 psi [2-8 bar], non-shock	11.0 lbs / 5.0 kg

EVERPURE®

In-Line Water
Filtration System

SET INCLUDES: 1ea. commercial quality corrosion resistant filter head 1ea. taste and odor filter cartridge (FETCO® #A075) / 1ea. 3/8" x 4' connection hose / 1 set — mounting bracket and hardware.

- Recommended for large-sized operations
- Taste and odor filter for extremely turbid (cloudy) water
- Granular-activated carbon reduces sediment and chlorine
- Quick-disconnect style head/cartridge design cartridge for effortless replacement
- Durable, corrosion-resistant head inlcudes built-in shutoff valve

BWT BESTMAX

In-Line Water
Filtration System

SET INCLUDES: 1ea. filter cartridge / 1ea. universal filter head / 1ea. wall mounting bracket Braided hose supplies 3/8" and 3/4" compression, in 24" or 48" lengths

- Recommended for small- to medium-sized operations
- Carbonate hardness removal prevents scale deposits and retains minerals
- Granular-activated carbon reduces sediment and chlorine
- Quick-disconnect style head/cartridge design cartridge for effortless replacement
- Durable, corrosion-resistant head inlcudes built-in shutoff valve
- Four bypass settings allows for different water qualities and product preferences

EXTRACTOR NG™

TECHNICAL SPECIFICATIONS

NORTH AMERICA

CBS-2251 NG Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2251US-1B230-MA110	16x6" Metal	208-240	2 x 3.0 kW / 240 V	1	2+G	4.6-6.1	No Cord	22.1-25.4	15.0 / 56.9	
E2251US-1B230-PA110	16x6" **Plastic**	208-240	2 x 3.0 kW / 240 V	1	2+G	4.6-6.1	No Cord	22.1-25.4	15.0 / 56.9	

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	5.89 / 22.30

CBS-2252 NG Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2252US-UB230-MA110 DUAL PHASE	16x6" Metal	208-240 208-240	2 x 3.0 kW / 240 V 3 x 3.0 kW / 240 V	1 3	2+G 3+G	4.6-6.1 6.9-9.1	No Cord No Cord	22.1-25.4 19.2-22.1	15.9 / 60.4 23.9 / 90.6	
E2252US-UB230-PA110 DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 3.0 kW / 240 V 3 x 3.0 kW / 240 V	1 3	2+G 3+G	4.6-6.1 6.9-9.1	No Cord No Cord	22.1-25.4 19.2-22.1	15.9 / 60.4 23.9 / 90.6	
E2252US-UB250-MA110 DUAL PHASE	16x6" Metal	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	
E2252US-UB250-PA110 DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	10.48 / 39.67

CBS-2253 NG 2.0 Gallon Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2253US-UB230-MA110 DUAL PHASE	16x6" Metal	208-240 208-240	2 x 3.0 kW / 240 V 3 x 3.0 kW / 240 V	1 3	2+G 3+G	4.6-6.1 6.9-9.1	No Cord No Cord	22.1-25.4 19.2-22.1	15.9 / 60.4 23.9 / 90.6	
E2253US-UB230-PA110 DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 3.0 kW / 240 V 3 x 3.0 kW / 240 V	1 3	2+G 3+G	4.6-6.1 6.9-9.1	No Cord No Cord	22.1-25.4 19.2-22.1	15.9 / 60.4 23.9 / 90.6	
E2253US-UB250-MA110 DUAL PHASE	16x6" Metal	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	
E2253US-UB250-PA110 DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	10.48 / 39.67

1 This version is made to order and it might require longer production lead time. Please ask your local sales representative for more information.

EXTRACTOR NG™

TECHNICAL SPECIFICATIONS

INTERNATIONAL

CBS-2251 NG Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2251IN-1B140-PA110	16x6" **Plastic**	200-240	1 x 4.0 kW / 240 V	1	L/N/PE	2.9-4.1	No Cord	14.3-17.1	10.6 / 40.3	NSF cULus
E2251IN-1B150-PA110	16x6" **Plastic**	200-240	1 x 5.0 kW / 240 V	1	L/N/PE	3.6-5.1	No Cord	17.8-21.2	13.3 / 50.4	NSF cULus
E2251IN-1B230-PA110[1]	16x6" **Plastic**	200-240	2 x 3.0 kW / 240 V	1	L/N/PE	4.3-6.1	No Cord	21.2-25.4	15.0 / 56.9	NSF cULus
E2251NM-1B230-PA110	16x6" **Plastic**	208-240	2 x 3.0 kW / 240 V	1	L/N/PE	4.6-6.1	No Cord	22.2-25.4	15.0 / 56.9	NSF NOM
E2251CE-1C230-PA110	16x6" **Plastic**	230/400	2 x 3.0 kW / 240 V	1	2L/N/PE	5.6	No Cord	12.4	14.9 / 56.4	NSF CE

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	5.89 / 22.30

CBS-2252 NG Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2252IN-3C330-PA110[1]	16x6" **Plastic**	220/380-240/415	3 x 3.0 kW / 240 V	3	3L/N/PE	7.7-9.1	No Cord	11.9-12.9	23.9 / 90.6	NSF cULus
E2252IN-3C350-PA110[1]	16x6" **Plastic**	220/380-240/415	3 x 5.0 kW / 240 V	3	3L/N/PE	12.7-15.1	No Cord	19.6-21.3	30.0 / 133.7	NSF cULus
E2252IN-1B230-PA110[1]	16x6" **Plastic**	200-240	2 x 3.0 kW / 240 V	1	L/N/PE	4.3-6.1	No Cord	21.2-25.4	15.9 / 60.4	NSF cULus
E2252IN-1B250-PA110	16x6" **Plastic**	200-240	2 x 5.0 kW / 240 V	1	L/N/PE	7.0-10.1	No Cord	35.1-42.1	26.6 / 100.7	NSF cULus
E2252IN-3C340-PA110	16x6" **Plastic**	220/380-240/415	3 x 4.0 kW / 240 V	3	3L/N/PE	10.2-12.1	No Cord	15.7-17.1	30.0 / 113.7	NSF cULus
E2252NM-1B250-PA110	16x6" **Plastic**	208-240	2 x 5.0 kW / 240 V	1	2+G	7.6-10.1	No Cord	36.5-42.1	26.6 / 100.7	NSF NOM
E2252NM-UB250-PA110[1] DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	NSF NOM
E2252CE-3C330-PA110	16x6" **Plastic**	230/400	3 x 3.0 kW / 240 V	3	3L/N/PE	8.4	No Cord	12.3	22.1 / 83.6	NSF CE
E2252CE-3C350-PA110	16x6" **Plastic**	230/400	3 x 5.0 kW / 240 V	3	3L/N/PE	13.9	No Cord	20.3	30.0 / 113.7	NSF CE

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	10.48 / 39.67

1 This version is made to order and it might require longer production lead time. Please ask your local sales representative for more information.

EXTRACTOR NG™

TECHNICAL SPECIFICATIONS

INTERNATIONAL

CBS-2253 NG Brewer

ELECTRICAL

Item Number	Brew Basket	Voltage	Heater Config.	Phase	Wires	kW	Connection	Max Amp Draw	[Gal] / [L] Hour	Certification
E2253IN-3B330-PA110[1]	16x6" **Plastic**	220/380-240/415	3 x 3.0 kW / 240 V	3	3L/N/PE	7.7-9.1	No Cord	11.9-12.9	23.9 / 90.6	NSF cULus
E2253IN-3B350-PA110[1]	16x6" **Plastic**	220/380-240/415	3 x 5.0 kW / 240 V	3	3L/N/PE	12.7-15.1	No Cord	19.6-21.3	30.0 / 133.7	NSF cULus
E2253IN-1B230-PA110[1]	16x6" **Plastic**	200-240	2 x 3.0 kW / 240 V	1	L/N/PE	4.3-6.1	No Cord	21.2-25.4	15.9 / 60.4	NSF cULus
E2253IN-1B250-PA110	16x6" **Plastic**	200-240	2 x 5.0 kW / 240 V	1	L/N/PE	7.0-10.1	No Cord	35.1-42.1	26.6 / 100.7	NSF cULus
E2253IN-3B340-PA110	16x6" **Plastic**	220/380-240/415	3 x 4.0 kW / 240 V	3	3L/N/PE	10.2-12.1	No Cord	15.7-17.1	30.0 / 113.7	NSF cULus
E2253NM-1B250-PA110	16x6" **Plastic**	208-240	2 x 5.0 kW / 240 V	1	2+G	7.6-10.1	No Cord	36.5-42.1	26.6 / 100.7	NSF NOM
E2253NM-UB250-PA110[1] DUAL PHASE	16x6" **Plastic**	208-240 208-240	2 x 5.0 kW / 240 V 3 x 5.0 kW / 240 V	1 3	2+G 3+G	7.6-10.1 11.4-15.1	No Cord	36.5-42.1 31.7-36.5	26.6 / 100.7 30.0 / 113.7	NSF NOM
E2253CE-3B330-PA110	16x6" **Plastic**	230/400	3 x 3.0 kW / 240 V	3	3L/N/PE	8.4	No Cord	12.3	22.1 / 83.6	NSF CE
E2253CE-3B350-PA110	16x6" **Plastic**	230/400	3 x 5.0 kW / 240 V	3	3L/N/PE	13.9	No Cord	20.3	30.0 / 113.7	NSF CE

WATER

Water Inlet	Water Pressure [psig] / [Bar]	Minimum Flow Rate [gpm] / [L/min]	Tank Capacity [Gal] / [L]
3/8" Male Flare	20-75 / 1.37-5.17	1.50 / 5.68	10.48 / 39.67

1 This version is made to order and it might require longer production lead time. Please ask your local sales representative for more information.

EXTRACTOR NG™

DIMENSIONS

CBS-2251 NG Brewer

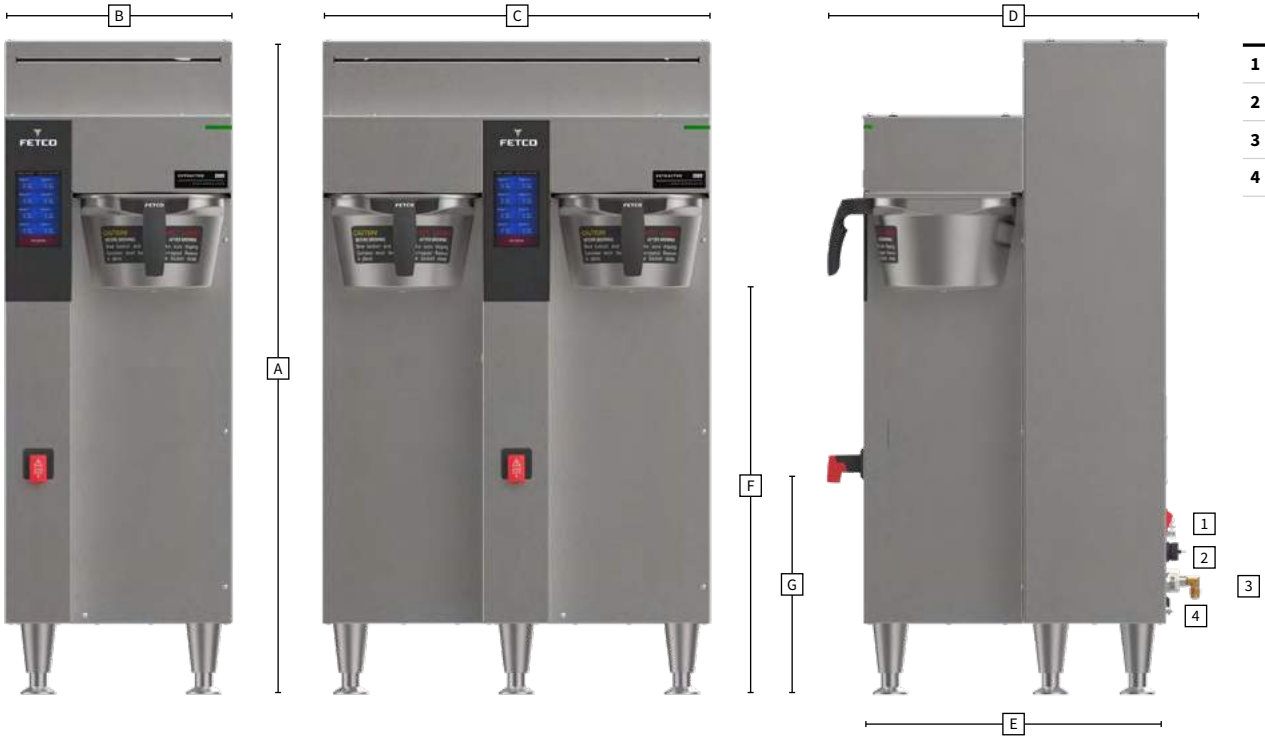
DIMENSIONS	Height (A)	Width (B)	Depth (D)	Depth (E)	Brew Basket Clearance (F)	Faucet Clearance (G)
Product Dimensions	36.88" 93.67 cm	12.75" 32.38 cm	22.5" 57.15 cm	17.13" 43.51 cm	22.5" 57.15 cm	12.13" 30.80 cm
Shipping Dimensions	37.0" 93.98 cm	18.0" 45.72 cm	24.0" 60.96 cm	N/A	N/A	N/A

WEIGHT	Empty [lbs] / [kg]	Filled [lbs] / [kg]
Product Weight	53 lbs 24.0 kg	106 lbs 48.1 kg
Shipping Weight	63 lbs 28.5 kg	N/A

CBS-2252 NG Brewer

DIMENSIONS	Height (A)	Width (C)	Depth (D)	Depth (E)	Brew Basket Clearance (F)	Faucet Clearance (G)
Product Dimensions	36.88" 93.67 cm	21.88" 55.57 cm	22.5" 57.15 cm	17.13" 43.51 cm	22.5" 57.15 cm	12.13" 30.80 cm
Shipping Dimensions	37.0" 93.98 cm	24.0" 60.96 cm	27.0" 68.58 cm	N/A	N/A	N/A

WEIGHT	Empty [lbs] / [kg]	Filled [lbs] / [kg]
Product Weight	77 lbs 34.9 kg	174 lbs 78.8 kg
Shipping Weight	97 lbs 44.0 kg	N/A



FETCO®
WEBSITE fetco.com
EMAIL inquiries@fetco.com
PHONE +1.847.719.3000 1.800.338.2699
FAX +1.847.719.3001
ADDRESS FETCO® 600 Rose Road Lake Zurich, IL 60047, USA

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Dispensers, airpots, paper filters, water filters, stands, accessories and options sold separately
Rev. 1.0 2024.08.30 Digital Letter

LUXUS® 1.0 / 1.5 / 2.0 GALLON THERMAL DISPENSERS AND SERVERS

L4 SERIES

2.0 Gallon

1.5 Gallon

1.0 Gallon

The L4 Series Thermal Dispenser and Servers are designed to keep your coffee service hot, fresh and portable. With the legendary thermal retention properties you'd expect from FETCO, the L4 is equipped with enhanced features that now make it even easier for operators to manage their daily coffee service. Digital liquid-level monitoring and rugged stainless construction make the L4 the perfect self-serve choice for any foodservice segment - Hotels, OCS, C-Stores, Restaurants, Coffee Shops, Cafes, etc.

L4D Thermal Dispensers

L4S Thermal Servers

2.0 Gallon

1.5 Gallon

1.0 Gallon

* Shown with #A147 Server Stand (sold separately)

FETCO® TRUSTED | RELIABLE | QUALITY

L4D Series LUXUS® Thermal Dispensers & Servers

The LUXUS® L4D Thermal Dispensers and Servers are designed to retain all the heat generated during the brewing process with very little dissipation. In fact, FETCO thermal dispensers maintain the suggested 180-185°F holding temperature for at least 4 hours and meet or exceed industry standards. This patented technology eliminates the need for an additional heat source, thus saving energy and equipment costs.

L4D Dispenser

With integrated stand and removable drip tray.

L4S Server

Shown with Serving Station with removable drip tray (sold separately).

Key Features and Benefits

Integrated Lid Design with Improved Functionality

The integrated lid design features a removable funnel system, pivoting brew cap and front-positioned handle.

- Precision Fit Funnel Assembly keeps moisture and heat from escaping to lock in freshness and aroma
- Brew Cap mounted on lid exterior for easy access
- Forward positioned handle for better maneuverability

Digital Freshness Timer

Four pie-shaped visual indicators that represent how much time (in 15 minute increments) has elapsed since filling.

- Example #1

1 hour 15 mins. elapsed / 80% liquid remaining (represented by 4 filled bars)

*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Digital Volume Indicator

Digital visual indicator shows how much liquid remains with a series of "V" shape bars representing 20% increments.

- Example #2

2 hours 30 mins. elapsed / 20% liquid remaining (represented by 1 filled bar)

*NOTE: Time is reset when dispenser is emptied, removing funnel or when enough liquid is added to increase volume by one level.

Funnel Construction

Funnel enclosure helps provide additional protection to circuit board, internal battery and display window. Features built-in handle for quick cleaning and maintenance.

Traditional Pull Faucet

Precise control of beverage container filling. Transparent polycarbonate faucet guard keeps containers and cups away from the spout to help prevent cross contamination.

Wrap Stabilizer

Pronounced ledge in molded plastic cover helps prevent graphic "wraps" from sliding up the dispenser body during handling.

Mullti-Face Serving Stations (L4 Servers)

Modular multi-station design in 1, 2 or 3 increments can create a permanent or temporary beverage service on any countertop, meeting room, lobby or food line.

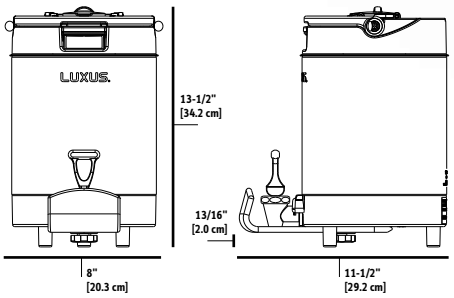
L4D Dispenser / L4S Server | Technical Specifications

Measurements

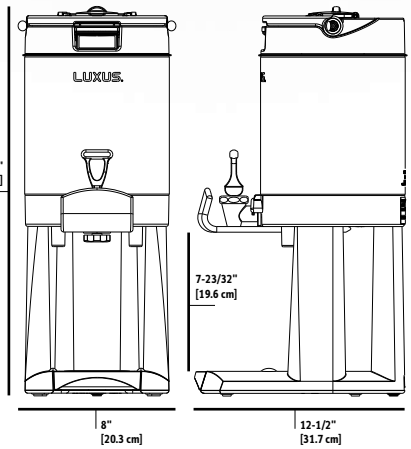
	Height	Width	Depth	Empty Weight	Filled Weight
D448 L4D-10 1.0 Gallon LUXUS® Thermal Dispenser					
Product	21¾" [55.2 cm]	8" [20.3 cm]	12½" [31.7 cm]	8.0 lbs [3.6 kg]	15.9 lbs [7.2 kg]
Shipping	23"	16"	13"	12.0 lbs	–
D449 L4D-15 1.5 Gallon LUXUS® Thermal Dispenser					
Product	23" [58.4 cm]	9" [22.9 cm]	13¼" [33.6 cm]	10.5 lbs [4.8 kg]	22.4 lbs [10.2 kg]
Shipping	25"	17"	13"	14.0 lbs	–
D450 L4D-20 2.0 Gallon LUXUS® Thermal Dispenser					
Product	24½" [62.2 cm]	9" [22.9 cm]	13¼" [33.6 cm]	11.5 lbs [4.8 kg]	27.5 lbs [10.2 kg]
Shipping	27"	17"	13"	16.0 lbs	–
D451 L4S-10 1.0 Gallon LUXUS® Thermal Server*					
Product	13½" [34.2 cm]	8" [20.3 cm]	11½" [29.2 cm]	5.6 lbs [2.5 kg]	12.4 lbs [5.6 kg]
Shipping	15"	16"	12"	9.0 lbs	–
D452 L4S-15 1.5 Gallon LUXUS® Thermal Server*					
Product	14¾" [37.4 cm]	9" [22.9 cm]	12½" [31.7 cm]	7.2 lbs [3.3 kg]	17.6 lbs [8.0 kg]
Shipping	16"	17"	13"	10.0 lbs	–
D453 L4S-20 2.0 Gallon LUXUS® Thermal Server*					
Product	16¹/₁₆" [40.8 cm]	9" [22.9 cm]	12½" [31.7 cm]	8.3 lbs [3.3 kg]	25.0 lbs [8.0 kg]
Shipping	21"	17"	13"	12.0 lbs	–

* Must be used with with "A" series Serving Stations.

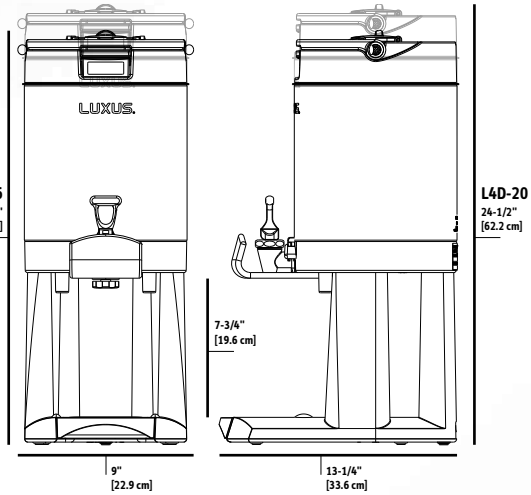
L4S-10



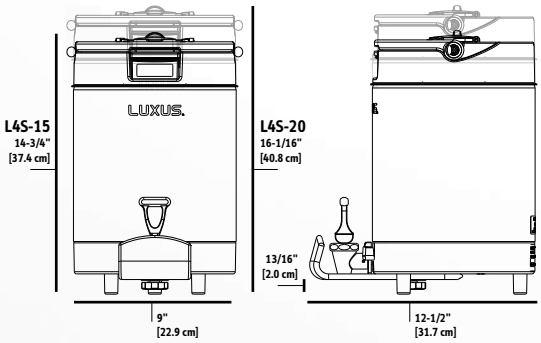
L4D-10



L4D-15/20



L4S-15/20



Customize Your Dispenser

#1071.00030.00	Orange Dispenser Faucet Replacement Handle*
#1071.00031.00	Green Dispenser Faucet Replacement Handle*
#1071.00032.00	Blue Dispenser Faucet Replacement Handle*
#1071.00040.00	Red Dispenser Faucet Replacement Handle*
#Z053	Rear Facing Positioned Digital Display

* Color choice must be specified at time of purchase for no charge

Serving Stations

Serving Stations for L4S-10 Server

#A147	Single Face
#A148	Double Facing
#A149	Triple Facing

Serving Stations for L4S-15/L4S-20 Servers

#A150	Single Face
#A151	Double Facing
#A152	Triple Facing

NOTE: Serving stations work for both L3 and L4 series servers.

Information

fetco.com
info@fetco.com
847.719.3000
1.800.338.2699 USA
847.719.3001
Food Equipment Technologies Co.
600 Rose Road
Lake Zurich, IL 60047
USA

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#RR14004

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

EVERPURE® QL3 BH² SYSTEM

DELIVERS PREMIUM QUALITY WATER FOR COFFEE APPLICATIONS

QL3-BH² System: EV9272-00
BH2 Replacement Cartridge: EV9612-50

APPLICATIONS

Coffee

Low-Flow, Medium-Volume Brewers

FEATURES • BENEFITS

Provides clear, fresh, premium quality ingredient water for great tasting coffee and beverages

Sanitary cartridge replacement is simple, quick and clean; internal filter parts are never exposed to handling or contamination

Engineered to always feed the correct amount of scale inhibitor into each volume of water

Proportioned scale inhibitor feed

Proprietary Everpure® Micro-Pure® II media inhibits the growth of bacteria

Precoat submicron technology reduces dirt and particles as small as 0.5-micron in size

Everpure's unique filter blend using activated carbon reduces chlorine taste & odor and other offensive contaminants

Increases holding time of coffee

Saves energy by reducing scale buildup.

Dramatically prevents limescale from forming in brewers

Reduces health contaminants such as cysts

INSTALLATION TIPS

Never use saddle valve for connection.

Use 3/8" water line.

Install vertically with cartridges hanging down.

Allow 2 ½" (6.35 cm) clearance below the cartridge for easy cartridge replacement.

Flush BH² Cartridge by running water through filter for three (3) minutes at full flow.

OPERATION TIPS

Replace cartridge when flow rate becomes inconveniently slow or before rated capacity is reached. It is recommended to replace cartridge at least once per year.

Change cartridges when capacity is reached or when pressure falls below 10 psi (0.7 bar).

Service flow rate must not exceed 0.5 gpm (1.9 Lpm).

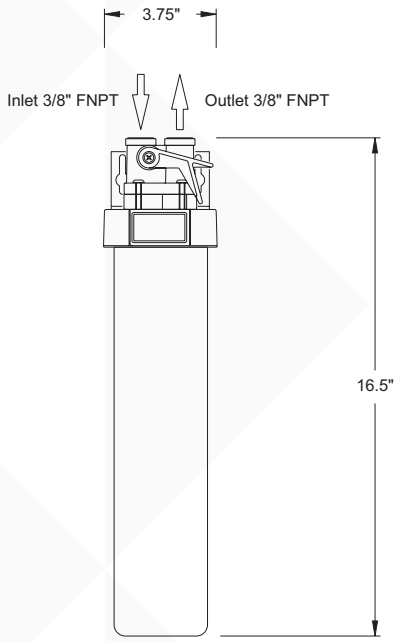
Always flush the filter cartridge at time of installation and cartridge change.

SIZING

Service Flow Rate: Maximum 0.5 gpm (1.9 Lpm)

Rated Capacity: 3,000 gallons (11,350 L) or 6,000 pots

EVERPURE® QL3 BH² SYSTEM
EV9272-00



The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used with disinfected water that may contain filterable cysts.

SPECIFICATIONS

Service Flow Rate
Maximum 0.5 gpm (1.9 Lpm)

Rated Capacity
3,000 gallons (11,350 L) or 6,000 pots

Pressure Requirements
10 – 125 psi (0.7 – 8.6 bar), non-shock

Temperature
35 – 100°F (2 – 38°C)

Overall Dimensions
16.5" H x 3.75" W x 4" D
(41.9 cm x 9.5 cm x 10.1 cm)

Inlet Connection
3/8"

Outlet Connection
3/8"

Electrical Connection
None

Shipping Weight
4 lbs (1.8 kgs)

Operating Weight
7 lbs (3.1 kgs)

System Tested and Certified by NSF International against NSF/ANSI Standards 42 and 53 for the reduction of:

STANDARD NO. 42 — AESTHETIC EFFECTS
- Bacteriostatic Effects
- Chemical Reduction
  - Taste & Odor
  - Chlorine
- Mechanical Filtration
  - Nominal Particulate Class I

STANDARD NO. 53 – HEALTH EFFECTS
- Mechanical Filtration
  - Cyst

WARRANTY

Everpure water treatment systems by Pentair® (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Pentair will provide a copy of the warranty upon request.

PENTAIR

WATER FILTRATION
EVERPURE-SHURFLO WORLD HEADQUARTERS, 1040 MUIRFIELD DRIVE, HANOVER PARK, IL 60133 USA • FOODSERVICE.PENTAIR.COM
800.942.1153 (US ONLY) • 630.307.3000 MAIN • 630.307.3030 FAX • CSEVERPURE@PENTAIR.COM EMAIL

EVERPURE-SHURFLO AUSTRALIA, 1-21 MONASH DRIVE, DANDENONG SOUTH, VIC 3175 AUSTRALIA
011.1300 576 190 TEL • 011.61.39.562.7237 FAX • AU.EVERPURE@PENTAIR.COM EMAIL

EVERPURE-SHURFLO CHINA, 21F CLOUD 9 PLAZA, NO 1118, SHANGHAI, 200052, CHINA
86.21.3211.4588 TEL • 86.21.3211.4580 FAX • CHINA.WATER@PENTAIR.COM EMAIL

EVERPURE-SHURFLO INDIA, GREEN BOULEVARD, B-9/A, 7TH FLOOR - TOWER B SECTOR 62, NOIDA - 201301
91.120.419.9444 TEL • 91.120.419.9400 FAX • INDIACUSTOMER@PENTAIR.COM EMAIL

EVERPURE-SHURFLO EUROPE, PENTAIR WATER BELGIUM BVBA, INDUSTRIEPARK WOLFSTEE, TOEKOMSTLAAN 30, B-2200 HERENTALS, BELGIUM
+32.(0).14.283.504 TEL • +32.(0).14.283.505 FAX • SALES@EVERPURE-EUROPE.COM EMAIL

EVERPURE-SHURFLO JAPAN INC., HASHIMOTO MN BLDG. 7F, 3-25-1 HASHIMOTO, MIDORI-KU, SAGAMIHARA-SHI KANAGAWA 252-0143, JAPAN
81.(0)42.775.3011 TEL • 81.(0)42.775.3015 FAX • INFO@EVERPURE.CO.JP EMAIL

EVERPURE-SHURFLO SOUTHEAST ASIA, 390 HAVELOCK ROAD, #04-01 KING'S CENTRE, SINGAPORE 169662
65.6768.5800 TEL • 65.6737.5149 FAX • CSEVERPURE@PENTAIR.COM EMAIL

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EVERPURE® BH² FILTER CARTRIDGE

DELIVERS PREMIUM QUALITY WATER FOR COFFEE APPLICATIONS

BH² Filter Cartridge: EV9612-50

APPLICATIONS

Coffee

Low-Flow, Medium-Volume Brewers

FEATURES • BENEFITS

Provides clear, fresh, premium quality ingredient water for consistently great tasting coffee and beverages

Sanitary cartridge replacement is simple, quick and clean; internal filter parts are never exposed to handling or contamination

Proportioned scale inhibitor feed dramatically prevents limescale from forming in brewing equipment

Exclusive precoat filtration provides superior chlorine taste & odor reduction and micro-filters dirt and particles as small as 0.5 micron in size by mechanical means

Everpure's unique filter blend using activated carbon reduces chlorine taste & odor and other offensive contaminants

Proprietary Micro-Pure® II filtration media effectively inhibits the growth of bacteria on the filter media that can decrease product life

Saves energy by reducing scale buildup*

Reduces cysts such as *Cryptosporidium* and *Giardia* by mechanical means

*As tested by Pentair

INSTALLATION TIPS

Must be installed and maintained according to the manufacturer's instructions, including installation and replacement of filter cartridges.

Install vertically with cartridge hanging down.

Allow 2½" (6.35 cm) clearance below the cartridge for easy cartridge replacement.

Flush system by running water through cartridges per Installation and Use Manual.

OPERATION TIPS

Replace cartridge when flow rate becomes inconveniently slow or before rated capacity is reached. It is recommended to replace cartridge at least once per year.

Change cartridges when capacity is reached or when pressure falls below 10 psi (0.7 bar).

Service flow rate must not exceed 0.5 gpm (1.9 Lpm).

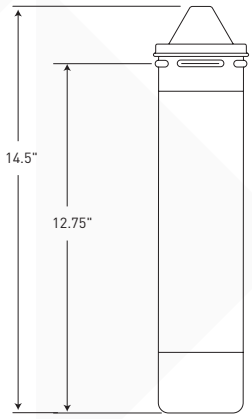
Always flush the filter cartridge at time of installation and cartridge change.

SIZING

Service Flow Rate: Maximum 0.5 gpm (1.9 Lpm)

Rated Capacity: 3,000 gallons (11,356 L)

EVERPURE® BH² FILTER CARTRIDGE
EV9612-50



SPECIFICATIONS

Service Flow Rate
Maximum 0.5 gpm (1.9 Lpm)

Rated Capacity
3,000 gallons (11,356 L)

Pressure Requirements
10 - 125 psi (0.7 - 8.6 bar), non-shock

Temperature
35 - 100°F (2 - 38°C)

Overall Dimensions
14.5" L x 3.25" D (36.8 cm x 8.2 cm)

System Tested and Certified by NSF International against NSF/ANSI Standards 42 and 53 for the reduction of:

STANDARD NO. 42 — AESTHETIC EFFECTS
- Bacteriostatic Effects
- Chemical Reduction
  - Taste & Odor
  - Chlorine
- Mechanical Filtration
  - Nominal Particulate Class I

STANDARD NO. 53 – HEALTH EFFECTS
- Mechanical Filtration
  - Cyst

EPA No. 002623-IL-002

The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used with disinfected water that may contain filterable cysts.

WARRANTY

Everpure water treatment systems by Pentair® (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Pentair will provide a copy of the warranty upon request.

PENTAIR

WATER FILTRATION

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EVERPURE-SHURFLO CHINA, 21F CLOUD 9 PLAZA, NO 1118, SHANGHAI, 200052, CHINA
86.21.3211.4588 TEL • 86.21.3211.4580 FAX • CHINA.WATER@PENTAIR.COM EMAIL

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DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

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OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: SPARE NUMBER

CUSTOM FABRICATED

EXISTING

WHERE SHOWN

RELOCATED

MODIFIED

X SPARE NUMBER

NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

OWNER

SUPPLIER/VENDOR

GENERAL CONTRACTOR

MILLWORK TRADE

OTHER _____

COMMENTS:

DESCRIPTION: CHANNEL GUARD

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

CHANNEL GUARD
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

DESCRIPTION: CORNER GUARD

X CUSTOM FABRICATED

☐ EXISTING

- ☐ WHERE SHOWN
- ☐ RELOCATED
- ☐ MODIFIED

☐ SPARE NUMBER

☐ NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:

- ☐ OWNER
- ☐ SUPPLIER/VENDOR
- ☐ GENERAL CONTRACTOR
- ☐ MILLWORK TRADE
- ☐ OTHER _____

COMMENTS:

CORNER GUARD
CONSTRUCTED PER 114000 SPECIFICATIONS
SIZE AND SHAPE PER PLAN

DESCRIPTION: Refrigeration Rack System

- x **CUSTOM FABRICATED**
- ☐ **EXISTING**
  - ☐ **WHERE SHOWN**
  - ☐ **RELOCATED**
  - ☐ **MODIFIED**
- ☐ **SPARE NUMBER**
- ☐ **NOT IN KITCHEN EQUIPMENT CONTRACT (NIKEC) FURNISHED BY:**
  - ☐ **OWNER**
  - ☐ **SUPPLIER/VENDOR**
  - ☐ **GENERAL CONTRACTOR**
  - ☐ **MILLWORK TRADE**
  - ☐ **OTHER** _____

COMMENTS:

AIRDYNE REFRIGERATION RACK SYSTEM
SEE MANUFACTURER'S DRAWINGS