TECHNICAL SPECIFICATIONS

FOR THE

CONSTRUCTION

OF THE

ANTHONY MUNOZ COMMUNITY CENTER GYMNASIUM

CONTRACT NO: D & C 23-015

ONTARIO, CALIFORNIA

Prepared By

RCA+A

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RCA+A Project No. 2024.01

Date:
July 13, 2026

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(Revised March 26, 2026)

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SECTION 01010

SUMMARY OF WORK

1.01 DESCRIPTION: The Work includes the Construction of:

ANTHONY MUNOZ COMMUNITY CENTER GYMNASIUM
ONTARIO, CALIFORNIA

in strict conformance with the Drawings and Specifications prepared by:

RCA+A
Robert R. Coffee Architect & Associates
183 McKellar Road
Dripping Springs, TX 78620
Telephone (949) 697-2326

A. The Project:

1. Project Title ; City of Ontario (RCA+A Project No. 2024.01).
2. Project Locations: 1242 West 4th Street, Ontario, CA 91762, as shown on the Vicinity Map in the Drawings.
3. Owner: City of Ontario, CA

1.02 WORK INCLUDED IN THE CONTRACT

A. The Work:

1. Demolition of some of the courtyard fencing, landscaping and paving adjacent to the existing Anthony Munoz Community Center and the adjacent site work as noted on the drawings (see Architectural and Civil Demolition Plans).
2. The Work will include all site preparation including demolition, site clearing and tree and shrub removal. Demolition shall be performed as per Section 02050. Demolition shall be performed with the requirement to separate recyclable materials that cannot be recycled. Refer to Section 01352 Construction Waste Management and Disposal.
   a. The Work includes the removal of all existing “site culture” including but not limited to trees, fences, signs, light poles, gates, paving and other items noted on the Demolition Plans and within the Limit of Work.
3. The Work includes all new site work including hardscape and landscape, building elements, site walls and parking lot and exterior lighting as indicated in the Contract Drawings and Contract Specifications. The Work includes new utility systems, site paving, curbs, ramps, pavement markings, parking, signage, fences and gates, site lighting and other site features to extent indicated in the Contract Drawings.
4. The Work includes the construction of a new single story 21,900 +/-SF community center building. The Building is to be Type VB Fully-Sprinklered Construction. Additionally, the work includes the construction

of a trash enclosure, site walls and security gates. As indicated on the Drawings and in the Specifications, the Work Includes:

a. New building structures including all exterior finishes, doors, windows, storefronts, curtainwall, covered walkway, interior finishes, casework, specialties and built-in equipment.
b. All concrete paving, landscaping and irrigation system.
c. Built-in Audio and Visual Equipment.
c. Signage and Graphics to the extent indicated on the Drawings and in the Project Manual, Appendix A-Signage.
d. Wet pipe fire suppression (sprinkler) system.
e. Fire Detection and Alarm system.
f. Plumbing and HVAC (heating, ventilating and air-conditioning) and electrical power and lighting and signal systems as indicated on the Plumbing, Mechanical and Electrical Drawings.
g. Telephone equipment, conductors and telephone instruments. Work under the building construction contract shall include conduits, junction boxes, outlet boxes, backboards, conductors and conduit ties between backboards and in the Specifications.
i. Additionally, Work under the building to include conduits, junction boxes, outlet boxes, backboards, conductors and conduit ties between backboards and in the Specifications, as indicated on Electrical Drawings.
j. All infrastructure including conduit, back-boxes, hardware and equipment for Security Cameras and Access Control System.
k. All underground utilities.
m. All work shown on Minor Off-Site Improvement Plan and Minor On-Site Improvement Plan.

B. Work Under Separate Contracts: The work includes coordination of work being performed by others under separate contracts with the City described in Article below titled “Concurrent Work Under Separate Contracts”.

1. Telecommunication system: Work under separate contract will include telecommunication equipment, conductors and telephone and computer equipment.
2. Security and Access Control: Work under separate contract will include Security Cameras and Access Control System. Electrical conduit and backboxes and pull-strings to be provided by the General Contractor and should be included in the electrical subcontractor’s scope of work. Conduits shall be installed from the device location as shown on the drawings to the IT Control Room and Security Panel.
3.. Work under separate contracts shall include products not built into permanent construction, including:
   a) Furniture, Fixtures and Equipment.

C. Environmental Considerations The proposed project has been designed and shall be constructed in compliance with the requirements of CCR Title 24, Part 11, 2022 California Green Building Standards Code (CALGreen Code) with July 2024 Supplement.

1. One of the perquisites for this certification is Construction Activity Pollution Prevention. In order to receive this credit the contractor must reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation.
2. The Contractor shall create and implement an Erosion and Sedimentation Control (ESC) Plan for all construction activities for the project.
3. Additional environmental considerations and scope of work are specified in Section 01352 – Construction Waste Management & Disposal, Section 01353 – Indoor Air Quality During Construction and Section 01571 – Stormwater Pollution Control Measures for Construction Activities.

D. Additional Information Available to Contractor:

1. **Appendix A:** Signage and Graphics Bid Package dated July 13, 2026.

2. **Appendix B:** Report of Geotechnical Study for the Proposed Anthony Munoz Community Center Gymnasium, 1242 West 4th Street, Ontario, CA, Kleinfelder Project No. 20236170.006A, dated June 24, 2024, Revised March 26, 2026.

E. Relationship to Work Under the Contract: Work under the contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein. Coordinate scheduling and sequencing of work under separate contracts with Construction Manager. See Section 01041 – Project Coordination for additional requirements.

1.03 CONSTRUCTION SEQUENCE AND SCHEDULING

A. Construction Sequence and Scheduling: Contractor shall coordinate on-site and off-site work to minimize traffic obstruction and interference with continuing activities on adjacent properties and thoroughfares. Sequence and scheduling of grading, paving and utility work, in particular, shall be coordinated with the City of Ontario.

1.04 PERMITS, LICENSES AND FEES

A. Permits: For Work included in the Contract, Contractor shall obtain all permits from Authority Having Jurisdiction (AHJ) and from serving utility companies and agencies.

B. Permits: A “No Fee Letter” will be provided to the General Contractor. No Building Permit Fees will be due by the General Contractor. Utility usage is not waived and is to be paid by the General Contractor for all temporary power and water.

1. Building permit: Contract Sum shall not include cost of building permits.
2. Fire sprinkler system permits: For Work performed under design/build basis, Contract Sum shall include costs for plan check and permit fees charged by Authority Having Jurisdiction (AHJ), unless otherwise directed.

3. Fire detection and alarm system: Contract Sum shall include costs for plan check and permit fees charged by Authority Having Jurisdiction (AHJ), unless otherwise directed.

A. Assessments: Costs of assessments and connection fees shall not be included in the Contract Sum. Owner will pay all assessments and utility service connection fees.

B. Licenses: Contractor shall obtain and pay for all licenses associated with construction activities, such as business licenses, contractors' licenses and vehicle and equipment licenses. All costs for licenses shall be included in the Contract Sum.

C. Test and Inspection Fees:

1. Contractor shall pay all fees charged by City, County and special district authorities having jurisdiction and from serving utility companies and agencies, for tests and inspections conducted by those authorities, companies and agencies. Owner will reimburse Contractor for actual amount of such fees, without mark-up.
2. Contractor shall pay for all additional charges by testing and inspection companies or agencies (including testing and inspection companies hired by owner to inspect the Work) due to the following:
   a) Contractor's failure to properly schedule or notify the City of Ontario testing and inspection provider.
   b) Changes in sources, lots or suppliers of products after original tests or inspections.
   c) Changes in means, methods, techniques, sequences and procedures of construction that necessitate additional testing, inspection and related services.
   d) Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
   e) Contractor submitted requests to change materials or products, which are accepted but require testing and/or re-inspection beyond original design.
   f) Costs of travel and per diem to perform factory testing on sites over 50 miles from the jobsite.
   g) Costs of re-inspection of re-testing work due to incomplete work or the failure in the original inspection or test.

END OF SECTION

SECTION 01015

DEFINITIONS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers additional definitions supplementary to those given in the Conditions of the Contract.

1.02 DEFINITIONS:

A. **Drawings**: Words such as "shown", "indicated", "detailed", "noted", "scheduled", or words of similar import shall mean that reference is made to the information on the Drawings unless stated otherwise.

B. **Architect**: Words such as Architect shall mean that of Architect/Engineer unless stated otherwise.

C. **Contractor**: Words such as Contractor shall mean General Contractor unless stated otherwise.

D. **Owner/Owner's Representative**: Words such as Owner/Owner's Representative shall mean that unless stated otherwise.

E. **Project Construction Manager**: Shall mean the designated City Project Manager.

F. **Actions of Architect**: Such words as "directed", "designated", "selected", and words of similar import shall mean that the direction, designation, selection, or similar action of the Architect is intended unless stated otherwise.

G. **Required**: The word "required" and words of similar import shall mean "required to complete the Work" and "required by the Architect", as is applicable to the context of the place where used, unless stated otherwise.

H. **Perform**: The word "perform" shall be understood to mean that the Contractor, at his expense, shall perform all the operations necessary to complete the Work or mentioned portions of the Work, including furnishing and installing materials as are indicated, specified, or required to complete such performance.

I. **Provide**: The term "provide" shall be understood to mean that the Contractor, at his expense, shall furnish and install the Work and the mentioned portion of the Work, complete and ready for the intended use. These definitions apply the same to future, present, and past tenses except "provided" may mean "contingent upon" where such is the context.

J. **Equal**: Terms such as "equal", "approved equal", "equivalent", and all terms of similar import shall be understood to be followed by the phrase "in the opinion of the Architect" unless stated otherwise. Refer to Section 01600 Products and Materials in Paragraph 1.03 for additional definitions and requirements.

K. **Review /Approval**: Such words as "approved", "approval", "acceptable", "acceptance", or words of similar import shall mean that acceptance of the Architect is intended within the context of the review; deviations from the requirements of the Contract Documents is not intended unless specifically identified or noted as part of the review.

L. **Submit**: Such words as "submit", "submittal", "submission" and terms of similar import shall include the meaning of the phrase "submit to the Architect for his approval" unless otherwise stated.

M. **Expense**: Such terms as "at no extra cost to Owner", "with no extra compensation to Contractor", "at Contractor's expense", or phrases of similar import shall be understood o mean that the Contractor shall perform or provide the operation or Work with no increase to the Contract Sum stated in the Agreement.

N. **Fees and Charges**: To the extent indicated or specified, Contractor shall secure the permits, governmental authorizations, utility fees, licenses, inspections, and all similar requirements and shall pay all costs relating thereto no matter how such costs are defined by the political subdivision, public authorities or agencies, public utilities, telephone company, special district, quasi-governmental entity, or other agency involved.

O. **Language**: Specifications are written in a modified brief style consistent with clarity. Generally, the words "the", "shall", "will" and "all" are not stated. Words requiring an action or performance, such as "perform", "provide", "erect", "install", "furnish", "connect", "test", "coordinate", and words and phrases of similar import, shall be understood to be preceded by the phrase "The Contractor shall" unless otherwise stated. The requirements indicated and specified apply to all Work of the same kind, class, and type, even though the word "all" is not stated.

P. **Titling and Arrangement**: Article, Paragraph, and \Subparagraph titles and other identifications of subject matter in the Specifications are intended as an aid in locating and recognizing various requirements in the Specifications. Except where titling forms a part of the text, such as beginning words of a sentence or where the title establishes the subject, the titles are subordinate to and do not define, limit, or otherwise restrict the Specification text. Underlining or capitalizing of any words in the text does not signify or mean that such words convey special or unique meanings having precedence over any other part of the Contract Documents. Specification text shall govern over titling and shall be understood to be and interpreted as a whole. The order of Articles, Paragraphs, Subparagraphs, and Sub-subparagraphs in the Specifications text is defined by the sequence of indentations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01017

OWNER-FURNISHED ITEMS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers the general requirements for Owner-furnished Contractor-installed (OFCI) equipment.

1.02 CONDITIONS: In every case, the Contractor shall be responsible for the correct and properly located installation of the OFCI equipment in accordance with the various manufacturers specifications and instructions.

A. **Conflicts**: Where a conflict occurs between requirements for OFCI equipment and the actual field conditions, Contractor shall not install the affected equipment until the conflict is resolved. No extra payment will be made to Contractor for correction of improper installation of equipment when reasonably adequate data and instructions for installation were furnished by Project Manager/Owner or various equipment manufacturers.

B. **Installation of OFCI Equipment** shall be complete in every detail, with each item accurately and correctly placed, connected, and tested.

C. **Delivery**: OFCI equipment will be delivered to the site of the Work. Contractor shall receive and unload the equipment, place in covered storage or the enclosed building, and be responsible therefore after delivery. Equipment that is damaged or abused during storage or installation operations shall be repaired, replaced, or otherwise made good to the Architect's/Owner's satisfaction at the Contractor's expense.

D. **Inspection of Delivered Equipment**: Within 10 working days after delivery of the OFCI equipment, Contractor shall open and uncrate the equipment for inspection. The Owner's representative and Contractor shall inspect each item and maintain a written record of all damage, missing parts, and other defects disclosed, all of which will be made good by the Architect's/Owner. After the inspection, Contractor shall be solely responsible for the equipment as specified above.

E. **Templates furnished** by the various equipment manufacturer's shall be kept at the site for reference and stored readily available to both the Architect's/Owner. Deviations from manufacturers' templates will not be approved.

F. **Additional Information**: The Contractor may request and receive from the Owner any necessary additional information, specifications, templates, and the like from any of the manufacturers of the OFCI equipment. Contractor may request a manufacturer's representative to supervise the installation of OFCI equipment items, but at no extra cost to Owner.

PARTS 2 - PRODUCTS

2.01 OFCI EQUIPMENT:

A. **Equipment List**: The list of OFCI equipment listed below.

1. Security System including all Access Control (keypads) and Security Cameras will be provided by another contractor through a separate contract with the City. All backboxes, conduit and pull-wire are to be provided by the General Contractor and are shown in the Architectural and Electrical Drawings. Conduit shall be installed from the device location shown on the drawings to the Security Panel in the IT Room.
2. Telecommunication system equipment: Work under separate contract will include telecommunication equipment, conductors and telephone and computer equipment.
3. Furniture, Fixtures and Equipment. All moveable fixtures, furniture and equipment not shown in the drawings or listed in the specifications will be provided by the City under separate contracts.

B. **Installation Materials**: The Contractor shall provide the attachments, fittings, fasteners, connectors, and the like that are necessary for the installations but not regularly furnished by the equipment manufacturers, types as approved.

PART 3 - EXECUTION

3.01 INSTALLATION: In accordance with each equipment manufacturer's specifications, templates, and information, including the necessary assembling of components or sub-assemblies.

3.02 TESTS: The Contractor shall operate and test each item of OFCI equipment after installation. Should malfunctions occur through no fault of the Contractor, the Owner will make the defect good; otherwise, the Contractor shall effect all the necessary corrections so the equipment operates properly and as intended, at his expense.

END OF SECTION

SECTION 01025

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION: General Conditions and this Section cover schedule of values, supplementary to those given in the Conditions of the Contract.

1.02 SCHEDULE OF VALUES:

A. **Submit to Owner** for approval within 2 days of award of Contract, on the Owner Payment Request Form a breakdown to the total contract price showing the value assigned to each part of the work. List items in accordance with the specifications index.

B. **Support Values** given with data substantiating their correctness upon Owner's request.

C. **Use Schedule of Values** for Contractor's application for payment.

1.03 FORM OF SUBMITTAL: The form of Application for Payment shall be AIA G702 form acceptable to Owner. Use Table of Contents of this Specification for format and for listing costs of work specified in Specification Divisions 1 through 16 inclusive. Identify each line item using number and title as listed in the Table of Contents of these Specifications.

1.04 PREPARING SCHEDULE OF VALUES:

A. **Itemize Separate Line Item Cost** for each of the following general cost items:

1. Performance and payment bonds.
2. Field supervision and layout.
3. Temporary facilities and controls.
4. Allowances or budget for unforeseen or anticipated costs.
5. Insurance costs.

B. **Itemize Separate Line Cost** for work required by each Section of the Specifications.

C. **Break Down** installed costs into:

1. Delivered cost of product, with taxes paid.
2. Total installed cost, with overhead and profit.

D. **For Each Line Item** which has installed value of more than $10,000.00, break down cost to list major products or operations under each item.

E. **Round Off Figures** to nearest dollar.

1.05 REVIEW AND RESUBMITTAL: After review by Owner, revise and resubmit schedule (and schedule of material values) as required. Resubmit revised schedule in same manner.

1.06 BASE BID COST BREAKDOWN: (For information only--Award of this contract will be aggregate of all components formulating the Total Base Bid).

SCHEDULE OF VALUES FORM

DIVISION 01 General Requirements . . . . . Dollars ($_____)

DIVISION 02 Site Work. . . . . Dollars ($_____)

Demolition $_____

Grading $_____

Underground Utilities $_____

Landscaping and Irrigation $_____

Paving $_____

DIVISION 03 Concrete . . . . . Dollars ($_____)

DIVISION 04 Masonry. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

CMU $_____

DIVISION 05 Metals . . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Structural Steel $_____

Ornamental Metal $_____

DIVISION 06 Carpentry. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Rough Carpentry (incl. GluLams) $_____

Finish Carpentry $_____

DIVISION 07 Moisture . . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Metal Wall Panels $_____

Single Ply Roofing Systems $_____

DIVISION 08 Doors and Windows. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

HM Doors and Frames $_____

Aluminum Storefront/Curtainwall/Entrances $_____

Glass and Glazing $_____

DIVISION 09 Finishes . . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Lath and Plaster $_____

Gypsum Wallboard $_____

Acoustical Ceilings $_____

Linear Wood Ceilings $_____

Porcelain Wall and Floor Tile $_____

Resilient Flooring $_____

Cushioned Wood Flooring $_____

Carpet $_____

Painting $_____

Wallcoverings $_____

DIVISION 10 Specialties. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Toilet Partitions and Accessories $_____

Louvered Sunshades $_____

DIVISION 11 Equipment. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Gymnasium Equipment $_____

Base Audio / Video Systems $_____

Fitness Room Wireless Mic Option _$_____

DIVISION 12 Furnishings. . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Telescoping Stands $_____

DIVISION 15 Mechanical . . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Fire Sprinklers $_____

HVAC $_____

Plumbing $_____

DIVISION 16 Electrical . . . . . Dollars ($_____)
Costs associated with Work specified in the following Sections:

Electrical Power and Signal Infrastructure $_____

Lighting $_____

APPENDIX A SIGNAGE AND GRAPHICS . . . . . Dollars ($_____)

SUBTOTAL Dollars ($_____)

Overhead and Profit. . . . . Dollars ($_____)

Base Bid Total . . . . . Dollars ($_____)

TOTAL Dollars ($_____)

END OF SECTION

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Coordination of** Work under Contract.

B. **Pre-construction** conference.

C. **Construction** progress meetings.

D. **Pre-installation** conferences.

1.02 RELATED SECTIONS

A. **Section 01010 - Summary of the Project:** Various types of Work to be coordinated.

B. **Section 01300 - Submittals:** General requirements for submittals schedule, to be reviewed at construction progress meetings.

C. **Section 01320 - Construction Progress Documentation:** General requirements for construction progress schedules and construction progress reports, to be reviewed at construction progress meetings.

B. **Section 01400 - Quality Control:** General requirements for construction quality, to be reviewed at construction progress meetings.

C. **Section 01600 – Material and Equipment:** Coordination of products, especially general requirements for system completeness and product substitutions.

1.03 COORDINATION

A. **Coordination:** Contractor shall coordinate the Work as stated in the General and Special Provisions of the Contract. Contractor shall also coordinate Work under the Contract with work under separate contracts by City.

B. **Relationship of Contract Documents:** Drawings, Specifications and other Contract Documents in the Project Manual are intended to be complementary. What is required by one shall be as if required by all. What is shown or required, or may be reasonably inferred to be required, or which is usually and customarily provided for similar work, shall be included in the Work.

C. **Discrepancies in Contract Documents:** In the event of error, omission, ambiguity or conflict in Drawings or Specifications, Contractor shall bring the matter to Architect's attention in a timely manner during the bidding period, for

Architect's determination and direction in accordance with provisions of the General and Special Provisions of the Contract.

D. Construction Interfacing and Coordination: Layout, scheduling and sequencing of Work shall be solely the Contractor's responsibility.

1. Contractor shall verify, confirm and coordinate field measurements so that new construction correctly and accurately interfaces with conditions existing prior to construction.
2. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and integration of all elements of Work. Contractor shall coordinate Work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by City, utility agencies and companies.

1.04 COORDINATION OF SUBCONTRACTS AND SEPARATE CONTRACTS

A. Superintendence of Work: Contractor shall appoint a field superintendent and a project manager, who shall direct and provide full time supervision and coordination of all Work in the Contract.

B. Subcontractors, Trades and Materials Suppliers: Contractor shall require all subcontractors, trades, crafts and suppliers to coordinate their portions of Work with the Contractor's field superintendent to prevent scheduling, sequencing, dimensional and other conflicts and omissions.

C. Coordination with Work Under Separate Contracts: Contractor shall coordinate and schedule Work under the Contract with work being performed for Project under separate contracts by City, serving utilities and public agencies. Contractor shall make direct contacts with parties responsible for work of the Project under separate contracts, in order to provide timely notifications and to facilitate information exchanges.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Preconstruction Conference: The City’s Project Manager will administer the pre-construction conference for execution of City-Contractor Agreement and exchange of preliminary submittals and other data.

B. Schedule: Schedule Pre-construction Conference within 10 days of construction start date established in the Notice to Proceed.

C. Location: Pre-construction conference will be held at a location as directed by City’s Project Manager.

1.06 SITE MOBILIZATION CONFERENCE

A. Site Mobilization Conference: The City’s Project Manager will administer site mobilization conference for clarification of responsibilities of City, Architect, other

responsible design professionals and Contractor in use of site and for review of Contract administration.

B. **Schedule:** Site mobilization conference shall occur within 14 days of Notice to Proceed, unless otherwise directed.

C. **Location:** At Project site, unless otherwise directed.

D. **Agenda:** Site Mobilization Conference shall cover the following topics as a minimum.

1. Special Project Procedures: Site access restrictions, if any, and requirements to avoid disruption of operations at adjoining facilities.
2. Subcontractors List: Distribute and discuss list of subcontractors and suppliers.
3. Construction Schedule: Distribute and discuss initial construction schedule and critical path sequencing of major elements of Work, including work under separate contracts by serving utility agencies and companies and City.
4. Designation of Key Personnel: Contractor shall designate key personnel and provide a name, email address, cell phone number and address which includes the following.
    a) Contractor: Project Manager and Superintendent.
    b) Major subcontractors: Principal/Project Manager and Superintendent.
    c) Major materials suppliers: Contact person.
5. Project Communication Procedures: Review requirements and administrative requirements for written and oral communications.
6. Change Procedures: Review requirements and administrative procedures for Change Orders, Construction Change Directives, Architect's supplemental instructions and Contractor's Requests for Interpretation (RFI's).
7. Coordination: Review requirements for Contractor's coordination of Work; review sequence and schedule for work being performed for Owner under separate contracts.
8. Site Access by City and Architect: Review requirements and administrative procedures Contractor may wish to institute for identification and reporting purposes.
9. Permits and Fees: Review Contract requirements and review schedule and process for obtaining permits and paying fees.
10. Construction Facilities and Temporary Utilities: Designate storage and staging areas, construction office areas; review temporary utility provisions; present City's requirements for use of premises.
11. Materials and Equipment: Review substitution requirements; review schedule for major equipment purchases and deliveries.
12. Testing and Inspection: Review tests and inspections to be performed by the following.
    a) Independent testing and inspection agency.
    b) Manufacturers and installers.
    c) Serving utilities and public agencies.

d) Authorities having jurisdiction.

13. Submittals Administration: Review administrative procedures for shop drawings, product data and samples submittals and review of preliminary Submittals Schedule.
14. Project Record Documents: Review requirements and procedures for project record drawings and specifications.
15. Operation and Maintenance Data: Format and content of operation and maintenance manuals; instruction of City's personnel.

1.07 CONSTRUCTION PROGRESS MEETINGS

A. **Schedule:** Project meetings shall be scheduled weekly throughout progress of the Work. Frequency may be occasionally modified as necessary to properly maintain progress of Work. Generally, it is intended that progress meetings be held at weekly intervals during the time of the Contract.

B. Administration: Contractor shall make physical arrangements for meetings. Contractor will prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within three days to City, Architect, participants and those affected by decisions made at meetings. Every discussion item at Project meetings shall be numerically identified and carried through subsequent meeting minutes until resolved.

C. **Attendance:** Contractor's project manager and jobsite superintendent shall attend each meeting. Contractor's subcontractors and suppliers may attend as appropriate to subject under discussion. City will have a representative attend each meeting. Architect and Architect's consultants, as appropriate to agenda topics for each meeting and as provided in City-Architect Agreement, will also attend.

D. **Meeting Time and Location:** As mutually agreed by City’s Project Manager, Contractor, Architect, and City, at on-site location.

E. **Special Meetings:** As necessary, City’s Project Manager may convene special meetings to discuss specific construction issues in detail and to plan specific activities.

F. **Site Inspections:** Field Quality Control

1. All site re-inspections due to either the site or contractor not being prepared or nonconformance with the Construction Documents shall be back-charged to the contractor. These costs shall be paid for by the contractor prior to the Design team member’s participation in any future site visits.
2. Final Review: At, or near the end of specified Landscape Maintenance Period, the contractor shall make written request for a final review and the work shall be reviewed for conformance with the Construction Documents. If work is not accepted at time of review, a punch list of items requiring attention will be issued to the contractor for correction. The Landscape Maintenance Period shall be extended at contractor’s

sole cost as necessary. Upon completion of the punch-list the contractor shall again make written request for review. If, upon re-visiting the site, it is found that the punch list has not been completed, the review shall end and the contractor shall be back- charged for all additional visits.

1.08 PRE-INSTALLATION CONFERENCES

A. Pre-Installation Conferences: When specified in individual product specification Sections, convene a pre-installation conference prior to commencing Work specified in individual product Sections.

1. Require attendance by representatives of firms whose activities directly affect or are affected by Work specified in the Section.
2. Review conditions of installation, preparation and installation procedures and coordination with related Work and work under separate contracts.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01048

CONTRACTOR'S REQUESTS FOR INFORMATION

PART 1 - GENERAL

1.01 DESCRIPTION: All other sections of Division 1 apply to this Section. This Section covers the general requirements for Contractor's Requests for Information and pertains to all portions of the contract documents.

A. Related Work Specified Elsewhere:

1. Project Meetings - Section 01200
2. Submittals - Section 01300

1.02 DEFINITION: Request for Information, a document submitted by the Contractor requesting clarification of a portion of the contract documents, hereinafter referred to as RFI.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION:

A. When the Contractor is unable to determine from the contract documents, the exact material, process or system to be installed, the Architect shall be requested to make a clarification of the indeterminate item. Wherever possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Architect.

B. Contractor shall endeavor to keep the RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Architect, because of the number and frequency of RFI's submitted, the Architect may require the Contractor to abandon the process and submit all requests as either submittals, substitutions or requests for change.

C. RFI's shall be submitted in a digital/electronic form approved by the Architect and the City's Project Manager. Forms shall be completely filled-in, shall be fully legible after copying by xerographic process. Each page of attachments to RFI's shall bear the RFI number. Plan sheets in question shall be referenced along with specifications. The RFI Submittal Date along with the Due Date shall also be noted.

D. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect.

E. Contractor shall carefully study the contract documents to assure that the requested information is not available therein. RFI's which request information available in the contract documents will not be answered by the Architect.

F. In all cases where RFI's are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work

shown diagrammatically, and similar items, the Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale and submit same with the RFI. RFI's which fail to include a suggested solution will not be answered.

G. **RFI's shall not be** used for the following purposes:

1. To request approval of submittals
2. To request approval of substitutions,
3. To request changes which entail additional cost or credit.
4. To differentiate methods of performing work than those drawn and specified.

H. **In the event the Contractor** believes that a clarification by the Architect results in additional cost, Contractor shall not proceed with the work indicated by the RFI until a change order is prepared and approved. Answered RFI's shall not be construed as approval to perform extra work.

I. **Unanswered RFI's** will be returned with a stamp or notation: Not Reviewed.

J. **Contractor shall prepare** and maintain a log of RFI's, and at any time requested by the Architect, Contractor shall furnish copies of the log showing all outstanding RFI's. Contractor shall note all unanswered RFI's in the log.

K. **Contractor shall allow** for 5-10 days review and response time for RFI's depending on the complexity of the issue.

PART 2 – PRODUCTS - Not applicable to this Section.

PART 3 – EXECUTION - Not applicable to this Section.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers Contractor's survey work and engineering responsibilities where required under this Project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 LAYOUT THE WORK: Employ a Registered Land Surveyor to layout the Work and set grades, lines, levels, and positions throughout the site. Before beginning the Work, locate all general reference points, verify locations (horizontal and vertical) of all existing utilities, establish monuments, and take action as necessary to prevent their destruction; then layout lines, elevations, and measurements for the entire Work including buildings, on the Drawings and accept responsibility for all errors resulting from failure to so verify. Establish permanent monuments on curbs, manholes, or pavements, or with concrete embedded steel pipe with lead plug and brass nail, as approved. Provide a permanent single point of vertical (Datum) control to aid in installation of building utilities, ceilings, doors and wall material/color changes.

3.02. VERIFICATION: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Before commencing work, verify the locations (horizontal and vertical) of all existing utilities that must be protected in place and/or that will be connected to as part of Work. If discrepancies are discovered, promptly notify Construction Manager and Architect.

3.03 SITE GRADING VERIFICATION AND CERTIFICATION: Upon completion of rough grading, survey graded areas and establish that elevations are correct and within acceptable tolerances prior to construction of slabs, foundations, sidewalks, paving and finish grading. Contractor's Registered Land Surveyor shall also provide Letter of Certification to the Owner and Architect as required by the City and/or Owner for each Certification.

3.04 VERIFICATION OF WORK: Periodically verify layout and completed conditions of the Work by same means.

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers general requirements for codes and standards pertaining to the Work and is supplementary to the codes and standards mentioned or referenced elsewhere in the Contract Documents.

1.02 CODES AND STANDARDS:

A. Requirements of Regulatory Agencies: All pertaining statutes, ordinances, laws, rules, codes, regulations, standards, and lawful orders of public authorities having jurisdiction of the Work of this Contract are hereby incorporated into the Contract Documents the same as if repeated in full herein and are intended wherever reference is made in either the singular or plural to Code or Building Code except as otherwise specified, including, but not limited to, those in the following listing. Contractor shall make available at the site such copies of the listed documents applicable to the Work as Architect and/or Owner may request, including mentioned portions of the California Code of Regulations (CCR).

1. 2022 California Building Code and Code of jurisdiction including research reports approved by the Building Department for materials, equipment, systems, and designs as applicable to the Work, including current applicable California amendments and additional regulatory codes not mentioned herein:
2. Title 8 CCR, Industrial Relations, including Chapter 4, Div. of Industrial Safety, Safety Orders (CAL/OSHA).
3. Federal, Industrial Relations, Division of Industrial Safety, Safety Orders (FED/OSHA).
4. Title 19 CCR, Public Safety.
5. Title 22 CCR, Social Security.
6. Title 24 CCR, Building Standards, including ADA regulations, architectural barrier laws and regulations regarding handicapped persons.
7. 2008 Building Energy Efficiency Standards Code.
8. 2022 CBC California Mechanical Code.
9. 2022 CBC California Plumbing Code.
10. 2022 CBC California Fire Code.
11. 2022 CBC California Electrical Code.
12. 2025 CA Green Building Standards Code (CALGREEN) Part 11, Title 24.
12. All other laws, regulations, rules, orders, codes, and ordinances specified in other Sections of these Specifications or bearing on the Work.

END OF SECTION

SECTION 01070

ABBREVIATIONS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers abbreviations for the documents mentioned or referenced elsewhere in the Contract Documents, and language abbreviations used in the text of the Specifications. Abbreviations in Drawings and Specifications shall be interpreted according to recognized and well-known technical, industry, or trade meanings.

1.02 TRADE ABBREVIATIONS include but are not limited to the following:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Traffic Officials
ACI	American Concrete Institute
ADC	Air Diffusion Council
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AFI	Air Filter Institute
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
CBM	Certified Ballast Manufacturers
CCR	California Code of Regulations (Formerly CAC)
CDA	Copper Development Association
CGA	Compressed Gas Association
CISPI	Cast-Iron Soil Pipe Institute
CS	Commercial Standard, US Department of Commerce
CTI	Cooling Tower Institute
DEMA	Diesel Engine Manufacturers Association

DOD-	Department of Defense (leading symbol)
EIA	Electronic Industries Association
ETL	Electrical Testing Laboratories
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
Fed Spec	Federal Specification or Standard
FIA	Factory Insurance Association
FM	Factory Mutual
HI	Hydraulic Institute
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
ISO	International Standards Organization
MIL	Military Specification or Standard (leading symbol)
MSS	Manufacturers Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NAFM	National Association of Fan Manufacturers
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFC	National Fire Code
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
NWWDA	National Wood Window and Door Association
OSA	Office of the State Architect
PDI	Plumbing and Drainage Institute
PS	Product Standard, US Department of Commerce
REA	Rural Electrification Administration
RIS	Redwood Inspection Service
SAE	Society of Automotive Engineers
SDI	Steel Door Institute
SFM	State Fire Marshal
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WI	Woodwork Institute
WWPA	Western Wood Products Association

1.03 TEXT ABBREVIATIONS include but are not limited to the following:

AMP or amp	Ampere
CFM or cfm	Cubic feet per minute
FPM or fpm	Feet per minute
FPS or fps	Feet per second
GPM or gpm	Gallons per minute
Kip or kip	Thousand pounds
Ksi or ksi	Thousand pounds per square inch

Ksf or ksf	Thousand pounds per square foot
KV or kv	Kilovolt
KVA or kva	Kilovolt amperes
KW or kw	Kilowatt
KWH or kwh	Kilowatt hour
LF or lf	Linear foot
MPH or mph	Miles per hour
PCF or pcf	Pounds per cubic foot
PSF or psf	Pounds per square foot
PSI or psi	Pounds per square inch
SF or sf	Square foot
SY or sy	Square yard

PART 2 - PRODUCTS (Not applicable to this Section)

PART 3 - EXECUTION (Not applicable to this Section)

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers the general requirements for reference standards pertaining to the Work and is supplementary to the reference standards mentioned or referenced elsewhere in the Contract Documents.

1.02 REFERENCE AND STANDARD TYPE SPECIFICATIONS: Specifying by reference to reference and standard type specification documents or to another portion of the Contract Documents shall be the same as if the referenced document or portion referred to were exactly repeated at the place where reference is made. In case of conflict between the requirements of regulatory agencies and the referenced reference and standard type specification documents, Contractor shall conform to the most restrictive requirement if such conformance is legal. The reference or standard type specification documents shall be the current issue at the time the Construction Documents Phase, unless otherwise specified. Contractor shall make available at the site such copies of the reference or standard type specification documents as Architect or Owner may request.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers general requirements for project meetings.

PART 2 - PRODUCTS (Not Applicable to This Section)

PART 3 - EXECUTION

3.01 PROJECT MEETINGS:

A. **Attendees**: Unless otherwise specified or required by Owner, all meetings shall be attended by Owner, Architect, City's Project Manager, Contractor, and the Contractor's Superintendent. Subcontractors may attend the meetings when involved in matters to be discussed or resolved but only when requested by the Owner, Architect, or Contractor.

B. **Meeting Records**: The Contractor will record minutes of each meeting and furnish copies within 3 days to the Owner, Architect, and other attendees. Unless written objection to the contents of such meeting minutes is received by Contractor within 7 days after presentation, it will be understood and agreed that the minutes are a true and complete record of the meeting.

C. **Meeting Schedule**: Dates, times, and locations for the various meetings shall be agreed upon and recorded at preconstruction conference. Thereafter, changes to schedule shall be agreed between Owner, Architect and Contractor, with appropriate written notice to all parties involved.

3.02 PRECONSTRUCTION CONFERENCE:

A. **General:** Prior to issuance of Notice to Proceed, a Pre-Construction Conference shall be held at location, date, and time designated by the City's Project Manager. In addition to attendees named herein, the meeting shall be attended by representatives of regulatory agencies having jurisdiction, if required, and such other persons the Owner may designate.

B. **Agenda:** Matters to be discussed or resolved and instructions and information to be furnished to or given by Contractor at pre-construction conference include:

1. Schedule of progress meetings.
2. Progress schedule and schedule of values submitted by Contractor.
3. Communication procedures between the parties.
4. Names and titles of all persons authorized by Contractor to represent and execute documents for him, with samples of all authorized signatures.
5. The names, addresses, email address and cell phone numbers of all those authorized by the Contractor to act for him in emergencies.
6. Construction permit requirements, procedures, and posting.

7. Public notice of starting Work.
8. Forms and procedures for Contractor's submittals.
9. Change Order forms and procedures.
10. Payment application forms and procedures and the revised progress schedule reports to accompany the applications.
11. Contractor's designation of his organization's accident prevention member and his qualifications if other than the Superintendent.
12. Contractor's provisions for barricades, traffic control, utilities, sanitary facilities, and other temporary facilities and controls.
13. Consultants and professionals employed by Owner and their duties.
14. Construction surveyor and initiation of surveying services.
15. Testing Laboratory or Agency, and testing procedures.
16. Procedures for payroll and labor cost reporting by the Contractor.
17. Procedures to ensure nondiscrimination in employment on and for the Work.
18. Warranties and guarantees.
19. Other administrative and general matters as needed.

3.03 CONSTRUCTION PROGRESS MEETINGS: Progress meetings shall be held according to the agreed schedule. All matters bearing on progress and performance of the Work since preceding progress meeting shall be discussed and resolved including, without limitation, any previously unresolved matters, deficiencies in the Work or the methods being employed for the Work, and problems, difficulties, or delays which may be encountered.

3.04 SPECIAL MEETINGS: On appropriate notice to other parties, special meetings may be called by the Owner, Construction Manager, Architect, or Contractor. Special meetings will be held where and when designated by the Owner.

3.05 POSTCONSTRUCTION CONFERENCE: A post-construction conference shall be held prior to final inspection of the Work to discuss and resolve all unsettled matters. Bonds and insurance to remain in force, and the other documents required to be submitted by the Contractor will be reviewed and any deficiencies determined. Schedule and procedures for final inspection and for correction of defects and deficiencies shall be agreed.

END OF SECTION

SECTION 01250

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Administrative requirements** for changes in the Work.

B. **Construction Bulletins, containing:**

1. Architect's Supplemental Instructions.
2. Requests for Proposal.
3. Construction Change Order Directives.

C. **Change** Orders.

D. **Reconciliation** of Change Orders.

1.02 RELATED DOCUMENTS AND SECTIONS

A. **Agreement:** Monetary values to be used in computing Change Orders.

B. **General Provisions of the Contract:** Governing requirements for changes in the Work, in Contract Sum and Contract Time.

C. **Section 01600 – Material and Equipment:** Product options, substitutions, omissions and misdescriptions.

D. **Section 01770 - Contract Closeout Procedures:** Project record documents.

1.03 ADMINISTRATIVE REQUIREMENTS FOR CHANGES IN THE WORK

A. **Contract Requirements for Changes in the Work:** Comply with provisions of the General Provisions of the Contract.

B. **Administrative Requirements for Changes in the Work:** All changes to approved Drawings and Specifications shall be made by Change Order and shall be subject to approval of Authority Having Jurisdiction (AHJ).

1. Comply with administrative requirements specified in this Section preparation, submission, review and approval of changes in the Work.
2. Administrative procedures are specified for Architect's Supplemental Instructions, Construction Change Directives and Change Orders.
3. The Architect will prepare and issue a Bulletin on which the Architect's Supplemental Instructions, a Construction Change Directive or a Request for Proposal will be presented to the Contractor for action.

C. Responsible Person for Contractor: Submit name of the individual authorized to receive construction change documents, and who is responsible for informing others in Contractor's employ or subcontractors of changes in the Work.

D. Change Order Forms: Form as directed by City's Project Manager.

1.04 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

A. Architect's Supplemental Instructions:

1. Minor changes in the Work, not involving an adjustment in either the Contract Sum or Contract Time, as authorized by the General Provisions of the Contract, may be presented by the Architect using American Institute of Architects (AIA) Document G710 - Architect's Supplemental Instructions, or correspondence containing similar information.
2. Should the Architect's Supplemental Instructions result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the General Provisions of the Contract.

1.05 REQUESTS FOR PROPOSAL

A. Architect- or City-Initiated Requests for Proposal: Architect will prepare and issue a Request for Proposal through the City's Project Manager, which will include a detailed description of a proposed change, with supplementary or revised Drawings and Specifications as appropriate.

1. Such Request for Proposal may include an estimate of additions or deductions in Contract Time and Contract Sum for executing the change and may include stipulations regarding overtime work and the period of time the requested response from the Contractor shall be considered valid.
2. Contractor shall prepare and submit a response to the Request for Proposal within 10 days of the date of the Request for Proposal.
   a) Issuance of such a request by the City shall not indicated authorization for the Contractor to proceed with the proposed change.
   b) Changes will be approved only by an approved Construction Change Directive and Change Order.

B. Contractor-Initiated Request for Proposal: The Contractor may propose a change by submitting a request for a change to City's Project Manager, with a copy to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and a full description of effects on the Contract Sum, Contract Time, related Work and work being performed under separate contracts.

1. Requests for substitutions shall be included under this category, with procedures as specified in Section 01600 – Products and Materials..
2. After review of the request and with approval of City's Project Manager, Architect will prepare a Request for Proposal, as described above.

3. Issuance of such a request by City's Project Manager shall not indicated authorization for the Contractor to proceed with the proposed change.
4. Changes will be approved only by a signed Construction Change Directive or Change Order.

1.06 CONTRACTOR'S RESPONSE TO REQUESTS FOR PROPOSAL

A. Substantiating Data for Proposed Changes in Contract Sum and Contract Time: Contractor shall provide full information required for evaluation of proposed changes and to substantiate costs of changes in the Work.

1. Document each quotation for a change in Contract Sum and Contract Time, with sufficient data to allow evaluation of the quotation.
2. Upon request, provide additional data to support computations:
   a) Quantities of products, labor and equipment.
   b) Taxes, insurance and bonds.
   c) Overhead and profit.
   d) Justification for change in Contract Time, if claimed.
   e) Credit for deletions from Contract, similarly documented.

B. Cost and Time Resolution: If amounts for changes in Contract Sum and Contract Time cannot be agreed upon by City's Project Manager and Contractor, amounts shall be resolved in accordance with provisions of the General Provisions of the Contract for resolution of disputes and the following:

1. Contractor shall keep accurate records of time, both labor and calendar days, and cost of materials and equipment.
2. Contractor shall prepare and submit an itemized account and supporting data after completion of changed Work, within the time limits indicated in the General Provisions of the Contract.
3. Contractor shall provide full information as required and requested, for Construction Manager and Architect to evaluate and substantiate proposed costs and time for the change in the Work.
4. When City's Project Manager and Contractor determine mutually-acceptable amounts for changes in Contract Sum and Contract Time, a Change Order shall be executed for these amounts.
5. City shall have the right to audit Contractor's invoices and bid quotations to substantiate costs for Change Orders.

C. Construction Changes Based on Stipulated Sum or Time: Based on the Contractor's response to a Request for Proposal or Construction Change Directive, City's Project Manager and Architect will review the response.

1. City's Project Manager and Contractor shall negotiate a mutually acceptable adjustment in Contract Sum and Contract Time, as appropriate, prior to performance of the changed Work.
2. A Change Order for the stipulated amounts shall be prepared based on the stipulated sum and change in time.

D. Construction Changes Based on Unit Costs or Quantities: When the scope of a change in the Work cannot be accurately determined in advance, a Construction Change Directive shall be executed based on mutually-acceptable quantities and pre-determined unit prices. Actual costs shall be determined after completion of the Work and a Change Order for this amount shall be executed.

E. Construction Changes Based on Time and Material Costs: When the scope of a change in the Work cannot be accurately determined in advance, a Construction Change Directive shall be executed based upon an agreement that City will adjust the Contract Sum and the Contract Time based on actual costs and time expended by the Contractor in performance of the change.

1.07 CHANGE ORDERS

A. Change Order Preparation, General:

1. In response to each Request for Proposal or Construction Change Directive, Contractor shall submit information for review by Construction Manager and Architect, in order to confirm the scope of the proposed change and to determine the acceptable amounts, if any, for changes to be made in the Contract Sum and Contract Time.
2. In accordance with General Provisions of the Contract, the City's Construction Manager and Architect will review the Contractor's response to the Request for Proposal or Construction Change Directive, confirm the scope of the proposed change and determine with the Contractor the acceptable amounts, if any, for changes in the Contract Time and the Contract Sum.
3. When agreement is reached on changes, if any, in the Contract Time and the Contract Sum, the Architect will prepare a Change Order using a form as directed by City, with supplementary documents as necessary to describe the change and the associated costs and schedule impacts.
    a) Architect will prepare and issue Change Order documents, including drawings, specifications and other supporting documents via electronic digital format.
    b) Construction Manager, Architect and Contractor shall sign the Change Order indicating acceptance and approval of the change.

B. Execution of Change Orders: Upon approval of the Change Order by Construction Manager and Contractor, Contractor shall promptly execute the change in the Work.

1.08 CONSTRUCTION CHANGE DIRECTIVES / CHANGE ORDER REQUESTS

A. Construction Change Directives: In accordance with provisions of the General Provisions of the Contract, the City through the City's Project Manager may direct the Contractor to proceed with a change in the Work prior to formal preparation, review, agreement and approval of a Change Order, in order to not delay construction.

1. Architect will prepare and issue a Construction Change Directive which, when signed by the City's Project Manager and the Architect, shall instruct the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
2. Construction Change Directives shall follow procedures specified above in Article titled "CHANGE ORDERS," except that Contractor shall immediately proceed with the change upon receipt of the signed Change Directive.
3. Construction Change Directives shall be incorporated into subsequent Change Order prepared, reviewed and approved as specified in Article above titled "CHANGE ORDERS."
4. All Construction Change Directives shall be subject to modification according to subsequent review, if required, by Authority Having Jurisdiction (AHJ).
5. Should the Construction Change Directive result in disputed costs and time adjustments, such dispute shall be resolved in accordance with the provisions of the General Provisions of the Contract.

1.09 RECONCILIATION OF CHANGE ORDERS

A. **Schedule of Values:** Contractor shall promptly revise the Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjustment to the Contract Sum.

B. **Schedules:** Contractor shall promptly revise progress schedules to reflect changes in Contract Time, revising sub-schedules to adjust time for other items of Work as may be affected by the change. Contractor shall submit revised schedules at the next Application for Payment following approval and acceptance of the Change Order.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

Not applicable to this Section.

END OF SECTION

SECTION 01290

MEASUREMENT AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Procedures for preparation** and presentation of Applications for Payment.

1.02 RELATED DOCUMENTS AND SECTIONS

A. **Agreement Form:** Contract Sum.

B. **General Provisions of the Contract:** Amounts for Progress Payments and Final Payment, retainages and time schedule for presenting Applications for Payment.

C. **Section 01250** - Contract Modification Procedures: Accounting of costs for changes to the Work.

D. **Section 01320** - Construction Progress Documentation: Updated construction progress schedules to be submitted concurrent with Application for Payment.

E. **Section 01770** - Contract Closeout Procedures: Final Payment procedures.

1.03 FORM

A. **Payment Application Form:** Unless otherwise directed, prepare Applications for Payment using American Institute of Architects (AIA) Document G702 - Application and Certification for Payment, edition date as directed by City's Project Manager.

1. Include continuation sheets as necessary, using AIA Document G703 - Continuation Sheet, edition as applicable to edition of AIA Document G702.
2. AIA Documents G702 and G703 are available, for a nominal charge, from most local chapter offices of The American Institute of Architects.

1.04 PREPARATION OF APPLICATIONS

A. **Preparation of Applications for Payment:** The following requirements supplement the provisions of the General Provisions of the Contract.

1. Present required information typewritten on the specified forms.
2. Execute certification by notarized signature of authorized officer of the Contractor.
3. Use data from reviewed and accepted Schedule of Values.
4. Provide dollar value in each column of Application for each line item for portion of Work performed and for products stored, if permitted.

5. List each authorized Change Order as an extension on the continuation sheet, listing the Change Order number and dollar value as for an original portion of Work. No Change Orders shall be included with Application for Payment until approved in writing by Construction Manager.
6. List each Construction Change Directive as each provides for an adjustment in the Contract Sum. Include in the Application only amounts not in dispute.
7. All updated "as-built" drawings for approval by Architect and City.

B. Final Payment: Prepare Application for Final Payment as specified in Section 01770 - Contract Closeout Procedures.

1.05 SUBMISSION OF APPLICATIONS FOR PAYMENT

A. Submission of Applications for Payment: The following requirements supplement the provisions of the General Provisions of the Contract.

1. Submit three (3) copies of each Application for Payment with original signature. Round off values to nearest dollar or as specified for the Schedule of Values.
2. Submit an updated Construction Schedule with each Application for Payment. Refer to Section 01320 - Construction Progress Documentation.
3. Submit Construction and Demolition (C&D) Waste Management Progress Report with each Application for Payment.
4. Submit Chain-of-Custody Certificates for Forest Stewardship Council (FSC) certified wood products if required. Refer to Section 01352 – Construction Waste Management and Disposal.
5. Updated "As-Built" Drawings.
6. Signed Conditional and Un-Conditional Lien Releases.

B. Payment Period: Submit Applications at intervals and covering periods stated in the Agreement. Application submission date may be adjusted by mutual consent of the Construction Manager and Contractor to coincide with regularly scheduled progress meetings or to accommodate holiday periods.

C. Lien Releases: Provide with each Application for Payment, lien releases from all subcontractors, workers and materials suppliers employed for the Project.

1. Lien releases shall cover portion of Work to date for which payment application is made.
2. Lien release forms will be provided by Construction Manager and shall be completed in accordance with directions provided.

D. Certified Payrolls: Provide Certified Payroll documentation with each Application for Payment.

1.06 SUBSTANTIATING DATA

A. Substantiating Data: Submit substantiating information, as required by City's

Project Manager, to substantiate dollar amounts on Application for Payment.

1. Substantiating information will normally be required only for those portions of Work whose completion state cannot be readily determined by observation of the completed Work.
2. Provide one copy of substantiating information with each copy of the Application for Payment.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers the general requirements and procedures for submittals.

A. Submittal Requirements In This Section:

1. Schedule of submittals and transmittals.
2. Deviations.
3. Contractor's review.
4. Corrections and resubmittals.
5. Review.
6. Shop Drawings, samples and product and equipment data.
7. Manufacturers' instructions.
8. Materials furnished under standard specifications.
9. Certificates.

B. Submittal Requirements Not In This Section:

1. Performance and payment bonds, insurance - Conditions of the Contract.
2. Record Drawings, manuals, and maintenance materials - Section 01789.
3. Product Warranties and Bonds - Section 01785.

1.02 GENERAL SUBMITTAL REQUIREMENTS: Submit to the Architect Electronic copies of all submittals. Some submittals may also require full size paper drawings (such as steel shop drawings and fire sprinkler drawings) or require a physical material sample. Submittals shall be correctly prepared, identified, and transmitted as specified herein or as otherwise directed. Prepare submittals according to the requirements herein and as may be specified in other Sections. MSDS sheets are not required and will not be reviewed as part of the submittal. Architect shall return copies to General Contractor and to City's Project Manager in electronic format.

A. Conformance: Do not purchase or commence any Work covered by a submittal until the pertaining submittal is reviewed. Work shall conform to reviewed submittals and all other requirements of Contract Documents unless revised by Modification, in which case submit revised submittals as directed or required at no extra cost to the Owner. Do not start related Work affected by Work covered in submittals where applicable submittals are returned marked **Revise and Resubmit** or **Submit Specified Item** or **Rejected** especially where machinery, equipment, piping, conduit, and required arrangements and clearances are involved.

B. Schedule of Submittals: Submit Progress Schedule within 10 days of the Award of the Contract. The Progress Schedule shall include an itemized listing of all required submittals with a scheduled date for each submittal and shall allow a review period of 10 days by the Architect and up to 15 days by the various Consultants plus time for delivery or return. Contractor shall consult with

Architect regarding major and/or large submittals and time periods required by the Architect for the reviews prior to preparation of the Progress Schedule. Extension of the Contract Time will not be granted because of the Contractor's failure to make timely and correctly prepared and transmitted submittals with an adequate and approved time allowance for the checking and review periods.

C. **Transmittals**: Deliver submittals in version as required by Architect and/or City's Project Manager (Electronic version and/or Paper version) with a dated and sequence numbered transmittal letter typed on Contractor's letterhead, noted as to the initial or resubmittal status, and describing the submittal contents. Submittals are not acceptable directly from Subcontractors, suppliers, or manufacturers. In each transmittal state the Drawing numbers and Specification Section, Articles, and Paragraphs to which the submittal pertains and identify accompanying data, catalogs, drawings, sketches, and brochures in the same manner. Include Transaction Log on Transmittal Form i.e:

To Architect: (Date) _____
To Consultant: _____
From Consultant: _____
To Contractor: _____

D. **Deviations**: Notify the Architect in the transmittals of all deviations from the requirements of the Contract Documents. Fully describe each deviation and all other changes required to correlate the Work including the related Work. State in writing all variations in costs caused by each deviation and the Contractor's assumption of costs for the deviation and of all related costs if any deviation is approved.

E. **Contractor's Review and Approval**: Transmit each submittal in (Electronic version) with AIA Form G810. Every submittal upon which proper execution of the Work is dependent shall bear the Contractor's review and approval stamp, dated and signed by Contractor in every case, certifying that Contractor (a) has reviewed, checked, and approved the submittal and has coordinated the submittal contents with requirements of the Work and Contract Documents including related Work, (b) determined and verified quantities, field measurements, construction criteria, materials, equipment, catalog numbers and identifications, and similar data, or will do so, and (c) states that Work illustrated or described in the submittal is recommended by Contractor and that Contractor's warranty will fully apply thereto. The Architect assumes the Contractor has done all the above and signed the submittal as certification that the proceeding has been undertaken by the Contractor. Architect will return unreviewed submittals not meeting this criteria. Non-compliant submittal may cause Project delays caused by Contractor

F. **Corrections and Re-submittals**: Contractor shall make corrections required by the Architect, resubmit corrected submittals until final review, shall direct specific attention in writing to all revisions other than corrections called for on previous submittals, and shall state in writing all changes in costs for such revisions and assumption of all costs for revisions and related changes the same as is required for deviations in Paragraph "Deviations".

G. **Check of Returned Submittals**: Contractor shall check and review the submittals returned for correction and ascertain whether the required corrections result in extra cost above that included in the Contract and shall give written notice to the Architect within 5 working days if, in the Contractor's opinion, extra costs result from corrections. The Contractor's failure to give such written notice or the starting of any Work covered by a returned submittal constitutes a waiver by the Contractor of claims for extra costs resulting from required corrections.

H. **Review and Approval of Submittals By The Architect**: Submittals (Electronic version) will be reviewed with reasonable promptness (see 1.02B), but only for conformance with the design concept of the Project and with the information indicated on the Drawings and stated in the Specifications. Approval of a separate item as such will not indicate approval of the assembly in which the item functions. Approval of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents or for any revision in resubmittals unless Contractor has given written notice of such deviation or revision at the time of submission or resubmission and written approval has been given to the specific deviation or revision, nor shall approval relieve the Contractor of responsibility for errors or omissions in the submittals or for the accuracy of dimensions and quantities, the adequacy of connections, and the proper and acceptable fitting, execution, functioning, and completion of the Work.

I. **Incomplete or Inadequate Submittals**, including those not correctly transmitted, titled, and identified, or not bearing Contractor's review stamp, will be returned to the Contractor without review.

J. **Interrelated Submittals**: Except where the preparation of submittal information is dependent upon the approval of any prior submittal, all submittals pertaining to the same class or portion of the Work shall be submitted simultaneously.

K. **Expense**: All cost for the preparation, correction, delivery, and return of the submittals shall be borne by Contractor.

1.03 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

A. **Normal Submittals:**

1. The Commissioning Authority will receive a copy of the normal submittals for equipment to be commissioned.
2. The Commissioning Authority will review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrently with review by the Architect and Responsible Engineer.

B. Data for Commissioning:

1. The Contractor will receive a written request from the Commissioning Authority requesting specific information needed about each piece of commissioned equipment or system. This will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
2. The Commissioning Authority may request further documentation necessary for the commissioning process.
3. This data request may be made prior to normal submittals.
4. Much of this information is contained in the regular O&M manual submittals normally submitted in the project and is required prior to the regular formal O&M manual submittals.

C. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority's review.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SHOP DRAWINGS: Prepare each submittal complete including all dimensions, design criteria, materials, connections, bases, foundations, anchors, and the like, and further including such technical and performance data as is necessary to confirm the information in the Shop Drawings. Prepare Shop Drawings (Electronic version) of same size as the Drawings (30" x 42") or 8-1/2" by 11" suitable for reproduction. **Copies of the Contract Drawings marked to show Shop Drawing information are not acceptable.** Each Shop Drawing shall have an adequate title block showing the following identification:

Name and address of the Work.
Name and address of the Contractor.
Name and address of the Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor, as applicable.
Name and address of the Architect.
Date, scale of drawings, and identification number.
Contractor's review and approval stamp, dated and signed.

A. Initial and Resubmittals: Submit Shop Drawings in PDF format with Transmittal sent electronically or in sets consisting of one original reproducible.

B. Correction and Review of Shop Drawings: The Architect will mark on the reproducible prints and return to the Contractor as follows to indicate the action taken:

1. Reviewed: Where submittal is marked “Reviewed”, that part of the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents; final acceptance is contingent on that compliance.
2. Make Corrections Noted: When submittal is marked “Make Corrections Noted”, that part of Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and with the requirements of the Contract Documents; final acceptance is contingent on that compliance.
3. Revise and Resubmit: Where submittal is marked “Revise and Resubmit”, the submittal is not to be used at the project site, or elsewhere where Work is in progress. The submittal information requires additional information as noted and/or required by Contract Documents. Revise in accordance with the notations and submit for an additional review.
4. Submit Specified Item: Do not proceed with any part of the Work covered by the submittal. Prepare a new submittal in accordance with the notations and submit for review.
5. Rejected: When a submittal is marked “Rejected”, information submitted is not in compliance with Contract Documents. Resubmit submittal as required in the Contract Documents.

C. **Final Distribution**: Furnish and distribute prints of review Shop Drawings (Electronic version) as required for performance of the Work and distribute prints as required of Shop Drawings marked “Reviewed” or “Make Corrections Noted” for performance of the Work.

3.02 SAMPLES: Unless otherwise specified, each submittal shall include (3) three complete sets of Samples. Two sets of approved Samples and all disapproved Samples will be returned to Contractor. Samples of value retained by Architect will be returned to Contractor after completion of the Work if the Contractor's first transmittal for the Sample requests its return. Approved Samples of items returned to Contractor may be installed in the Work if the location is recorded and the Samples bear temporary identification as such.

3.03 PRODUCT AND EQUIPMENT DATA SUBMITTALS:

A. **Product Data** shall include materials lists, catalogs, brochures, performance and technical data, service history, characteristics, and like information to fully describe the products covered by the submittal.

1. Submittal Preparation. Bind submittal copies with sturdy labeled covers and include a typed index listing the contents. Loose or unbound submittals will be returned unreviewed. For each item listed, include the manufacturer's name and address, the trade or brand name, all conditions of manufacturer's guarantee and warranty, information to fully describe each item, and supplementary information as may be required for approval. Mark clearly and completely cuts, brochures, and data to indicate the items proposed and the intended use.
2. Product Data Submittals. Unless otherwise specified, every submittal shall include four bound copies. One copy will be returned to the Contractor marked to indicate the action taken. If corrections are required, the final submittal shall include four bound corrected copies.

B. **Equipment Data**: Submit complete technical, performance, and catalog information for every item of mechanical and electrical equipment and machinery proposed for installation in the Work. Deliver (both paper version and electronic version) bound, indexed, and containing information and data as required in Paragraph "Product Data" above. Include information on performance and operating curves, ratings, capacities, characteristics, power efficiencies, manufacturers' standard guarantees and warranties with the terms and conditions fully described, and all other information to fully illustrate and describe the items as may be specified or required for approval. Submit in sets which cover complete systems or functioning units. Unless otherwise specified, submittals shall be as specified in Subparagraph “Product Data Submittals". If applicable, incorporate the equipment data into and submit with the manuals specified under Section 01700.

3.04 MANUFACTURERS' INSTRUCTIONS: Submit manufacturers' installation instructions and directions for materials specified to be installed in accordance with such instructions to demonstrate the adequacy of the instructions. Furnish copies to all trades involved.

3.05 MATERIALS FURNISHED UNDER STANDARD SPECIFICATIONS: For materials specified by reference to standard or reference type specifications, prepare and submit for approval a list of such materials by manufacturer's names and identifications to the extent requested by the Architect or Owner.

3.06 CERTIFICATES: Deliver in (Both paper version and electronic version) all certificates to Architect. Each certificate required under the Contract Documents shall be signed by the individual, officer, or the agent lawfully authorized to execute the certificate, and such authority shall be cited in the certificate by title, description, or other acceptable evidence. All certificates shall be sworn and notarized as to the correctness and validity of the contents, and copies shall be notarized to be true copies.

END OF SECTION

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 CONSTRUCTION PROGRESS SCHEDULE

A. **Construction Progress Schedule:** Within 14 days of receiving the Notice to Proceed, the Contractor shall prepare a baseline Construction Progress Schedule using software program such as Suretrack, P3 or MS Project (or as acceptable to City's Project Manager) for review and approval by the City's Project Manager.

B. **Format:** Bar chart. Include listings in chronological order according to the start date for each activity.

1. Identify each activity with the applicable Specification Section Number.
2. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction, particularly all Critical Path items.
3. Identify work of separate stages and other logically grouped activities.
4. Include conferences and meetings in schedule.
5. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
6. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
7. Indicate delivery dates for owner-furnished products.
8. Coordinate content with Schedule of Values specified in Section 01290 - Measurement and Payment Procedures.
9. Provide legend for symbols and abbreviations used.

C. **Schedule Size:** When printed, maximum 22" x 17" (560 x 432 mm) or width as necessary. Text shall be legible when printed and minimum 8.5 point font size.

1. Sheets shall fold neatly to multiple of 8-1/2" x 11" (216 x 280 mm) for filing.
2. Scale and spacing in content shall allow for notations and revisions.
3. Include each submitted schedule also in digital form for use by Project team.

D. **Recovery:** If at any time project completion is ten or more working days behind schedule, the Contractor shall submit a recovery schedule, subject to approval, showing how the original completion date will be met.

E. **Weather:** Contractor's baseline schedule shall incorporate seven (7) anticipated weather days during the period from initial site work through the Date of Substantial Completion, affecting any work on the critical path. Unused weather allowance days become jointly owned.

1.02 REVIEW AND EVALUATION OF SCHEDULE

A. Review: Participate in joint review and evaluation of schedule with Construction Manager and Architect, as necessary or requested.

B. Evaluation: Evaluate project status to determine Work behind schedule and Work ahead of schedule.

C. Revision: After review, revise schedule as necessary as result of review, and resubmit within 5 working days.

1.03 UPDATING CONSTRUCTION PROGRESS SCHEDULE

A. Maintenance of Construction Progress Schedule:

1. Update Construction Progress Schedule weekly to record actual start and finish dates of completed activities.
2. Indicate progress of each activity to date of revision, with projected completion date of each activity.
3. Annotate diagrams to graphically depict current status of Work.
4. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
5. Indicate changes required to maintain Date of Completion.
6. Submit reports required to support recommended changes.

B. Narrative: Prepare and submit narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

1.04 DISTRIBUTION OF SCHEDULE

A. Distribution of Schedule:

1. Distribute copies of updated schedules to Construction Manager (two copies), Architect, Contractor's project site file, and to Subcontractors and suppliers.
2. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01350

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **General requirements and procedures** for compliance during construction with requirements of CCR Title 24, Part 11: 2022 California Green Building Standards Code (CALGreen Code) with July 2024 Supplement and the City of Ontario Construction and Demolition Recycling Plan (CDRP).

B. **Contractor shall be responsible** for completion and transmission to City's Project Manager and Architect documents developed during construction (submittals) necessary for completion and verification of the Application Checklist for Building Standards Code (BCS), in compliance with 2022 CALGreen Code and the City of Ontario Construction and Demolition Recycling Plan (CDRP).

1.02 RELATED SECTIONS

A. **Section 01352 - Construction Waste Management and Disposal:** Waste management controls and systems and compliance with City of Ontario CDRP.

B. **Section 01353 - Indoor Air Quality Management:** Indoor Air Quality (IAQ) management procedures and requirements.

C. **Section 01600 – Products and Materials:** Storage and protection of materials and equipment.

D. **Section 01910 - General Commissioning Requirements:** Requirements for CALGreen Code commissioning activities.

E. **Divisions 2 through 16 Sections:** Specific requirements for submittals demonstrating compliance with CALGreen requirements specific to the Work specified in each of these Sections.

1.03 DEFINITIONS

A. **Rapidly Renewable Materials:** Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

B. **Regionally Manufactured Materials:** Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

C. **Regionally Extracted, Harvested, or Recovered Materials:** Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.

D. **Recycled Content:** The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.04 SUBMITTALS

A. **CALGreen Compliance Submittals:** Make sustainable design-related submittals as specified in Division 2 through 16 Sections.

1. Comply with general requirements for submittals specified in Section 01300 - Submittal Procedures.
2. Prepare and submit Checklist for California Green Building Standards Code (CALGreen) including specific items specified in Article 3.1, below.
3. Sustainable design (CALGreen) submittals are in addition to submittals specified in other Sections.
4. Make submittals as Adobe Acrobat Portable Document Format (PDF) electronic files.

1.05 CONFERENCES

A. **Coordination Meetings:** Comply with general requirements for project meetings specified in Section 01200 - Project Management and Coordination. Conduct two onsite CALGreen Coordination Meetings.

1. Initial Coordination Meeting: Conduct pre-construction meeting to review CALGreen Implementation Plan. This includes mandatory participation by critical subcontractors.
2. Second CALGreen Coordination Meeting: Conduct Contract Closeout meeting to exchange outstanding documentation and to confirm final performance data.

PART 2 - PRODUCTS

Not Applicable to this Section

PART 3 - EXECUTION

3.01 CHECKLIST FOR CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGREEN)

A. **Completion of Checklists for** California Green Building Standards Code (CALGreen): Contractor shall complete this checklist and related tables for construction materials, with additional input from Architect for design-related requirements.

B. **Construction Waste Reduction, Disposal and Recycling:** In compliance with CALGreen 5.408.1, as specified in Section 01352 - Construction Waste Management and Disposal. Minimum C&D waste diversion rates are 65% by weight. Follow the City of Ontario Construction and Demolition Recycling Plan (CDRP) including requirements for deposits and administrative fees. Prepare report of waste diversion for reimbursement.

C. **Finish Materials Pollutant Control:**

1. Indoor Air Quality (IAQ) Control: In compliance with CALGreen A5.405.1 and as specified in Section 01353 - Indoor Air Quality Requirements. Include MERV 8 Filters installed prior to occupancy for HVAC outside and return air.
2. Adhesives, sealants and caulks: Comply with CALGreen Table 5.504.4.1, including South Coast Air Quality Management District (SCAQMD) Rule 1168 for VOC limits and CALGreen Tables 5.504.4.1 and 5.504.4.2.
3. Paints and coatings: Comply with CALGreen Table 5.504.4.3, including South Coast Air Quality Management District (SCAQMD) Rule 1116 for VOC limits, unless more stringent requirements are specified.
4. Carpet system: Comply with CALGreen 5.504.4.4, including testing and product requirements of CALGreen 5.504.4.4
   a. If used, carpet cushion shall comply with Carpet and Rug Institute Green Label Program.
   b. Adhesives used for carpet installation shall comply with requirements of CALGreen Table 804.4.1.
5. Composite wood products: Comply with CALGreen 5.504.4.5, including limitations on formaldehyde content in CALGreen Table 5.504.4.5 and in compliance with California Air Resources Board (CARB) Air Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products.
6. Resilient flooring system: Comply with CALGreen 5.504.4.6, including compliance with material list or product registry under 2009 Edition, California CHPS (Collaborative for High Performance Schools) (CA-CHPS) or certification under Floor Score Program of the Resilient Floor Covering Institute, for Tier 1.

END OF SECTION

SECTION 01352

CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **This Section specifies requirements** for the Contractor's implementation of demolition and construction (C&D) waste management controls and systems for the duration of the Work. The Ontario Municipal Ordinance (OMC) Sec. 6-3.602 Construction and Demolition Recycling Plan and 2022 California Green Building Standards Code (CALGreen) require all building and demolition permit applicants to submit a Construction and Demolition Recycling Plan (CDRP) and Construction and Demolition Recycling Plan (CDRP) Summary Report. **Fill out "FORM CDRP and submit to the Ontario Municipal Utilities Company-Solid Waste Department for approval PRIOR TO PULLING PERMIT**. The intent is to develop and implement a waste management plan, quantifying material diversion by either weight or volume to recycle and/or salvage at least 65 percent of non-hazardous construction and demolition debris. Technical assistance is available by calling 909-395-2664.

B. **Waste Management Objective for the Project:**

1. The intent is to develop and implement a waste management plan, quantifying material diversion from landfill by either weight or volume to recycle and/or salvage at least 65 percent of non-hazardous construction and demolition debris, in order of preference 1) weight, 2) volume, whichever is most feasible to measure.
2. Provide contract documents, including C&D waste management plan, to show evidence of recycling, and reuse of recovered materials in compliance with Section 5.408.1 of CALGreen Code.
3. Inform City's Project Manager where C&D Waste Management requirements could detrimentally impact C&D schedule.
4. In Schedule of Values provide separate itemization of cost related to C&D Waste Management.
5. Comply with LEED Version 2009 MR Credit 2 Construction Waste Management.

1.02 RELATED SECTIONS

A. **Section 01350** – Sustainable Design Requirements

B. **Section 01353** - Indoor Air Quality (IAQ) Management.

A. **Section 01500** - Construction Facilities and Temporary Controls

B. **Section 01770** - Contract Closeout Procedures: Cleaning for final review and Contract closeout.

1.03 REFERENCES

A. **California Code of Regulations, Title 24, Part 11:** 2016 California Green Building Standards Code (CALGreen Code), including Amendments.

B. **The California Integrated Waste Management Board** (CIWMB), including the California Materials Exchange (CalMAX), Telephone 877-520-9703; www.ciwmb.ca.gov/calmax/.

C. **City of Ontario** technical assistance is available by calling 909-395-2651 or in person at the Ontario Municipal Utility Company-Integrated Department at 1425 Bon View Avenue, Ontario, CA 91761 or email tcoates@ontario.gov.

D. **State of California, Department of Toxic Substances Control (DTSC).**

1.04 DEFINITIONS

A. **Inert Fill:** Permitted facility that accepts inert waste such as asphalt and concrete exclusively.

B. **Class III Landfill:** Landfill that accepts non-hazardous waste such as household, commercial, and industrial waste, including construction, remodeling, repair, and demolition operations.

C. **Construction and Demolition Waste:** Including solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting form construction, remodeling, repair, and demolition operations.

1. Rubbish: Including both combustible and noncombustible wastes, such as paper, boxes, glass, crockery, metal and lumber scrap, tin cans, and bones.
2. Debris: Including both combustible and noncombustible wastes, such as leaves and tree trimmings that result from construction or maintenance and repair work.

D. **Weight Conversion Factor:** It is the rate set forth in the Weight Conversion Factors published by The California Integrated Waste Management Board (CIWMB), for the use in estimating the volume or weight of materials identified in the C&D Waste Management Plan.

E. **Deconstruction:** Process of removing existing building materials from renovation and demolition projects for the purposes of reuse, and recycling, in a efficient and safe manner possible.

F. **Divert:** Using material for any purpose other than disposal in a landfill.

G. **Waste Materials:** Large and small pieces of listed materials which are excess to contract requirements and generally include materials to be recycled and/or recovered from existing construction and items of trimmings, cuttings, and

damaged goods resulting from new installations, which can be effectively used in the Work.

H. Reuse: Using a material or product that is recovered from construction, renovation, or demolition activities.

I. Recycling: Process of collecting and preparing recyclable materials in their original form or in manufacturing processes that do not cause the destruction/contamination of recyclable materials in a manner that precludes further use.

J. Recovery: Any process that reclaims materials, substances, energy, or other products contained within or derived from waste on-site. It includes waste-to-energy, composting, and other processes.

K. Sources Separation: Sorting the recovered materials into specific material types with no or a minimum amount of contamination on site.

L. Time-Based Separation: Collecting waste during each phase of construction or deconstruction which results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.

M. Commingled or Off-site Separation: Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types in an off-site facility.

1.05 CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT

A. Construction and Demolition (C&D) Waste Management Objective for the Project:

1. Factors that contribute to waste, such as over-packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized.
2. Of the inevitable waste that is generated, as much of the waste materials as economically feasible shall be reused or recycled. Waste disposal in landfills shall be minimized.
3. Excavated soil and land-clearing debris do not contribute to this credit.
4. Incineration does not contribute to this credit.

B. Diversion From Landfill: Waste categories appropriate for diversion from landfill shall include, but not be limited to, the following:

1. Wood: Clean dimensional wood, palette wood.
2. Sheet Wood: Plywood, OSB and particle board.
3. Concrete and concrete washout waste.
4. Asphalt Concrete.
5. Paper.
   a. Bond.

b. Newsprint.
c. Cardboard and paper packaging materials.

6. Metals.
   a. Ferrous.
   b. Non-ferrous.
7. Paint.
8. Rigid Foam.
9. Glass.
10. Plastics.
11. Carpet and pad.
12. Beverage containers.
13. Insulation.
14. Gypsum Board.
15. Porcelain Plumbing Fixtures.
16. Fluorescent Light Tubes (per Dept. of Toxic Substances Control regulations).

1.06 SUBMITTALS

A. Construction and Demolition (C&D) Waste Management Plan: Contractor shall submit plan containing information specified below under Article titled "Construction Waste Management Plan" before completion of Plan Check Review and issuance of Building Permit by Authority Having Jurisdiction (AHJ).

B. Construction and Demolition (C&D) Waste Management Progress Reports: Concurrent with each Application for Payment, Contractor shall prepare and submit Construction and Demolition (C&D) Waste Management Progress Reports as specified below in Article titled "Construction and Demolition (C&D) Waste Management Reports".

C. Waste and Demolition (C&D) Management Final Report: Prior to filing of Notice of Completion, Contractor shall prepare and submit written Construction and Demolition (C&D) Waste Management Final Report as specified below in Article titled "Construction and Demolition (C&D) Waste Management Reports".

D. Other Submittals:

1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
3. 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.
4. 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.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable regulations and policies of California Integrated Waste Management Board (CIWMB). A compendium of regulations and statutes is available at www.ciwmb.ca.gov/Publications.

B. Disposal Site, Recyclers and Waste Materials Processors: Use only facilities properly permitted by the State of California, and/or by local authorities, AND have published landfill diversion rates.

1.08 CONFERENCES AND MEETINGS

A. Meetings:

1. Contractor shall conduct Construction and Demolition (C&D) Waste Management meetings with subcontractors who generate construction waste.
2. Contractor shall present current status of the Construction and Demolition (C&D) Waste Management Report at regular job-site meetings. Refer to requirements specified in Section 01200 - Project Management and Coordination.

1.09 STORAGE AND HANDLING

A. Storage and Handling, General: In addition to requirements specified in Section 01600 - Product and Materials, comply with the following.

B. Site Storage:

1. Remove materials for recycling and recovery from the work locations to approved containers or storage area as required. Failure to remove waste or recovered materials will be considered cause for withholding payment and termination of Contract.
2. Position containers for recyclable and recoverable waste materials at a designated location on the Project Site. If materials are sorted on site, also provide a sorting area and necessary storage containers.
3. Change-out loaded containers for empty containers, as demand requires.
4. If recovered materials are stored on-site for project duration provide adequate security from pilferage.

C. Handling:

1. Deposit indicated recyclable, and recoverable materials in storage areas or containers in a clean (no mud, adhesive, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers until such time as such materials have been cleaned.
2. Ensure all recovered materials are made safe for handling and storage.

3. If the contamination chemically combines with the material so that it cannot be cleaned, do not deposit into the recycle containers. In such case, request resolution by the C&D Quality Manager for disposal of the contaminated material. Directions from the C&D Quality Manager do not relieve the Contractor of responsibility for compliance with all legal and regulatory requirements for disposal, nor shall such directions cause a request for modification of the Contract.

1.10 PROJECT CONDITIONS

A. Environmental Requirements:

1. Document site's existing natural, historical, and cultural features and make specific plans to preserve them. Coordinate with existing conditions documentation specified in Section 01010 - Summary of the Project.
2. Explain methods of protecting vegetation, such as designating access routes and parking.
3. Specify which areas of the site should be kept free of traffic, equipment, and storage.
4. Transport recyclable and recoverable waste materials from the Work Area to containers and carefully deposit in the containers without excess noise and interference with other activities, to minimize noise and dust.
5. Ensure adequate erosion control and storm water control, if required, to prevent or minimize the negative impact to its surrounding environment.
6. Provide measures to ensure containment of lead-based paint and dust, nails, asbestos-based products and any biological contaminants that may affect environmental health and safety conditions.

B. Site Conditions:

1. Signs and instructions should be clear, and easy to understand. All recycling containers should be clearly labeled and lists of acceptable and unacceptable materials will be posted throughout the site. Whenever possible, they should be in multiple-languages, especially in Spanish, and in graphic symbols.
2. Contractor shall ensure the safety of all personnel involved in the C&D process.
3. Prepare and submit C&D Site Management Plan that includes the following:
   a. Work areas.
   b. Materials processing areas.
   c. Materials storage and disposal areas.
   d. Toilet facilities, including worker hand-washing and changing stations.
   e. First aid.
   f. Fire and medical emergency contact information.
   g. Hazardous waste management.

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

3.01 CONSTRUCTION & DEMOLITION (C&D) WASTE MANAGEMENT PLAN

A. Construction and Demolition (C&D) Waste Manager: Contractor shall designate on-site party (or parties) responsible for instructing workers and subcontractors and overseeing and documenting results of C&D Waste Management for the Project.

B. Construction and Demolition (C&D) Waste Management:

1. Contractor shall be responsible for ensuring that construction and demolition debris is disposed of at appropriately designated licensed solid waste disposal facilities.
2. Contractor shall direct each Subcontractor to be responsible for segregating wastes into different disposal containers according to the Waste Management Plan.

C. Construction and Demolition (C&D) Waste Management Plan: With regard to goals for C&D waste management, Contractor shall develop, for review and acceptance by City's Project Manager, a Waste Management Plan specific for the Project. Plan shall contain the following at a minimum:

1. Analysis of the proposed jobsite C&D waste to be generated, including types and rough quantities. Indicate proposed methods to recover at least 65 percent of the C&D wastes for reuse and recycling.
2. Indicate compliance with requirements specified above in Article titled "QUALITY ASSURANCE".
3. Coordinate recovery efforts in C&D Waste Management Plan with Project construction schedule.
4. Include list of reuse facilities, recycling facilities and processing facilities that will be receiving recovered materials (including take-back by City or on-site auctions.).
5. If some materials will be donated or sold at on-site auctions, describe process and identify organizations that may receive materials.
6. Identify materials that are not recyclable or not recovered which will be disposed of in a landfill (or other means in compliance with applicable State of California and local ordinance and regulations) and explain why materials are not recovered.
7. List permitted landfill or other permitted disposal facilities that will be accepting disposed waste materials.
8. Indicate instances or situations where compliance with requirements specified in this Section do not apply or do not appear to be feasible.
9. Identify each type of waste material to be reused or recycled and estimate amount, by weight or volume.

10. Provide estimate of time requirements for demolition and for removal of valuable reusable items and materials.
11. Prepare building engineering survey and worker safety plan, assessment of building conditions and all potential hazards.
12. Provide final accounting of disposition of recovered materials upon completion of project for final payments.
13. Landfill Options: Name of landfills where trash and building debris will be disposed of, the applicable landfill tipping fees, and the projected cost of disposing of all Project waste in the landfills.
14. Landfill Certification: Contractor's statement of verification that landfills proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive waste from this project.
15. Alternatives to Landfilling: A list of each material proposed to be salvaged or recycled during the course of the Project. Include the following and any additional items proposed:
    a. Cardboard.
    b. Clean dimensional wood. If means of diversion is Wood Derived Fuel (WDF) refer to submittal requirements below.
    c. Beverage containers.
    d. Concrete.
    e. Slurry wall materials.
    f. Bricks, stones, tile and masonry.
    g. Asphalt.
    h. Metals from framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
    i. Mechanical and electrical equipment.
    j. Building components which can be removed relatively intact from existing construction.
    k. Packaging materials.
    l. Glass.
    m. Scraps from new gypsum wall board.
    n. Carpet and cushion (pad).
    o. Acoustical ceiling panels.
    p. Plastics.
    q. Vegetation.
16. Materials Handling Procedures: Description of means by which C&D waste materials identified above will be protected from contamination, and description of means to be employed in recycling above materials consistent with requirements for acceptance by designated facilities.
17. Transportation: Description of means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials.

D. Distribution: Contractor shall distribute copies of the Construction and Demolition (C&D) Waste Estimate and Construction and Demolition (C&D) Waste Management Report forms to the Job Site Foreman, each Subcontractor, Construction Manager and Project Inspector.

E. Materials Handling Procedures: Provide means by which waste materials will be protected from contamination and means to be employed in reuse or recycling of waste material consistent with requirements for acceptance by receiving facilities.

1. Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of according to local regulations, and in accordance with specifications for such work as may be included in this Project.
2. Instruction: Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at appropriate stages of the Project.

3.02 CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT REPORTS

A. Construction and Demolition (C&D) Waste Management Progress Reports: Concurrent with each Application for Payment, Contractor shall prepare and submit a written Waste Management Progress Report in the same format as required for Final Report. Attach delivery receipts for recovered materials and waste materials sent to the permitted recycling facilities, processing facilities or landfill with the following information:

1. Name of firm accepting the recovered materials or waste materials.
2. Specify type of facility (e.g. retail facility, recycler, processor, Class III landfill, MRF).
3. Location of the facility.
4. Type of materials.
5. Net weights (or volume) of each type of material.
6. Date of delivery.
7. Value of the materials or tipping fee paid.

B. Construction and Demolition (C&D) Waste Management Final Report: Prior to filing of Notice of Completion, Contractor shall prepare and submit written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan.

C. Construction and Demolition (C&D) Final Waste Management Report: Upon completion of Work, including final cleanup, prepare and submit Final Waste Management Report. Develop and use C&D Waste Management Report Form in electronic (spreadsheet) format, using software as acceptable to Construction Manager and City. Include the following:

1. Total quantity of each waste material generated and date(s) removed from job-site.
2. Percent of total quantity generated of each material sent to landfill, identity of the landfill (receiving facility), handling costs, transport costs, tipping fees paid at landfill and total landfill costs. Attach copies of manifests, weight tickets, receipts, and invoices.
3. For each material reused or recycled from the Project, include percent of total quantity generated, identity of receiving facility, total costs of handling and transportation and income. Attach manifests, weight tickets, receipts, and invoices.

4. Contractor shall edit and use C&D Waste Management Report Form as basis for Contractor's submittals.

3.03 RECYCLING, SALVAGE AND RE-USE

A. Recycling, Salvage and Re-Use: Waste Material management shall be implemented in priority as reuse on-site, recycle on-site, reuse off-site, and recycle off-site. Other innovative approaches to achieve the minimum diversion rate are encouraged and should be specified and described in the C&D Waste Management Plan. Minimum diversion rate may be achieved by recovering and recycling the following materials for salvage or re-use:

1. Asphaltic concrete (a.c.).
2. Concrete and concrete masonry, including portland cement tile backer board, portland cement plaster and portland cement mortar.
3. Brick, stone and tile materials.
4. Ferrous metal.
5. Non-ferrous metals: Copper, aluminum, brass and bronze.
6. Untreated lumber.
7. Plywood, OSB, wood fiber board and wood particle board.
8. Gypsum board scrap, including gypsum sheathing.
9. Paper and cardboard.
10. Beverage containers.
11. Insulation, batt.
12. Insulation, rigid foam.
13. Glass.
14. Carpet and pad and carpet tile.
15. Plumbing fixtures.
16. Windows.
17. Doors.
18. Cabinets and casework.
19. Architectural fixtures.
20. Millwork, paneling and other similar interior finishes.
21. Electric fixtures, motors, switch gear and other similar equipment.
22. HVAC equipment, duck work, control systems, switches and other similar equipment.
23. Other materials as appropriate.

B. Recycling Incentives: Revenues from recycling waste materials shall accrue to Contractor. Rebates, tax credits, and other incentives received for recycling waste materials shall accrue to City.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site.
   a. List acceptable and unacceptable materials at each container and bin.

b. 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 off City's property and transport to recycling receiver or processor.
6. Comingled waste placed in comingled containers will be acceptable.

D. Wood Collected for Reuse: Sorted by the following.

1. Type.
2. Size, dimension.
3. Protected from the ground, bending, and moisture.

3.04 DISPOSAL OF SPECIFIC CONSTRUCTION AND DEMOLITION (C&D) WASTE

A. Beverage Containers: Used by on-site workers, redeemed at recycling center.

B. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

C. Vegetation: Including branches and trunks shrubs and trees. Comply with City's directions through Construction Manager for disposal or vegetative waste.

1. Chip brush, branches, and trees on-site.
2. Comply with requirements specified in Section 02900 - Plants for use of chipped organic waste as organic mulch.

D. Asphaltic Concrete Paving: Place in separate containers and transport offsite to authorized facility for recycling.

E. Portland Cement Concrete: Place in separate containers and transport offsite to authorized facility for recycling.

F. Masonry:

1. Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
2. Clean and stack undamaged, whole masonry units on wood pallets for recycling off site.
3. Place broken or damaged masonry in separate containers and transport offsite to authorized facility for recycling.

G. Lumber and Construction Panels: Sort and stack wood framing and construction panels according to type and size. Separate lumber, engineered wood products, panel products (plywood and wood fiber board) and treated wood materials.

1. Clean Cut-Offs: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements specified in Section 02900 - Plants for use of clean sawdust as organic mulch.

H. Metals: Separate metals by type.

1. Structural Steel: Sort and stack members according to type of member, size and length.
2. Remove and sort dispose of bolts, nuts, washers and other rough hardware according to metal type.

I. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

J. Doors and Hardware: Remove doors and frames as assembled units. Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

K. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

L. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
2. Acoustical Ceiling Panel Recycling: Demolition and construction waste pulpable mineral fiber ceiling panels may be recycled by Armstrong World Industries and US Gypsum. Contact Armstrong at 1-877-ARMSTRONG (1-877-276-7876) or www.armstrong.com or contact USG at 1-800-USG-4YOU or www.usg.com, to coordinate recycling efforts, apply for product approvals, and receive reclamation procedure requirements.

M. Carpet, Carpet Cushion (Pad) and Carpet Tile: Demolition and construction waste carpet and carpet padding may be recycled by Carpet America Recovery

Effort (CARE). Visit www.carpetrecovery.org to locate carpet reclaimers in local project area and reclamation procedure requirements.

1. Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
2. Store clean, dry carpet, cushion and carpet tile in closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

N. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

O. Plumbing Fixtures: Separate by type and size.

P. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

Q. Lighting Fixtures: Separate lamps by type and protect from breakage.

R. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

S. Conduit: Reduce conduit to straight lengths and store by type and size.

3.05 DISPOSAL OF CONSTRUCTION AND DEMOLITION (C&D) WASTE

A. Disposal of Construction and Demolition (C&D) Waste: 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.

C. Disposal: Transport waste materials off City's property and dispose of materials legally in Class III Landfill.

D. Disposal or Recycling Documentation: All materials disposed or recycled shall be have documented quantity records in tons, pounds or cubic yards through certified waste disposal records, hazardous waste manifests or other acceptable means of documentation.

END OF SECTION

SECTION 01353

INDOOR AIR QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **This Section specifies Indoor Air Quality** (IAQ) management procedures during construction, in compliance with CCR Title 24, Part 11: 2022 California Green Building Standards Code (CALGreen Code), including July 2024 Amendments.

B. **Contractor shall develop procedures and** maintain the project site to eliminate and mitigate potential sources of indoor air pollutants to enhance the indoor air quality of the project site and the finished, occupiable building

1.02 RELATED SECTIONS

A. **Section 01320 - Construction Progress Documentation:** Meetings and project documentation.

B. **Section 01350 - Sustainable Design Requirements:** General requirements and procedures for compliance with 2022 California Green Building Standards Code (CALGreen Code), including July 2024 Amendments.

C. **Section 01500 - Construction Facilities and Temporary Controls:** Requirements for dust and debris barriers.

D. **Section 01910 - General Commissioning Requirements:** Commissioning activities in compliance with 2022 California Green Building Standards Code (CALGreen Code), including July 2024 Amendments.

1.03 DEFINITIONS

A. **Definitions:** Pertaining to sustainable development, as defined in ASTM E 2114.

B. **Adequate Ventilation:** Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. **Hazardous Materials:** Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. **Indoor Air Quality (IAQ):** The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

E. **Interior Final Finishes:** Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, and ceilings.

F. **Packaged Dry Products:** Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

G. **Wet Products:** Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.04 SUBMITTALS

A. **Indoor Air Quality (IAQ) Management Plans:** Prepare and submit IAQ Management Plans demonstrating compliance with CCR Title 24, Part 11: 2022 California Green Building Standards Code (CALGreen Code), including July 2024 Amendments.

1. Confirm whether permanently installed air handling equipment was used during construction
2. Submit product data for temporary filtration media and filtration media used during occupancy (include manufacturer, model #, MERV rating, and location of installed filter)

PART 2 - PRODUCTS

Not applicable to this Section

PART 3 - EXECUTION

3.01 INDOOR AIR QUALITY (IAQ) MANAGEMENT

A. **Indoor Air Quality (IAQ) Management:** Contractor shall manage and protect indoor air quality, including performance of the following:

1. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.

a. Minimize accumulation of dust and debris which may become airborne and infiltrate the heating, ventilating and air conditioning system.
b. Conduct thorough progress and final completion cleaning to remove dust from interior surfaces.

2. Protect stored on-site or installed absorptive materials from moisture damage, including materials such as insulation, carpeting, ceiling tile and gypsum wallboard. Coordinate with requirements for temporary dust and debris barriers specified in Section 01500 - Temporary Facilities and Controls.
3. Protect from intrusion by dust, water and debris all heating, ventilating and air conditioning equipment, ductwork and other related air distribution component openings by closing all openings with tape, durable plastic sheeting, sheet metal or other methods as acceptable to Authority Having Jurisdiction (AHJ). Provide protection during shipping and handling, storage on the construction site, installation and operational adjustments and testing, until final startup.
4. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999
5. Replace all filtration media immediately prior to Completion review.
6. Prohibit smoking inside the building and within 25 feet of building entrances once the building is closed-in.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers general requirements for quality control of the Work, including testing and inspection procedures.

A. Requirements In This Section:

1. Testing laboratory or agency.
2. Geotechnical (Soils or Foundation) Engineer.
3. Coordination of tests and inspections.
4. Test costs and reports.
5. Inspections, continuous and special.
6. Contractor-furnished assistance.
7. Verification of conditions.

B. Requirements Not In This Section:

1. Specific test procedures in other Sections to be performed in accordance with this Section.
2. Testing of electrical work.
3. Testing of materials specified to be tested by other agencies under other section.

1.02 GENERAL QUALITY CONTROL REQUIREMENTS:

A. General Test Requirements: Materials to be furnished under the Contract are subject to testing and inspection for compliance with requirements of Drawings and Specifications.

B. Testing Laboratory or Agency shall be the licensed Testing Laboratory or Agency, being acceptable to the City having jurisdiction and certified as meeting the requirements of ASTM D3666, D3740, E329, E543, and E548 as applicable to the Work and approved by the Owner and referred to hereafter as the Testing Laboratory. Perform all testing under supervision and control of a California registered professional engineer employed by Testing Laboratory.

C. Soils or Foundation Engineer will be the registered professional Geotechnical Engineer employed and paid by Owner.

D. Disqualified Material: Any material shipped or delivered to the site by the Contractor from the source of supply prior to having satisfactorily passed the required testing and inspection, or prior to the receipt of a notice from the Architect that such testing and inspection will not be required, shall not be incorporated in the Work.

1.03 COORDINATION OF TESTS AND INSPECTIONS: Contractor shall initiate and coordinate testing and inspections required by Contract Documents and public authorities having jurisdiction of the Work.

A. **Notification**: Contractor shall notify the Owner a sufficient time in advance of the manufacture of material to be supplied by him which, by requirements of the Contract Documents, must be tested at the source of supply in order that the Owner may arrange for the testing.

1.04 TEST SAMPLES AND PROCEDURES:

A. **Test Samples**: Furnish and deliver Samples of materials to be tested at no extra cost to Owner. Test samples will be selected by the Architect, Inspector, or Testing Laboratory and not by the Contractor.

B. **Test Procedures**: Testing Laboratory shall perform tests according to ASTM or other methods of test specified for the various materials under other Sections. If no procedure or test method is specified, testing shall conform to material specification referenced unless otherwise directed by Architect. The Testing Laboratory shall tag, seal, label, record, or otherwise suitably identify the materials for testing and no such materials shall be used in the Work until the test result reports are submitted and approved, excepting only the materials specified to be placed or installed prior to testing.

C. **Test Repeating**: Repeat applicable tests at specified intervals, whenever the source of supply is changed, or whenever the characteristics of the materials change or vary in the opinion of Owner or Architect.

1.05 TEST COSTS: Owner will pay for testing performed by Testing Laboratory except Contractor shall reimburse the Owner for retesting costs caused by failure of materials to pass initial tests. Contractor shall arrange and pay for all other testing.

1.06 INSPECTION AND TEST REPORTS: Furnish copies of each inspection and test result report, signed and certified by the Testing Laboratory supervising engineer, as follows:

	Copies
Owner	1
Architect	1
Structural Engineer (structural inspection and test only)	1
Contractor	2
Building Department	1

1.07 INSPECTIONS, CONTINUOUS AND SPECIAL:

A. **Inspections**, continuous and special, shall be performed by Registered Deputy approved by Agency, or Special Inspectors (hereinafter referred to as the Inspector) as required by the Contract Documents and Building Code. During course of Work under inspection, each Inspector shall submit detailed reports relative to progress and condition of Work including variances from the Contract Documents, and stipulating dates, hours, and locations of the inspections.

B. **Inspection Costs**: Owner will employ Inspector and pay for required continuous and special inspections.

C. **Reimbursement of Inspection Costs**:

1. Contractor's failure to complete the Work within the Contract Time stated in the Agreement, and any previously authorized extensions thereof.
2. Claims between separate contractors.
3. Covering of any of the Work before the required inspections or tests are performed.
4. Extra inspections required for Contractor's correction of defective Work.
5. Overtime costs for acceleration of Work done for Contractor's convenience.

D. **Approvals Required by Others**: If the laws, ordinances, rules, regulations, or orders of any public agency having jurisdiction require any of the Work to be specifically inspected, tested, or approved by some authority other than the Owner, Architect, or Contractor, the Contractor shall give all required notices and make all arrangements, shall deliver to the Architect the certificates of inspection, testing, or approval of such public agency, and shall pay all costs therefor unless otherwise provided in the Contract Documents.

1.08 CONTRACTOR-FURNISHED ASSISTANCE: Whenever requested, Contractor shall furnish access, facilities, and labor assistance as necessary for duties to be performed at the site by Testing Laboratory and Inspector including furnishing ladders, hoisting, temporary lighting and water supply, and like services.

1.09 VERIFICATION OF CONDITIONS: Prior to installation of any portion of the Work, the installing Contractor, Subcontractor, or Sub-subcontractor shall inspect the Work in place to receive the Work to be installed and arrange for correction of defects in the existing workmanship, material, or conditions that may adversely affect Work to be installed. Such inspections shall include test applications of the materials to be installed as required to establish the correct condition of surfaces involved. Installation of materials on Work in place constitutes acceptance by the installing Contractor, Subcontractor, or Sub-subcontractor of such Work in place as being in proper condition to receive the materials to be applied and waiver of claim that the Work in place is defective as pertains to warranty requirements, excluding unascertainable or concealed conditions. Where the Specifications require a material to be installed under the supervision or inspection of the material manufacturer or his representative, manufacturer or his representative also shall inspect the Work in place and issue a letter of approval to Architect.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 TESTS AND INSPECTIONS: Owner will pay for the following testing and inspections except as stated otherwise for specific items.

A. **Site Work**: Tests and inspections performed by Geotechnical Engineer of record for the Foundation Investigation Report.

1. Foundations, compaction, trenching, fill and backfill inspection and testing.
2. Shoring of cut banks and slope at cuts, except as otherwise specified under Division 2.
3. Approval of site and imported earthwork materials.
4. Unauthorized overexcavation or retesting.
5. Verification of shoring stability and monitoring.

B. Reinforcing Steel:

1. Review and approval of mill certificates.
2. Conformance testing of bars.
3. Inspector for welding of bars.
4. Inspector during placement of bars.

C. Concrete Work:

1. Mix design of concrete.
2. Conformance testing of materials.
3. Casting and testing of cylinders.
4. Inspector during placing of concrete.

D. Structural Steel:

1. Review and approval of welding procedure specifications.
2. Conformance testing of materials.
3. Inspector for high-strength bolting, groove welding, and field welding.
4. Inspector for installation of Welded Stud Connectors
5. Inspector for shop fabrication of structural steel unless shop is approved by the Building Department.
6. Inspector to verify grouting under column base plates.
7. Ultrasonic inspection of groove welds and lamination check of materials.

E. Masonry:

1. Conformance testing of materials.
2. Testing of mortar and grout.
3. Continuous inspection required by Drawings or Specifications.

F. Wood:

1. Materials:
   a. Sawn Lumber and Wood Structural Panels.
   b. Glued Laminated Members.
2. Wood Inspection:
   a. Wood Construction.
   b. Glued Laminated Construction.
   c. Timber Connectors.

END OF SECTION

SECTION 01458

MOCK-UPS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Section Includes: Mock-ups are independent structures that represent components of a portion of the building as indicated and where located, on the Contract Drawings. Refer to Article: Field Samples in the various Sections of the Specifications for description of in-place review of materials and systems.

1. Prior to installation provide specified mock-ups identical in every respect to the finished work specified.
2. In accordance with the provisions of Section 01070, provide engineering design required to ensure the structural stability of the mock-ups.
3. Mock-ups will be reviewed for approval by cognizant building officials and for acceptance by the Architect. When so approved and accepted, the mock-ups will become the standard by which subsequent work will be evaluated.

B. Related Work in Other Sections: The work of other sections related to the work of this section includes but is not limited to the following:

1. Section 01050 - Field Engineering.
2. Section 02751 – Concrete Paving
3. Section 03300 - Cast-In-Place Concrete Walls
4. Section 03352 – Polished and Stained Concrete Floors
5. Section 04220 – Concrete Masonry Units
6. Section 05500 – Metal Fabrications/Handrails.
7. Section 07430 – Metal Panel System
8. Section 07540 – Thermoplastic Membrane Roofing.
9. Section 07600 – Sheet Metal.
10. Section 07900 – Caulking and Sealants.
11. Section 08400 – Aluminum Storefront and Entrances.
12. Section 08800 – Glass and Glazing.
13. Section 09200 – Lath and Plaster.
14. Section 09250 – Gypsum Board.
15. Section 09300 – Tile Masonry.
16. Section 09510 – Acoustical Panel Ceilings.
17. Section 09645 - Cushioned Wood Flooring Assemblies
18. Section 09900 – Painting.
19. Section 10162 – Toilet Partitions.
20. Section 10240 – Louvered Sunshades

1.02 SUBMITTALS:

A. Product Data and Samples: Submit in accordance with the requirements of each respective product Section.

B. Schedule: Time schedule for the construction of mock-ups shall be prepared and submitted to the owner for review prior to construction.

C. **Quality Control Submittals**: In accordance with the provisions of Section 01300 submit design data when and as directed by the Architect, engineering design calculations confirming the structural stability of the mock-ups.

1.03 QUALITY ASSURANCE:

A. **Qualifications:** Fabricators' and installers' qualification in accordance with the provisions of the specification Sections for products and materials incorporated in the mock-ups. In constructing mock-ups, take measures to ensure the safety of Project personnel and the public.

B. **Field Representation:** During construction of mock-up, a representative of the manufacturer shall be present on site to coordinate installation.

1.04 SUBMITTALS: The Architect shall be notified at the start of construction of mock-ups and shall receive progress reports to allow the Architect to schedule his inspections. Visual examination of the mock-ups will be made by the Architect and other interested parties during construction. After approximately 50 percent of each mock-up has been built, request the Architect's preliminary review before completion. Incorporate changes or variations requested by the Architect into mock-ups during their construction and prior to their completion, insofar as possible.

A. **Procedures:** Obtain the Owner Representative's acceptance of visual qualities of mock-ups before commencing the corresponding work for the Project, revise the updated Construction Schedule to reflect required revisions to the mock-ups. Should mock-ups fail to meet the Owner Representative's approval, they shall be taken down or dismantled, and reconstructed to the extent necessary, until acceptance has been obtained.

B. **Time:** Time the completion and reworking of mock-ups necessary to obtain acceptance to avoid delay in the construction schedule of the Project. Update the Construction schedule to reflect required revisions to mock-ups. Retain and maintain mock-ups during construction to serve as a standard for judging work incorporated into the Project. Do not alter, remove or destroy mock-ups until their removal has been authorized by the Architect.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS: Materials and finishes shall comply with the requirements specified in the various applicable Sections of the Specifications and shall match previously submitted and approved samples. Mock-ups shall incorporate all related construction materials and finishes having a visual or technical effect upon the completed work.

PART 3 - EXECUTION

3.01 INSTALLATION: Install materials in a manner that will duplicate the appearance in the completed building. In constructing mock-ups, take measures to ensure the safety of Project personnel and the public. Construction mock-ups using same construction personnel, means, and methods as intended for use on actual project. Mock-ups shall be constructed in accordance with details indicated on the drawings and approved Shop Drawings. Mock-ups shall be located where specified or directed and shall not be built “in place” of the permanent construction.

3.02 MAINTENANCE: Maintain mock-ups during course of construction or until removal is directed. Repair damage to mock-ups immediately upon occurrence. Maintain mock-ups and surrounding site in a safe and clean condition.

3.03 REMOVAL: Remove mock-ups at the completion of the work in a manner that shows no evidence of mock-ups previous existence. Complete site work at area of mock-up in accordance with Contract Drawings.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers general requirements for construction facilities and temporary controls for the Work.

A. Work In This Section: Principal items include:

1. Temporary barricades.
2. Temporary storage facilities.
3. Temporary offices and telephones.
4. Temporary toilet facilities.
5. Temporary utility services.
6. Weather resistant site roads.
7. Removal of temporary facilities.

1.02 GENERAL: Drawings indicate building site and related areas of Owner's property available for the Work. On a daily basis the Contractor shall keep areas orderly, free of hazards, and leave in clean condition acceptable to Architect, Owner, and governing public authorities.

PART 2 AND 3 - PRODUCTS AND EXECUTION

2.01 TEMPORARY BARRICADES: Maintain existing chain link fencing and green screen around the project limits.

2.02 TEMPORARY STORAGE FACILITIES: Provide temporary storage facilities necessary to protect materials and equipment delivered to site from damage. Maintain sheds in a clean and orderly condition. Distribute all materials stored in permanent structures to prevent overloading of floors or structure. If on-site storage area is inadequate, arrange and pay for necessary off-site facilities.

2.03 CONTRACTOR'S FIELD OFFICE: The Contractor will provide a field office within a job trailer with lighting, power, plumbing for restrooms, heating and cooling and full internet connectivity (WIFI) and phone service. The job trailer shall have a conference room area large enough to accommodate weekly job meetings and office space for the superintendent of construction. Cost for trailer to be in the bid price. Contractor to provide a Site Plan showing proposed location for approval by the City.

2.05 TOILET FACILITIES: Install temporary toilets for workmen and maintain toilets in a clean and sanitary condition. Locate as approved and connect to existing sewers when feasible. Chemical toilets may be used if approved by local Code.

2.06 UTILITY SERVICES: Send proper notices, make necessary arrangements, provide services required in care and maintenance of public utilities, and assume the responsibility concerning same for which Owner may be liable, except existing utilities where no work by the Contractor is being performed. Do all necessary enclosing or boxing in for protection of public utilities. Upon completion of the Work, remove enclosures, fill in openings in concrete or masonry with like materials, grout watertight, and leave in finished condition.

A. **Water**: Furnish and pay for all water required for the Work, with the necessary temporary piping or hose from source to points on the site where used. If needed furnish potable water from domestic source.

B. **Light and Power**: Furnish and pay for electric service required for the Work and provide temporary poles and overhead construction, transformers, meters, drops, wiring, panels, circuit and ground fault protection, and fittings for both light and power at locations required and full internet connectivity (WIFI). Pay charges and fees for making the temporary service connections in accordance with schedule of value in contract
between Owner and Contractor.

C. **Gas**: Furnish and pay for fuel gas required for the Work. Make the necessary arrangements and pay charges required by the serving utility company. Furnish temporary distribution piping as required.

2.07 WEATHER RESISTANT SITE ROADS: Provide temporary roads to all buildings to withstand adverse weather conditions and as required by local jurisdiction to allow access by emergency vehicles.

2.08 REMOVAL OF TEMPORARY CONSTRUCTION: Remove all temporary facilities and other construction of temporary nature from site as soon as progress of the Work will permit in opinion of the Owner and/or Architect. When authorized, Contractor may move his facilities into designated areas of completed portions of the building. Upon completion of the Work, recondition and restore portions of site and building occupied by temporary facilities to acceptable condition.

2.09 JOB SIGN: Contractor to provide a Project Job Sign ¾" x 8'-0" x 16'-0" (maximum size) exterior grade Douglas Fir plywood with a rigid frame, having colored image and background and lettering as per artwork provided by the Architect. Obtain and pay for building permit for sign if required.

2.10 PROTECTION OF TREES IN ADJACENT PARK: Contractor to protect the trees in the adjacent park within 25 feet of the project limits. Contractor to keep trees watered and protected during the course of construction.

END OF SECTION

SECTION 01571

STORMWATER POLLUTION CONTROL MEASURES FOR CONSTRUCTION ACTIVITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Implementation and monitoring of Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharge of pollutants from the construction site into the receiving waters. This includes the elimination of pollution discharges such as improper dumping, spills or leakage from storage tanks or transfer areas.

B. Certification that the construction project has met all of the conditions of the General Construction Activity Storm Water Permit (GCASP).

1.2 RELATED SECTIONS

A. Section 01352 - Sustainable Design Requirements: General requirements for submission of documentation of compliance with sustainable design requirements.

1.3 REFERENCES

A. Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association. Available at www.cabmaphandbooks.com.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with Storm Water Pollution Prevention Plan.

B. Maintain one copy of document on site.

1.5 REGULATORY REQUIREMENT

A. Prior to the beginning of construction on this site the owner will file with the State of California, State Water Resources Control Board a Notice of Intent (N.O.I.) that this project will comply with the terms of the State Water Resources Control Board's latest Order and the latest National Pollutant Discharge Elimination System (NPDES) General Permit Waste Discharge Requirements (WDRs) for discharge of storm water run-off associated with construction activity to include erosion and sediment control.

B. Comply with requirements of the State's General Permit with regard to the implementation and maintenance of the SWPPP.

1.6 PERFORMANCE REQUIREMENTS

A. The Storm Water Pollution Prevention Plan is a minimum requirement. Revisions and modifications to the SWPPP are acceptable only if they maintain levels of protection equal to or greater than originally specified.

B. Read and be thoroughly familiar with all of the requirements of the SWPPP

C. Inspect and monitor all work and storage areas for compliance with the SWPPP prior to any anticipated rain.

D. Complete any and all corrective measure as may be directed by the regulatory agency.

E. Penalties: Pay any fees and be liable for any other penalties that may be imposed by the regulatory agency for non-compliance with SWPPP during the course of work.

F. Costs: Pay all costs associated with the implementation of the requirements of the SWPPP in order to maintain compliance with the Permit. This includes installation of all Housekeeping BMPs, General Site and Material Management BMPs, Bi-weekly Inspection requirements, maintenance requirements, and all other requirements specified in the SWPPP.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials of a class, grade and type needed to meet the performance described in the BMP Handbook.

PART 3 - EXECUTION

A. Erosion and Sedimentation Control, General: In order to prevent erosion, ensure that sediment-laden water does not enter drainage systems and to provide runoff controls to prevent siltation on site and on adjacent properties, a project-specific Storm Water Pollution Protection Plan (SWPPP) will be prepared. Contractor shall comply with requirements of the SWPPP.

B. Storm Water Pollution Protection Plan (SWPPP):

1. Owner with assistance from Civil Engineer and Contractor, will prepare a Notice of Intent (NOI) for submission to the California Regional Water Quality Control Board (CRWQCB) in compliance with the State General Construction Activity Storm Water Permit (Storm Water Permit).

2. Civil Engineer will prepare and submit to Authority Having Jurisdiction (AHJ) a Storm Water Pollution Protection Plan (SWPPP). The SWPPP will comply with California Storm Water Best Management Practice Handbook for Construction Activity (BMP Handbook), current Edition, and as specified below.

3. Contractor shall secure approval and permits from Authority Having Jurisdiction (AHJ).

   a. Costs of planchecks, permits and inspections will be paid by Owner.
   b. Implementation of SWPPP by Contractor shall be included in Contract Time and Contract Sum.

4. Erosion and sedimentation control provisions shall meet or exceed minimum requirements of Authority Having Jurisdiction (AHJ) and California State Water Resources Control Board (SWRCB). When provisions are indicated on Drawings, they are minimum requirements. See Civil Drawings for additional requirements and details.

5. Erosion and sedimentation control provisions shall be developed and implemented prior to commencing site clearing, grading, backfilling and compacting or other construction activities which will expose soil to erosion and potential for sediment-laden runoff. The SWPPP will also include provisions for monitoring and sampling of sediment and storm water constituents during storm events, as required in the Construction Permit.

C. Contractor's Responsibilities under the Storm Water Pollution Protection Plan (SWPPP):

1. Contractor shall implement and maintain erosion and sedimentation control provisions of the SWPPP, including amendments as directed to reflect actual construction practices. As construction progresses and seasonal conditions dictate, more erosion and sedimentation controls may be required. If so, Contractor shall provide additional provisions over and above minimum requirements as necessary.

2. The Contractor is hereby notified that specific construction practices in Section 7, "Responsibilities of the Contractor," of the Standard Specifications for Public Works Construction ("Green Book"), are considered to be Best Management Practices. Applicable construction practices in the Standard Specifications will be incorporated into the SWPPP.

3. It is the requirement of the State General Construction Activity Storm Water Permit that the SWPPP include a maintenance schedule for Best Management Practices (BMPs) installed during construction designed to reduce or eliminate pollutants after construction is completed (post construction BMPs).

4. The SWPPP document shall not be construed to be a waiver of the Contractor's obligation to review and understand the State General Construction Activity Storm Water Permit before submitting a bid. By submitting a bid, the Contractor acknowledges that he has read and understands the requirements of the State General Construction Activity Storm Water Permit.

5. Erosion control according to the SWPPP may include but not be limited to dikes, basins, ditches, gravel bags, sand bags, silt fence, inlet filter fabric, and application of approved straw and seed which might become necessary as a result of operations. Contractor shall maintain previously installed erosion control facilities.

6. Dewatering according to the SWPPP may include but not be limited to pumping water and desilting waters after each storm event.

7. As permanent storm water drainage systems and landscaping are completed, and with approval of Authority Having Jurisdiction (AHJ), Contractor shall remove all runoff control and measures in preparation for Substantial Completion review, unless otherwise directed by the Construction Manager.

8. Implementation, maintenance, replacement and additions to erosion and sedimentation control provisions shall continue until Substantial Completion review is completed for landscaping, or sooner if approved by Authority Having Jurisdiction (AHJ).

9. All fines and costs for remedial work related to Contractor's failure to comply with SWPPP and to maintain erosion and sedimentation controls shall be reimbursed by Contractor to owner by deductive Change Order.

10. A copy of the SWPPP shall be available at the construction site at all times. The NOI, SWPPP forms, and the Storm Water Permit (which can be downloaded from the following website: http://www.swrcb.ca.gov/stormwtr/construction.html).

D. Runoff Control: Surface runoff and other waters may be encountered at various times during construction. Contractor, by signing the Agreement, acknowledges that risks arising from surface runoff and other waters have been investigated and considered, and Contract Sum and Contract Time include all costs associated with runoff control.

1. It shall be responsibility of Contractor to protect Work from detrimental effects of all waters encountered.

2. It shall be responsibility of Contractor to protect Work from detrimental effects of runoff.

3. Should damage to the Work due to surface or other water occur prior to acceptance of the Work by the County or owner, Contractor shall repair or replace Work at no change in Contract Time or Contract Sum.

E. Drainage: Grade site and other Work areas to drain and protect Work areas from erosion and damage from accumulated water (ponding and flooding).

1. Provide temporary drainage ditches and diversion measures as necessary to protect construction.

2. Provide erosion control measures as necessary and as required by Authority Having Jurisdiction (AHJ). Comply with local water quality control requirements, as applicable.

3. Due to the site's ever-changing condition during construction, erosion protection shall be achieved by implementing Best Management Practices (BMPs).

F. De-Watering: Maintain excavations free of water. Provide and operate pumping equipment as necessary.

1. Removal of contaminated water from excavations, dewatering of contaminated groundwater and discharging of contaminated soils via surface erosion is prohibited.

2. Dewatering of non-contaminated groundwater shall be performed only after Contractor obtains a National Pollutant Discharge Elimination System Permit from the State or Regional Water Quality Control Board having authority. Costs of such permit shall be included in the Contract Sum.

G. Water Pollution Control (NPDES Compliance): Contractor shall comply with California Stormwater Best Management Practice Construction (BMP) Handbook available for free at *http://www.cabmphandbooks.com*.

1. Contractor shall implement and maintain all appropriate BMPs necessary or as required by Authority Having Jurisdiction (AHJ) to eliminate illicit discharges, prevent potential illicit discharges, and prevent debris/dirt/trash, etc. from entering drainage systems.

2. Drainage inlets and/or catch basins within the construction work area and immediately adjacent to the work area shall be protected at all times with appropriate BMPs to prevent debris/dirt/trash, etc from entering said devices.

3. Do not discharge any water into the storm drain system, gutter, street, creek or to any other area which ultimately may allow the water to migrate to the storm drain system. Comply with Section 7-8 "Project Site Maintenance" of the Standard Specifications for Public Works Construction.

4. In addition, listed below are BMPs related to common construction activities that shall be utilized:

   a. Concrete and Mortar Products:
      1) The Contractor shall prevent the discharge of pollutants into storm water or storm water systems from concrete waste by conducting washouts at appropriate off-site locations, performing on-site washouts in a designated area, and providing appropriate training for employees and subcontractors.
      2) The Contractor shall store and mix dry and wet materials either off-site or under cover, away from drainage areas.
      3) For washout of concrete trucks, the Contractor shall provide appropriate off-site locations or designated contained areas at least 50 feet away from storm drains, open ditches, streets, or streams.
      4) The Contractor shall prevent run-off from designated washout areas by constructing a temporary pit or bermed area large enough to handle all produced liquid and solid

waste. When concrete sets, break up and dispose of concrete in construction fills per direction of the soils engineer or dispose of it as solid waste and/or recycle.

5) The Contractor shall inform concrete suppliers and subcontractors of the designated washout locations and disposal sites for concrete and mortar products and shall be responsible for ensuring that all workers use it appropriately.

b. Asphalt and Bituminous Products: The Contractor shall prevent the discharge of pollutants from asphalt and bituminous operations by preventing run-on and run-off of water during paving operations and providing appropriate training for employees and subcontractors. In addition, the Contractor shall:
   1) Avoid prime or tack coating during wet weather.
   2) Store materials away from drainage courses.
   3) Cover catch basins and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
   4) Make sure sand or gravel placed over new asphalt does not wash into storm drains, streets, or creeks.
   5) Dispose of old asphalt properly and collect and remove all broken asphalt from the site and recycle whenever possible.
   6) Not dispose of asphalt products into waterways.
   7) Follow the storm water permitting requirements for industrial activities if paving involves an on-site mixing plant.

c. Construction Water: The Contractor shall eliminate excessive construction water that may cause erosion and carry pollutants from the site. In addition, the Contractor shall:
   1) Use construction water conservatively.
   2) Whenever possible, dispose of excess water on-site by allowing it to soak into the ground.

d. Sawcutting Water Runoff: Sawcutting water runoff contains pollutants that must be contained and disposed of properly. The Contractor shall:
   1) Prevent sawcut water runoff from entering catch basins, manholes, and storm drains.
   2) Direct water into a temporary pit and dispose of the water by vacuuming the water into a truck and removing the water from the site.
   3) Place drip pans or absorbent materials under sawcutting equipment when not in use.
   4) Clean up spills with absorbent materials rather than burying. Dispose of absorbent material properly.

e. Housekeeping/Cleanup: The Contractor shall prevent pollution of storm water from clean-up and disposal operations by using good housekeeping methods.
   1) When fluids or dry materials spill, clean-up should be immediate, thorough, and routine. The Contractor shall never attempt to "wash them away" with water or bury them.
   2) The Contractor shall report significant spills to the appropriate spill response agencies immediately.
   3) The Contractor shall recognize that different types of materials have different disposal requirements and follow appropriate practices.
   4) The Contractor shall confine non-hazardous debris to dumpsters, covered at night or during wet weather, and take the debris to a landfill for recycling or disposal.
   5) The Contractor shall handle hazardous debris in accordance with specific laws and regulations and dispose of them properly. A separate permit may be required. Common hazardous debris found on construction sites are: Liquid residues from paints, thinners, solvents, glues, and cleaning fluids; leaching agents from lumber such as formaldehyde, arsenic, copper, creosote, and chromium; motor oil; gear oil; antifreeze fluids; brake fluids; etc.; and unused pesticides.

f. Sanitary Waste Management: The Contractor shall prevent the discharge of sanitary waste into storm water systems by providing convenient, properly located, well-maintained facilities.
   1) The Contractor shall hire a licensed portable sanitary facility leasing company, which will clean the facilities regularly and keep them in good working order.

2) The Contractor shall make sure that portable sanitary facilities are located on relatively level ground away from traffic areas, drainage courses, storm drain courses, and storm drain inlets and install protective BMPs where appropriate.
3) The Contractor shall regularly inspect the facilities for any leaks, and have defective units replaced.

g. Vehicle and Equipment Management:
1) The Contractor shall use and maintain construction vehicles and equipment in a manner that prevents leaks and spills of fluids, contains wash waters, and controls off-site tracking.
a) The Contractor shall not allow leaking vehicles and equipment on-site and shall inspect equipment and vehicles frequently for leaks and repair them immediately.
b) The Contractor shall clean up spills and leaks promptly with absorbent materials, and shall not flush said spills with water.
2) The Contractor shall fuel, maintain, and repair vehicles and equipment off-site whenever possible, and on-site only in designated areas. The Contractor shall prevent run-on and run-off from designated areas and provide cover as well as containment devices as necessary.
3) The Contractor shall wash vehicles and equipment on-site in designated, contained areas, allowing wash waters to infiltrate into the ground. The Contractor shall use phosphate-free, biodegradable soaps, and limit steam cleaning to confined areas only.
4) When not in use, the Contractor shall store equipment and vehicles in designated, contained areas and place drip pans and absorbent material under stored equipment that is prone to leaking and dripping (e.g., paving equipment).
5) If the Contractor must drain and replace motor oil, radiator coolant, or other fluids on-site, use drip pans or drop cloths to catch drips and spills and have appropriate spill containment devices in place.
a) The Contractor shall collect all spent fluids, store in separate containers, and recycle whenever possible.
b) Note: For recycling purposes, such liquids must not be mixed with other fluids. Non-recycled fluids generally must be disposed of as hazardous waste.

h. Surface and Subsurface Water Control:
1) The Contractor shall prevent the discharge of pollutants into storm water or storm water systems as a result of surface and subsurface water control operations by using the following methods:
2) For surface water control operations where the flow is routed to bypass the construction area, establish stable (erosion resistant) conveyance routes for the diverted flow. Trap any significant sediment (e.g., mud) generated by the rerouted flow in a sediment trap, filtering berm, or basin or other approved BMP.
3) In subsurface pumping or other subsurface water control operations where significant amounts of sediment (e.g., mud) are present in the removed water, capture the sediment in a sediment trap, filtering berm, or basin or other approved BMP.
4) If a sediment trap or basin is required for the surface or subsurface water control operations, the facility should be designed such that the sediment is settled or trapped in the facility prior to discharging of the water.
5) In areas suspected of groundwater pollution, sample the groundwater near the excavation/pumping site and have the water tested for known or suspected pollutants at a certified laboratory.
6) Any proposed discharge of groundwater may be subject to requirements of the Regional Water Quality Control Board.

3.1 IMPLEMENTATION OF SWPPP

A. Implementation of SWPPP:

1. Install perimeter controls prior to starting other construction work at the site.

2. Contain on-site storm water at the jobsite. Do not drain on-site water directly into the storm drain.

3. Designate trained personnel for the proper implementation of the SWPPP.

4. Revise SWPPP to suit changing site conditions and also when properly installed systems are ineffective.

B. Termination of SWPPP: At the end of Construction Contract:

1. Leave in place storm water pollution prevention controls needed for post-construction storm water management and remove those that are not needed as determined by Construction Manager. Thereafter, left-in-place controls will be maintained by the County and/or owner.

2. Provide Site Monitoring Reports, SWPPP revisions, Compliance Certifications and related documents to Construction Manager. Post-construction storm water operation and management plan as mentioned in the compliance certifications are considered to be in place at the end of the Construction Contract.

C. Monitoring: Conduct examination of storm water pollution prevention controls monthly, as well as before and after each storm and each 24-hour period during extended storm events. Prepare and maintain, at the jobsite, a log of each inspection using Site Monitoring Report forms.

D. Liabilities and Penalties: Review of the SWPPP and inspection log by Construction Manager and owner's Civil Engineer shall not relieve the Contractor from liabilities arising from non-compliance of storm water pollution regulations.

1. Payment of penalties for non-compliance by the Contractor shall be the sole responsibility of the Contractor and will not be reimbursed by the owner.

E. Clean Water Act: Compliance of the Clean Water Act pertaining to construction activity is the sole responsibility of the Contractor. Any fine(s) levied against the owner due to non-compliance by the Contractor, the owner will deduct from the final payment due the Contractor the total amount of the fine(s) levied on the owner, plus legal and associated costs.

3.2 CHANGE OF INFORMATION

A. Changes in SWPPP: Submit to the Construction Manager a completed NOI for change of information (Construction Site Information and Material Handling/Management Practices).

END OF SECTION

SECTION 01600

PRODUCTS AND MATERIALS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers the general requirements for the materials and equipment for the Work. Specific requirements for materials and equipment are covered under other Sections of the Specifications.

A. Requirements In This Section:

1. Submittals for:
   a. Factory finish colors.
   b. Standard materials.
2. Proposed substitutions.
3. Materials, regarding:
   a. Equal materials.
   b. Optional materials.
   c. Plurality of terms.
   d. Factory finish colors.
4. Transporting and handling.
5. Storage and protection.

1.02 SUBMITTALS: Refer to Section 01300.

A. Submittals for Factory Finish Colors: Whether or not required elsewhere, submit color samples of materials specified to have a factory finish for approval.

B. Submittal for Standard Materials: For the products specified by reference to standard or reference specifications, prepare and submit for approval a list of such materials or equipment by manufacturers' names and identifications to the extent requested by Architect.

1.03 PROPOSED SUBSTITUTIONS: **Will only be accepted during Bid Process**. Submit proposed substitutions to the Architect for approval. Contractor will be notified of the approved substitutions by Addendum. Architect may require the submission of Drawings, Product Data, Samples, and other information in approved form for consideration of proposed substitutions.

A. Approval or Rejection of proposed substitutions is at Owner's discretion, whose judgement will be final and will include consideration of the following factors among others in comparing equality of proposed substitutions with indicated or specified requirements, where more than 1 manufacturer is listed, the item must be equal to the Basis of Design Item:

1. Quality of materials, structural strength, and details of construction or fabrication.
2. Performance and function, mechanically and technically.
3. Appearance and finish, or characteristics permitting required finish to be applied.

4. If proposed substitutions require altering the arrangement of adjoining or related Work, resulting arrangement must be equal in convenience and practicality to original arrangement.
5. Products equal in quality and utility are generally competitive products and are generally equal in price. If approval is requested for materials or equipment more economical than the specified products, Owner may require the specified products.
6. An inequality in availability of replacement parts or maintenance services may be a determining factor.
7. Code approvals and service history.

B. **Resubmittal of Proposed Substitutions**: Do not resubmit proposed substitutions that are rejected in modified form. Upon rejection of a proposed substitution, Bidder may submit another proposed substitution within the time limit stated above. If the second proposed substitution is rejected or not received by the Architect within the specified time, provide only the indicated and specified Work at no additional cost to Owner.

C. **Compliance**: Use of Approved Substitutions does not relieve Contractor from compliance with the Contract Documents. Contractor shall bear all extra expense resulting from approved substitutions where substitutions affect adjoining or related Work.

D. **Unauthorized Substitutions**: If substitute materials are installed without prior approval, remove all the unauthorized materials and install those indicated or specified, at no extra cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS: Provide new materials and equipment unless otherwise indicated or specified.

A. **Equal Materials**: Any material, apparatus, equipment, or process indicated or specified by patent or proprietary name or name of manufacturer shall be deemed to be followed by **"or equal as approved in writing by the Architect",** unless it is specified that substitutions are not acceptable for a particular material, apparatus, equipment, or process item. Criteria will be the same as above in Paragraph 1.03 (A) 1-7.

B. **Optional Materials**: Where more than one proprietary brand name is specified, Contractor may provide any one of the materials or equipment specified. Before placing orders, advise Architect in writing of each named material, appliance, or piece of equipment proposed for the Work and its intended use. Provide only one brand, kind, or make of material for each purpose throughout the Work not withstanding that similar material or equipment of two or more manufacturers may be specified for the same purpose.

C. **Plurality of Terms**: For all materials or equipment referred to in the singular number, it is intended unless otherwise limited that such references apply to as much material or equipment as is required to complete the Work.

D. **Factory Finish Colors**: Color of material specified to be furnished with factory finish is subject to Architect's approval. If available color is not approved, modify factory finish color to conform to the Architect's color instructions or provide another manufacturer's approved product which has an acceptable finish color, at no extra cost to Owner.

PART 3 - EXECUTION

3.01 TRANSPORTING AND HANDLING: Transport and handle all materials and equipment by methods that prevent damage, defacing, or overstressing. Lift the equipment, machinery and heavy fabricated products only at the lifting points designated by the manufacturer or, if not so designated, at the points or along the members designed to support the items when installed. Contractor shall bear all loss which may result from transporting and handling of materials and equipment and shall provide approved replacements for damaged or defective items at no extra cost to Owner. Conform handling procedures to applicable Codes.

3.02 STORAGE AND PROTECTION: Materials and equipment designed for permanent weather exposure may be stored off the ground without covering provided the equipment closures and seals are intact. Store all other materials and equipment off the ground and in dry, covered, weather-protected locations. Exercise special care to protect moisture-sensitive materials and other materials damaged by light (ultraviolet) or heat. Arrange adequate ventilation under protective covering to prevent condensation.

END OF SECTION

SECTION 01630

SUBSTITUTION REQUEST FORM

No substitutions will be considered without this completed substitution request form and supporting documentation. Refer to section 01600 PRODUCTS AND MATERIALS for proposed substitution requirements.

Date: _____ Number: _____

Project: ANTHONY MUNOZ COMMUNITY CENTER GYMNASIUM

From: _____

Re: Request for Substitution

The Trade Contractor proposes the following substitution in accordance with the requirements of the Contract Documents:

Specified Item _____

Section No. _____

Page No. _____

Paragraph No. _____

Drawing Reference _____

_____

Reason for Proposed Substitution _____

_____

_____

_____

Impact on Project Cost _____

_____

Impact on Project Schedule _____

_____

Impact on Guarantees and Warranties _____

Coordination Required with Adjacent Materials and System _____

List Deviations From Specified Requirements _____

Attachments: Attach supporting documentation sufficient for Architect to evaluate substitution. Substitution Request Forms submitted without adequate documentation will be returned without review.

Attachments _____

Submitted By _____

Firm and Address _____

Signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Substitution Request Form.

Authorized Signature _____

Authorized Representative of Trade Contractor

RESPONSE

Architect's Response

_____ Accepted

_____ Accepted as noted

_____ Not Accepted

_____ Received too late

_____ Returned Without Review

Remarks _____

_____

_____

_____

_____

Signed _____

Architect's Authorized Representative Date

Owner's Acceptance _____

Owner's Authorized Representative Date

END OF FORM

SECTION 01740

CLEANING REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Cleaning during** construction.

B. **Cleaning for Substantial** Completion review and final acceptance of the Work.

1.02 RELATED SECTIONS

A. **Section 01500 - Construction Facilities:** Cleaning service for site offices of Project Inspector and Testing Laboratory, as applicable.

B. **Section 01352 - Construction & Demolition (C&D) Waste Management:** Collection and disposal of construction waste.

C. **Additional Requirements:** Cleaning for specific products or elements of Work are described in individual product Specification Sections in Divisions 2 through 16.

1.03 SUBMITTALS

A. **Product List:** Submit complete list of all cleaning agents and materials for review and approval by City through City's Project Manager.

B. **Cleaning Procedures:** Submit description of cleaning processes, agents and materials to be used for final cleaning of the Work. Processes and degree of cleanliness shall be as directed by City's Project Manager. All cleaning processes, agents and materials shall be subject to City's review and approval.

1.04 CLEANING AND DISPOSAL REQUIREMENTS

A. **Cleaning and Disposal Requirements, General:** Conduct cleaning and disposal operations in compliance with all applicable codes, ordinances and regulations, including environmental protection laws, rules and practices.

PART 2 - PRODUCTS

2.01 MATERIALS

A. **Cleaning Agents and Materials:** Use only those cleaning agents and materials which will not create hazards to health or property and which will not damage or degrade surfaces.

1. Use only those cleaning agents, materials and methods recommended by manufacturer of the material to be cleaned.
2. Use cleaning materials only on surfaces recommended by cleaning agent manufacturer.

3. Before use, review cleaning agents and materials with Construction Manager for suitability and compatibility. Use no cleaning agents and materials without review and approval of City through Construction Manager.

PART 3 - EXECUTION

3.01 CLEANING DURING CONSTRUCTION

A. Garbage Control: Control accumulation of debris, waste materials and rubbish; periodically dispose of debris, waste and rubbish off-site in a legal manner. Comply with requirements specified in Section 01352 - Construction & Demolition (C&D) Waste Management.

B. Cleaning, General: Clean sidewalks, driveways and streets frequently to maintain public thoroughfares free of dust, debris and other contaminants.

C. Parking Area Cleaning: Keep parking areas clear of construction debris, especially debris hazardous to vehicle tires.

D. Thoroughfare Clearing and Cleaning: Keep site accessways, parking areas and building access and exit facilities clear of mud.

1. Remove mud, soil and debris and dispose in a manner which will not be injurious to persons, property, plant materials and site.
2. Comply with runoff control requirements stated above and as required by governing authorities having jurisdiction.

E. Cleaning Frequency: At a minimum, clean Work areas daily.

F. Failure to Clean: Should cleaning by Contractor not be sufficient or acceptable to Construction Manager, especially regarding sidewalks, driveways, streets and other public thoroughfares, City may engage cleaning service to perform cleaning and deduct costs for such cleaning from sums owed to Contractor.

3.02 CLEANING FOR SUBSTANTIAL COMPLETION REVIEW

A. Cleaning for Substantial Completion Review, General: Employ experienced workers or professional cleaners and perform thorough cleaning in preparation for Substantial Completion review.

1. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program.
2. Substantial Review cleaning will not require sanitary cleaning of toilet facilities.
3. Remove waste and surplus materials, rubbish and temporary construction facilities, utilities and controls.

3.03 INTERIOR CLEANING FOR FINAL COMPLETION

A. Interior Cleaning for Final Completion, General: Complete final cleaning before submitting final Application for Payment. Employ professional building cleaners to thoroughly clean building immediately prior to Final Completion inspection by Construction Manager and, if applicable, by authorities having jurisdiction.

1. Use Green Seal-listed cleaning agents, as reviewed and approved by City.
2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from all visible interior and exterior surfaces.
3. Remove dust from all horizontal surfaces not exposed to view, including light fixtures, ledges and plumbing fixtures.
4. Clean all horizontal surfaces to dust-free condition, including tops of door and window frames, tops of doors and interiors of cabinets and casework.
5. Perform sanitary cleaning of toilet, lavatory and shower facilities and food service equipment, as applicable.

B. Accessories and Fixtures Cleaning: Clean building accessories, including toilet partitions, fire extinguisher cabinets, lockers and toilet accessories, all plumbing fixtures and all lighting fixture lenses and trim.

C. Glass and Mirror Cleaning: Clean and polish all glass and mirrors as specified in Section 08800 - Glass and Glazing.

D. Metalwork: Clean and buff all metalwork, to be free of soiling and fingerprints. Mirror finished metalwork shall be buffed to high luster.

E. Floor Cleaning:

1. Exposed concrete floors: Thoroughly sweep and wet mop floors in enclosed spaces. At parking areas and ramps, sweep and hose off floor surface.
2. Ceramic tile flooring: Thoroughly sweep and mop tile flooring. Comply with specific requirements in tile and installation materials manufacturers for cleaning materials.
3. Resilient flooring: Thoroughly sweep all resilient flooring. Damp wash and wax (as appropriate) all resilient flooring. Comply with specific requirements in applicable resilient flooring Sections, and notes of the Drawings.
4. Carpeting: Clean and vacuum all carpeting. Clean as necessary to restore to like-new condition.

F. Ventilation System Cleaning: Coordinate with building flush-out specified in Section 01353 - Indoor Air Quality Requirements and commissioning of HVAC system specified in Section 01910 - Commissioning Requirements.

1. Replace filters and clean ventilation equipment, ducts, blowers and fans used for temporary heating, cooling and ventilation.
2. Replace filters at occupied buildings if ventilating system was operated during construction

3.04 SITE CLEANING FOR FINAL COMPLETION

A. Site Cleaning for Final Completion: Broom clean exterior paved surfaces. Rake clean other surfaces of the grounds.

1. Wash down and scrub where necessary all paving soiled as a result of construction activities. Thoroughly remove mortar droppings, paint splatters, stains and adhered soil.
2. Remove from the site all construction waste, unused materials, excess soil and other debris resulting from the Work.

3.05 CLEANING INSPECTION

A. Cleaning Inspection: Prior to Final Payment or acceptance by Construction Manager for partial occupancy or beneficial use of the premises, Construction Manager and Contractor shall jointly conduct an inspection of interior and exterior surfaces to verify that entire Work is acceptably clean.

B. Inadequate Cleaning: Should final cleaning be inadequate, as determined by Construction Manager, and Contractor fails to correct conditions, City may engage cleaning service under separate contract and deduct cost from Final Payment owed to Contractor.

END OF SECTION

SECTION 01770

CONTRACT CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Contract** closeout procedures.

1.02 RELATED SECTIONS

A. **Section 01300 - Submittals Procedures:** General requirements for submittals.

B. **Section 01500 - Temporary Facilities and Controls:** Cleaning and debris removal during construction.

C. **Section 01740 - Cleaning Requirements:** Cleaning as part of Contract closeout.

D. **Section 01785 - Warranties and Bonds:** Documents to be submitted as part of Contract closeout.

E. **Section 01789 - Project Record Documents:** Project Record Drawings, Project Technical Specifications and Project As-Built Drawings to be submitted as part of Contract closeout; Operation and Maintenance Data to be submitted as part of Contract closeout.

1.03 FINAL COMPLETION ACTIONS

A. **Final Application for Payment:** In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.

B. **Warranties, Bonds and Certificates:** Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications and similar documents.

C. **Locks and Keys:** Change temporary lock cylinders over to permanent keying and transmit keys to City, as directed by Construction Manager, unless otherwise directed or specified.

D. **Tests and Instructions:** Complete start-up testing of systems, and instruction of City's personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

E. **Sustainable Design Submittals:** Prepare and submit information validating compliance with Specifications Section 01350 Sustainable Design Requirements and as specified in individual product Sections in Divisions 2 through 16.

1.04 SUBSTANTIAL COMPLETION REVIEW

A. Contractor's Notification for Substantial Completion Review: When Contractor determines that the Work is complete in accordance with the Contract Documents, Contractor shall submit to City's Project Manager, Architect and Project Inspector written certification that the Contract Documents have been reviewed, the Work has been inspected by the Contractor and by authorities having jurisdiction, and the facility is ready for Completion review.

B. Preliminary Contract Closeout Review Meeting: As authorized by City's Project Manager, Architect and Architect's consultants and other responsible design professionals, as appropriate, will attend a meeting at the Project site to review Contract closeout procedures and to review the list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the City's Project Manager. This meeting shall be scheduled not earlier than 14 days prior to the date anticipated for the Substantial Completion review.

C. Correction (Punch) List: Contractor shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by Construction Manager.

1. The punch list shall include all items to be completed or corrected prior to the Contractor's application for final payment.
2. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
3. Contractor shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural, Structural, Mechanical, Plumbing, Electrical, Civil, Landscape, and Equipment. Provide a list also for the Fire Protection (sprinkler) system.
4. Architect, Architect's consultants and other design professionals under separate contracts with City, if in attendance, shall conduct a brief walk-through of Project with the Contractor to review scope and adequacy of the punch list.
5. Verbal comments will be made to the Contractor by the Architect, Architect's consultants and other design professionals under separate contracts with City, if in attendance, during the walk-through. These comments will indicate generally the additions and corrections to be made to the punch list. Such comments shall not be considered to be comprehensive; Contractor shall use the comments as guidance in preparing the punch list for the Substantial Completion review.

D. Substantial Completion Meeting: On a date mutually agreed by City's Project Manager, Architect and Contractor, a meeting shall be conducted at the Project site to determine whether the Work is satisfactory and complete for filing a Notice of Completion (Substantial Completion).

1. Contractor shall provide three working days notice to Architect for requested date of Substantial Completion meeting.

2. Architect and consultants of Architect and City, as authorized by Construction Manager, will attend the Substantial Completion meeting.
3. In addition to conducting a walk-through of the facility and reviewing the punch list, the purpose of the meeting shall include submission of warranties, guarantees and bonds to Construction Manager, submission of operation and maintenance data (manuals), provision of specified extra materials to City, and submission of other Contract closeout documents and materials as required and if not already submitted.
4. Architect, Architect's consultants, as appropriate, and other design professionals under separate contracts with City, if applicable, will conduct a walk-through of the facility with the Contractor and review the punch list.
5. Contractor shall correct the punch list and record additional items as may identified during the walk-through, including notations of corrective actions to be taken.
6. Contractor shall retype the punch list and distribute it within three working days to those attending the meeting.
7. If additional site visits are required by the Architect, Architect's consultants and other design professionals under separate contracts with City, to review completion and correction of the Work, the costs of additional visits shall be reimbursed to City by the Contractor by deducting such costs from the Final Payment.

E. Uncorrected Work: Refer to requirements specified in Section 01450 - Quality Control regarding Contract adjustments for non-conforming Work.

F. Clearing and Cleaning: Prior to the Substantial Completion review, Contractor shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls. Refer to Section 01740 - Cleaning Requirements.

G. Inspection and Testing: Prior to the Substantial Completion review, complete inspection and testing required for the Work, including securing of approvals by authorities having jurisdiction.

1. Complete all inspections, tests, balancing, sterilization and cleaning of plumbing and HVAC systems.
2. Complete inspections and tests of electrical power and signal systems.

H. Architect's Certification of Substantial Completion: When Architect determines that list of items to be completed and corrected (Punch List) is sufficiently complete for City to occupy Project for the use to which it is intended, Architect will complete and issue to City’s Project Manager and Contractor a Certificate of Substantial Completion using The American Institute of Architects Form G704 - CERTIFICATE OF SUBSTANTIAL COMPLETION or other form or correspondence as directed by Construction Manager.

I. Notice of Completion: After City has determined that the Work is complete, a Notice of Completion resolution will be scheduled for City Council approval and, when approved by City Council, will be promptly recorded by City with County Recorder.

1.05 FINAL COMPLETION SUBMITTALS

A. **Final Completion Submittals:** Prior to Completion review meeting and submission of final Application for Payment, Contractor shall complete and submit the following. Final payment will not be made by City until all submittals have been made and determined by Construction Manager and Architect to be acceptable.

B. **Agency Document Submittals:** Submit to City's Project Manager all documents required by Authority Having Jurisdiction (AHJ), including serving utilities and other agencies. Submit original versions of all permit cards, with final sign-off by inspectors. Submit all certifications of inspections and tests.

C. **Final Specifications Submittals:** Submit to City's Project Manager all documents and products required by Specifications to be submitted, including the following:

1. Project record drawings and specifications.
2. Operating and maintenance data. Refer to Section 01783 - Operation and Maintenance Data.
3. Guarantees, warranties and bonds. Refer to Section 01785 - Product Warranties and Bonds.
4. Keys and keying schedule (if keying has been performed by Contractor). Refer to Section 08710 - Door Hardware.
5. Spare parts and extra stock.
6. Test reports and certificates of compliance.

D. **Certificates of Compliance and Test Report Submittals:** Submit to City through City's Project Manager certificates and reports as specified and as required by Authority Having Jurisdiction (AHJ), including the following as applicable:

1. Sterilization of water systems.
2. Sanitary sewer system tests.
3. Gas system tests.
4. Lighting, power and signal system tests.
5. Ventilation equipment and air balance tests.
6. Fire sprinkler system tests.
7. Roofing inspections and tests.

E. **Lien and Bonding Company Releases:** Submit to City through City's Project Manager, with copy to Architect, evidence of satisfaction of encumbrances on Project by completion and submission of The American Institute of Architects Forms G706 - CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS, G706A - CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS, and (if applicable) G707 - CONSENT OF SURETY, or other form as directed by Construction Manager. Comply also with other requirements of City, as directed through Construction Manager. Signatures shall be notarized.

F. **Subcontractor List:** Submit two copies to City, through City's Project Manager and two copies to Architect of updated Subcontractor and Materials Supplier List.

G. Warranty Documents: Prepare and submit to City through City's Project Manager all warranties and bonds as specified in Section 01785 - Product Warranties and Bonds.

H. Sustainable Design Documentation: Complete proper documentation for Submittals according to 2022 California Green Building Standards Code (CALGreen). Refer to individual product Sections in Divisions 2 through 16.

1.06 FINAL PAYMENT

A. Final Payment: After completion of all items listed for completion and correction, after submission of all documents and products and after final cleaning, submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due. Payment will not be made until the following are accomplished:

1. All Project Record Documents have been transferred and accepted by City, through Construction Manager.
2. All extra materials and maintenance stock have been transferred and received by City, as verified by Construction Manager.
3. All warranty documents and operation and maintenance data have been received and accepted by City, as verified by Construction Manager.
4. All liens have been released or bonded by Contractor, as accepted by City through Construction Manager.
5. Contractor's surety has consented to Final Payment.

1.07 POST-CONSTRUCTION INSPECTION

A. Post-Construction Inspection: In accepting final payment, Contractor shall agree to perform a post-construction inspection with representatives of City and, if authorized by City, the responsible design professionals, to review performance of the completed Work and to determine what, if any, corrections shall be performed by Contractor in compliance with the Contractor's Warranty, as described in the General Provisions of the Contract.

B. Scheduled Date and Time of Post-Construction Inspection: No later than 300 days after the date of Substantial Completion, after occupancy and use of the facility by City, at days and times as directed by City.

C. Inspection Activities:

1. Contractor shall inspect, test and adjust the Work, noting defects and corrective actions to be taken.
2. Contractor shall instruct City's operating personnel in operational requirements needed to maintain correct appearance and function of the facility.

D. Post-Construction Inspection Report: Contractor shall prepare and submit to City through City's Project Manager a typewritten report, comparable to the Correction (Punch) List prepared for Completion Review.

1. Post-Construction Inspection Report shall identify deficiencies and corrective actions taken.
2. Post-Construction Inspection Report shall note when corrective actions are unable to restore defects in the Work to compliance with the requirements of the Drawings, Specifications and manufacturer's criteria.

E. Correction of Defects: Corrections shall be governed by provisions of the General Provisions of the Contract and requirements specified in Section 01785 - Product Warranties and Bonds.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01783

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Format and content of** operation and maintenance manuals.

1. Data requirements for materials and finishes.
2. Data requirements for equipment and operating systems.

B. **Submission of operation** and maintenance manuals.

1.02 RELATED SECTIONS

A. **Section 01041 - Project Management and Coordination:** Coordination documents and models prepared for performance of the Work, to be incorporated into operation and maintenance data submitted to City's Project Manager at Contract closeout.

B. **Section 01400 - Quality Control:** Manufacturer's instructions; test and balance reports.

C. **Section 01600 – Products and Materials:** Systems demonstration.

D. **Section 01770 - Contract Closeout Procedures:** Contract closeout procedures.

E. **Section 01785 - Product Warranties and Bonds:** Requirements for warranties and bonds.

F. **Section 01789 - Project Record Documents:** Submission of Project Record Documents..

G. **Section 01820 - Demonstration and Training:** Administrative and procedural requirements for instructing City's personnel in operation and maintenance of systems, subsystems, and equipment installed under the Contract.

H. **Section 01910 – General Commissioning Requirements:** Reports and other data from commissioning.

I. **Product Specifications Sections in Divisions** 2 through 16: Specific requirements for operation and maintenance data.

1.03 QUALITY ASSURANCE

A. Documentation: Preparation of operation and maintenance data shall be done by persons:

1. Trained and experienced in maintenance and operation of the described products.
2. Familiar with requirements of this Section.
3. Skilled in technical writing to the extent required to communicate essential data.
4. Skilled as drafters competent to prepare required drawings.

1.04 FORMAT AND CONTENT OF OPERATION AND MAINTENANCE MANUALS

A. Format for Operation and Maintenance Data Manuals: Prepare data in both digital/electronic format (PDF files) and in the form of an instructional manual. Comply with the general requirements specified below and comply with specific requirements for types of products in Articles following. See Article titled "SUBMISSION OF OPERATION AND MAINTENANCE MANUALS" for number of copies of manuals.

B. Operation and Maintenance Data Organization: Organize operation and maintenance data in 3-ring binders and organize the contents of each binder following the organization of the Contract Specifications.

1. Organize the group of binders and the contents of individual binders in sequence according to the Section numbers and titles as listed in the Table of Contents of the Project Manual. Number the binders consecutively; coordinate with Paragraph below titled "Tables of Contents."
2. Organize each binder with color-coded tabbed dividers for each distinct product and system, with typed inserts in tabs identifying the product or system.
3. Organize the contents of each tabbed division according to the Article headings in PART 2 - PRODUCTS in each product Specification Section.
    a. Within each tabbed division, organize the information according to major component parts of equipment and systems, as applicable, and to facilitate locating information.
    b. Separate operation and maintenance data for each product under separate tabbed divisions, where feasible.
    c. Within each tabbed division, include a cover sheet identifying the specific products and component parts included in the tabbed division.
4. If the products of more than one Specification Section are included in the binder, provide separate, heavy cover stock dividers to separate information for each Section.

C. **Binders:** 8-1/2 x 11 inch, standard three-ring binders with heavy duty vinyl covers with hard cardboard backing, black color, with provision on binder spine for inserting identification card; Maximum binder ring size shall be 3-inches. Use multiple binders as necessary to avoid overfilling. When multiple binders are used, correlate data into related consistent groupings.

D. **Cover:** Identify each binder with typed or printed card inserted on binder spine, stating OPERATION AND MAINTENANCE DATA, the Project name and the general subject matter of the contents of the binder.

E. **Title Page:** In each volume (binder) of operation and maintenance data, include a title page with the following:

1. Name of the Project.
2. Names, addresses and telephone numbers of the responsible design professionals (Architect and consultant of Architect or City, as applicable).
3. Name, address and telephone numbers of Contractor, including names of contact persons.

F. **Table of Contents:** In each volume (binder) of operation and maintenance data, include a listing of the contents of the volume. In a separate, first binder, provide a master Table of Contents of operation and maintenance data, identifying the product and systems, the applicable Specification Section number and title, and the operation and maintenance data binder number.

G. **Schedule of Products and Systems:** In the first volume of the set of operation and maintenance data, include a schedule of products and systems, indexed to the Table of Contents of the volumes (binders) and cross-referenced to the Contract Drawings and Specifications.

H. **Operation and Maintenance Data:** In each tabbed division of operation and maintenance data for each product or system, provide the following:

1. On a cover page for each tabbed division, provide the following:
   a. Identify by name, address and telephone number, the manufacturer, supplier and installer. Include names of contact persons, if known.
   b. Identify by name, address and telephone number, local sources of supplies, replacement parts and factory-authorized service.
2. Within each tabbed division, include complete operation and maintenance data as published by the product manufacturer where feasible. Otherwise, present all data neatly typewritten on 20 pound, correspondence quality bond paper. Strike-through information on printed literature where not applicable.
3. Supplement the manufacturer's printed data with neatly typewritten text and professionally drafted diagrams as necessary to suit the particular installation for the Project and to fully explain operation and maintenance procedures. Provide logical sequence of instructions for each procedure.

I. Drawings: Supplement operation and maintenance data to illustrate configurations and relationships of component parts of equipment and systems, and to show control and flow diagrams, as applicable.

1. Do not use Project Record Documents as maintenance drawings.
2. Neatly fold drawings to size of text pages and provide reinforced, punched binding edge. Add binding strip as necessary to avoid punching through drawing content.

J. Additional Data: As specified in individual product Specification Sections.

K. Warranty and Guaranty: Include copy of each warranty, guaranty, bond and service contract issued. Provide information sheet identifying:

1. Proper procedures in event of failure.
2. Instances that might affect validity of warranties or bonds.

L. Material Safety Data Sheet (MSDS): For products requiring MSDS, according to CCR Title 8, include copy of each applicable Material Safety Data Sheet (MSDS) for products delivered to the site and incorporated into the completed construction.

1.05 DATA REQUIREMENTS FOR MATERIALS AND FINISHES

A. Data for Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Data for Moisture Protection and Weather-Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual product Specification Sections.

1.06 DATA REQUIREMENTS FOR EQUIPMENT AND OPERATING SYSTEMS

A. Data for Equipment and Operating Systems: Include description of each unit or system, and component parts.

1. Include manufacturer's printed operation and maintenance instructions.
2. Identify function, normal operating characteristics and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Include sequence of operation by controls manufacturer, as applicable.
5. Provide diagrams by controls manufacturer for control systems, as applicable and as installed.

B. **Piping Data:** Provide Contractor's coordination drawings, with piping diagrams as installed. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Color code diagrams as necessary for clarity.

C. **Reports:** Include test and balancing reports, as applicable and as specified in individual product Specification Sections.

D. **Panelboard Circuit Directories:** Provide electrical service characteristics, controls and communications.

E. **Wiring Diagrams:** Include diagrams of wiring as installed, with color coding as necessary for clarity.

F. **Operating Procedures:** Include:

1. Start-up, break-in, and routine normal operating instructions and sequences.
2. Regulation, control, stopping, shut-down, and emergency instructions.
3. Summer and winter operating instructions.
4. Special operating instructions.

G. **Maintenance Requirements:** Include:

1. Routine maintenance procedures and guide for trouble-shooting.
2. Disassembly, repair, and reassembly instructions.
3. Alignment, adjusting, balancing, and checking instructions.

H. **Servicing and Lubrication:** Provide servicing and lubrication schedule, and list of lubricants required.

I. **Parts Data:** Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams as necessary for service and maintenance.

1. Include complete nomenclature and catalog numbers for consumable and replacement parts.
2. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in stock by City.

J. **Software:** All programming codes, access codes and other data necessary for operation, maintenance, future functioning and modifications of microprocessor-controlled products, independent of Original Equipment Manufacturer (OEM).

K. **Additional Requirements:** As specified in individual product Specification Sections.

1.07 DATA REQUIREMENTS FOR ELECTRIC AND ELECTRONIC SYSTEMS

A. **Date Requirements for Electrical and Electronic Systems:** Description of each system and component parts, including:

1. Function, normal operating characteristics and limiting conditions.
2. Performance curves, engineering data and tests.
3. Complete nomenclature and commercial number of replaceable parts.

B. Circuit Directories of Panel Boards: Include:

1. Electrical service.
2. Controls.
3. Communications.

C. Wiring Diagrams: As-installed, color-coded wiring diagrams.

D. Operating procedures:

1. Routine and normal operating instructions.
2. Sequences required.
3. Special operating instructions.

E. Maintenance procedures:

1. Routine operations.
2. Guide to "trouble-shooting."
3. Disassembly, repair and reassembly.
4. Adjustment and checking.

F. Manufacturer's printed operating and maintenance instructions.

G. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

H. Prepare and include additional data when the need for such data becomes apparent during instruction of City's personnel. Refer to Section 01820 - Demonstration and Training.

I. Additional requirements for operating and maintenance data: Respective sections of specifications.

1.08 INSTRUCTION OF CITY'S PERSONNEL

A. Instruction of City's Personnel: As specified in Section 01820 - Demonstration and Training.

B. Basis for Instruction: Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Instructional Material: Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.09 SUBMISSION OF OPERATION AND MAINTENANCE MANUALS

A. Submittal: Submit three copies to City through City's Project Manager prior to submission of final Application for Payment.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01785

PRODUCT WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **General administrative and procedural** requirements for preparation and submission of warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special Project warranties.

1. Refer to the General Provisions of the Contract for terms of Contractor's special warranty of workmanship and materials.
2. Certifications and other commitments and agreements for continuing services to City are specified elsewhere in the Contract Documents.

1.02 RELATED DOCUMENTS AND SECTIONS

A. **Section 01300 - Submittals Procedures:** General administrative requirements for submittals, applicable to warranties and bonds.

B. **Section 01770 - Contract Closeout Procedures:** General requirements for closeout of the Contract.

C. **Section 01783 - Operation and Maintenance Data:** Operating and maintenance data binders, to include copies of warranties and bonds.

D. **Product Specifications Sections in Divisions 2 through 16:** Special Project warranty requirements for specific products or elements of the Work; commitments and agreements for continuing services to City.

1.03 DEFINITIONS

A. **Warranty:** Assurance to City by Contractor, installer, supplier, manufacturer or other party responsible as warrantor, for the quantity, quality, performance and other representations of a product, system service of the Work, in whole or in part, for the duration of the specified period of time.

B. **Guaranty:** Assurance to City by Contractor or product manufacturer or other specified party, as guarantor, that the specified warranty will be fulfilled by the guarantor in the event of default by the warrantor.

C. **Standard Product Warranty:** Preprinted, written warranty published by product manufacturer for particular products and specifically endorsed by manufacturer to City.

D. **Special Project Warranty:** Written warranty required by or incorporated into Contract Documents, to extend time limits provided by standard warranty or to provide greater rights for City.

E. Guaranty Period: As defined in the General Provisions of the Contract guaranty period shall be synonymous with "warranty period", "correction period" and similar terms used in the Contract Specifications.

1.04 WARRANTIES AND GUARANTIES

A. Warranties and Guaranties, General: Provide all warranties and guaranties with City named as beneficiary. For equipment and products, or components thereof, bearing a manufacturer's warranty or guaranty that extends for a period of time beyond the Contractor's warranty and guaranty, so state in the warranty or guaranty.

B. Provisions for Special Warranties: Refer to General Provisions of the Contract for terms of the Contractor's special warranty of workmanship and materials.

C. General Warranty and Guaranty Requirements: Warranty shall be an agreement to repair or replace, without cost and undue hardship to City, Work performed under the Contract which is found to be defective during the guaranty period (warranty or guaranty) period. Repairs and replacements due to improper maintenance or operation, or due to normal wear, usage and weathering are excluded from warranty requirements unless otherwise specified.

D. Specific Warranty and Guaranty Requirements: Specific requirements are included in product Specifications Sections of Divisions 2 through 16, including content and limitations.

E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties and guaranties shall not relieve Contractor of responsibility for warranty and guaranty requirements for the Work that incorporates such products, nor shall they relieve suppliers, manufacturers, and installers required to countersign special warranties with Contractor.

F. Related Damages and Losses: When correcting warranted Work that has been found defective, remove and replace other Work that has been damaged as a result of such defect or that must be removed and replaced to provide access for correction of warranted Work.

G. Reinstatement of Warranty: When Work covered by a warranty has been found defective and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

H. Replacement Cost: Upon determination that Work covered by a warranty has been found to be defective, replace or reconstruct the Work to a condition acceptable to Construction Manager, complying with applicable requirements of the Contract Documents. Contractor shall be responsible for all costs for replacing or reconstructing defective Work regardless of whether City has benefitted from use of the Work through a portion of its anticipated useful service life.

I. **City's Recourse:** Written warranties made to City shall be in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which City can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: City reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

J. **Warranty as Condition of Acceptance:** City reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment shall be required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.05 PREPARATION OF WARRANTY AND BOND SUBMITTALS

A. **Project Warranty and Guaranty Forms:** Forms for special Project warranties and guaranties are included at the end of this Section. Prepare written documents utilizing the appropriate form, ready for execution by the Contractor, or the Contractor and subcontractor, supplier or manufacturer. Submit a draft to Construction Manager for approval prior to final execution.

1. Refer to product Specifications Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
2. Prepare standard warranties and guaranties, excepting manufacturers' standard printed warranties and guaranties, on Contractor's, subcontractor's, material supplier's, or manufacturer's own letterhead, addressed to City as directed by Construction Manager.
3. Warranty and guaranty letters shall be signed by all responsible parties and by Contractor in every case, with modifications only as approved in advance by Construction Manager to suit the conditions pertaining to the warranty or guaranty.

B. **Manufacturer's Guaranty Form:** Manufacturer's guaranty form may be used instead of special Project form included at the end of this Section. Manufacturer's guaranty form shall contain appropriate terms and identification, ready for execution by the required parties.

1. If proposed terms and conditions restrict guaranty coverage or require actions by City beyond those specified, submit draft of guaranty to Construction Manager for review and acceptance before performance of the Work.
2. In other cases, submit draft of guaranty to Construction Manager for approval prior to final execution of guaranty.

C. **Signatures:** Signatures shall be by person authorized to sign warranties, guaranties and bonds on behalf of entity providing such warranty, guaranty or bond.

D. Co-Signature: All installer's warranties and bonds shall be co-signed by Contractor. Manufacturer's guaranties will not require co-signature.

1.06 FORM OF WARRANTY AND BOND SUBMITTALS

A. Form of Warranty and Bond Submittals: Prior to final Application and Certificate for Payment, collect and assemble all written warranties and guaranties into binders and deliver binders to City, as directed by City's Project Manager, for final review and acceptance. Provide three (3) paper copies and one (1) electronic copy (PDF) of all material.

1. Prior to submission, verify that documents are in proper form and contain all required information and are properly signed by Contractor, subcontractor, supplier and manufacturer, as applicable.
2. Organize warranty and guaranty documents into an orderly sequence based on the Table of Contents of the Project Manual.
3. Include Table of Contents for binder, neatly typed, following order and Section numbers and titles as used in the Project Manual.
4. Bind warranties, guaranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, with clear front and spine to receive inserts, and sized to receive 8-1/2 inch by 11-inch paper.
5. Provide heavy paper dividers with celluloid or plastic covered tabs for each separate warranty. Mark tabs to identify products or installation, and Section number and title.
6. Include on separate typed sheet, if information is not contained in warranty or guaranty form, a description of the product or installation, and the name, address, telephone number and name and email address of the responsible person for applicable installer, supplier and manufacturer.
7. Identify each binder on front and spine with typed or printed inserts with title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor. If more than one volume of warranties, guaranties and bonds is produced, identify volume number on binder.
8. When operating and maintenance data manuals are required for warranted construction, include additional copies of each required warranty and guaranty in each required manual. Coordinate with requirements specified in Section 01783 - Operation and Maintenance Data.

1.07 TIME OF WARRANTY AND BOND SUBMITTALS

A. Submission of Preliminary Copies: Unless otherwise specified, obtain preliminary copies of warranties, guaranties and bonds within ten days of completion of applicable item or Work. Prepare and submit preliminary copies for review as specified herein.

B. Submission of Final Copies: Submit fully executed copies of warranties, guaranties and bonds within ten days of date identified in Notice of Completion but no later than three days prior to date of final Application for Payment.

C. Date of Warranties and Bonds: Unless otherwise directed or specified, commencement date of warranty, guaranty and bond periods shall be the date established in the Notice of Completion.

1. Warranties for Work accepted in advance of date stated in Notice of Completion: When a designated system, equipment, component parts or other portion of the Work is completed and occupied or put to beneficial use by Construction Manager, by separate agreement with Contractor, prior to completion date established in the Notice of Completion, submit properly executed warranties to City, as directed by Construction Manager, within ten days of completion of that designated portion of the Work. List date of commencement of warranty, guaranty or bond period as the date established in the Notice of Completion.
2. Warranties for Work not accepted as of date established in the Notice of Completion: Submit documents within ten days after acceptance, listing date of acceptance as beginning of warranty, guaranty or bond period.

D. Duration of Warranties and Guaranties: Unless otherwise specified or prescribed by law, warranty and guaranty periods shall be not less than the guaranty period required by the General Provisions of the Contract but in no case less than one year from the date established for completion of the Project in the Notice of Completion. See product Specifications Sections in Divisions 2 through 16 of the Project Manual for extended warranty and guaranty beyond the minimum one-year duration.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01789

PROJECT "AS-BUILT" RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Requirements for Project "AS BUILT" Record** documents to be submitted for Contract closeout by the General Contractor.

1.02 RELATED SECTIONS

A. **Section 01300 - Submittals Procedures:** General requirements for submission for shop drawings, product data, samples and quality control reports.

1.03 PROJECT RECORD DOCUMENTS

A. **Project "As-Built" Record Documents, General:** Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the reference by City Project Manager and Architect during normal working hours.

B. **Record Drawings:** Contractor to record as-built information continuously as Work progresses. Do not conceal Work permanently until all required information is recorded.

1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately.
2. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
3. Legibly and to scale, mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the work.
4. Mark new information that is important to the City's operation and maintenance of the Work but was not shown on Contract Drawings or Shop Drawings. Record actual construction, including:
    a. Measured depths of foundations and footings encountered, measured in relation to finish First Floor datum.
    b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent ground improvements.
    c. Field changes of dimension and detail.
    d. Details not on original Contract Drawings. Application of copies of details produced and provided by Architect during construction will be accepted.
    e. Permanent Room names and Room numbers.

5. Note related Change Order numbers where applicable.
6. Organize as-built record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
7. Store Record Documents separate from documents used for construction.

C. Record Specifications: Record changes made by Addenda and Change Orders. In PART 2 - PRODUCTS in each Section, legibly mark and record in red ink actual Products installed or used, including:

1. Manufacturer's name and product model or catalog number.
2. Product substitutions or alternates utilized.

D. Submission:

1. Project “As-Built” Record Documents shall be kept current and will be reviewed for completeness by City’s Project Manager and Architect as condition for certification of each monthly Progress Payment Application.
2. Submit Complete set of “As-Built” Record documents to City’s Project Manager and Architect for approval prior to final Application for Payment. Submit 2 sets of documents xerographically reproduced on white bond paper and one set of PDF electronic copies.

PART 2 - PRODUCTS

Not Applicable to this Section.

PART 3 - EXECUTION

Not Applicable to this Section.

END OF SECTION

SECTION 01820

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Administrative and procedural** requirements for instructing City'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 installed under the Contract.
3. Demonstration and training visual presentation media and notes.

1.02 RELATED SECTIONS

A. **Section 01041 - Project Management and Coordination:** Requirements for pre-instruction conferences.

B. **Section 01783 - Operation and Maintenance Data:** Operating and maintenance instructions to be used during training and demonstration.

C. **Divisions 2 through 16 Sections** for specific requirements for demonstration and training for Work specified in those Sections.

1.03 SUBMITTALS

A. **Instruction Program:** Submit two copies of outline of instructional program for demonstration and training, including 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. Receipt, review and acceptance of instruction program by City, through City’s Project Manager shall be condition precedent to approval of Contractor's application for payment in excess of 50 percent of the Contract Sum.
2. Submission of instruction program shall be scheduled to allow sufficient time for receipt, review and acceptance of instruction program by City, through City’s Project Manager and shall be not less than 3 weeks prior to proposed date of first training session.
3. At completion of training, submit two complete training manual(s) to City, through City’s Project Manager, for City's use.

B. **Qualification Data:** For persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

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.

E. **Demonstration and Training Video Presentations:** Submit two DVD copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
   a. Name of Project and Contract Number
   b. Name and address of videographer.
   c. Name of Architect.
   d. Name of Contractor.
   e. Date video was recorded.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.04 QUALITY ASSURANCE

A. **Facilitator Qualifications:** A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. **Instructor Qualifications:** Factory-authorized service representative and other qualified instructors, complying with requirements in Section 01450 - Quality Control, experienced in operation and maintenance procedures and training.

C. **Photographer/Videographer Qualifications:** A professional photographer who is experienced photographing construction projects.

D. **Pre-Instruction Conference:** Conduct conference at Project site to comply with requirements in Section 01200 - 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.

1.05 COORDINATION

A. Coordination of Instruction Schedule: Coordinate instruction schedule with City's operations. Adjust schedule as required to minimize disrupting City's operations. Coordinate with City through Construction Manager (CM).

B. Coordination of Instructors: Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content. Allow for 30 days notice to City through Construction Manager (CM).

C. Coordination with Operation and Maintenance Data: 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.

1. Do not submit instruction program until operation and maintenance data have been reviewed by Architect or other responsible design professional and accepted by City through Construction Manager (CM).
2. Coordinate review of operation and maintenance data to make operation and maintenance data available at least 30 days prior to date scheduled for initial training session.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized overhead basketball goals.
2. Equipment, including gymnasium equipment, audio-visual and any food service equipment as applicable.
3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
4. Intrusion detection systems, if applicable.
5. Heat generation, including boilers, pumps and water distribution piping, as applicable.
6. Refrigeration systems, including chillers, cooling towers, condensers, pumps and distribution piping, as applicable.
7. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices, as applicable.
8. HVAC instrumentation and controls, as applicable.
9. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls, as applicable.
10. Lighting equipment and controls, as applicable.
11. Communication systems, including voice and data systems and video equipment, as applicable.
12. Motorized window coverings.
13. Security System.

B. **Schedule / Video of Training Sessions:** Arrange to have training conducted on consecutive days, with no more than 6 hours of training scheduled for any one day. Concurrent classes will not be acceptable. Make a video of each training session and provide an electronic copy to the City at Closeout.

C. **Training Modules, General:** Develop a learning objective and teaching outline for each module. Develop an instruction program that includes individual training sessions for each system and operating products not part of a system, as required by Division 2 through 16 Specification Sections. Include a description of specific skills and knowledge that participant is expected to master.

D. **Training Module Content:** Training modules shall progress logically. Each training module shall be comprised of time spent both in the classroom and at specific location of subject equipment or system. As a minimum, cover the following subjects for each item of equipment and system:

1. Familiarization:
   a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plant files and operation and maintenance manuals.
   b. Check out the installation of the specific equipment items.
   c. Demonstrate the unit and indicate how all parts of the specifications are met.
   d. Answer questions.
2. Safety:
   a. Using material previously provided, review safety references.
   b. Discuss proper precautions around equipment.
3. Operation:
   a. Using material previously provided, review reference literature.
   b. Explain all modes of operation (including emergency).
   c. Check out City's personnel on proper use of equipment and controls.
4. Preventive Maintenance:
   a. Using material previously provided, review preventive maintenance (PM) lists including:
      1) Reference material.
      2) Daily, weekly, monthly, quarterly, semiannual, and annual jobs.
   b. Demonstrate how to perform Preventative Maintenance tasks.
   c. Demonstrate to City's personnel what to look for as indicators of equipment problems.
5. Corrective Maintenance:
   a. List possible problems.
   b. Discuss repairs--point out special problems.
   c. Open up equipment and demonstrate procedures, where practical.
6. Parts:
   a. Show how to use previously provided parts list and order parts.
   b. Check over spare parts on hand. Make recommendations regarding additional parts that should be available.

7. Local Representatives:
   a. Where to order parts: Name, address, telephone.
   b. Service problems:
      1) Who to call.
      2) How to get emergency help.
8. Operation and Maintenance Manuals:
   a. Review any other material submitted.
   b. Update material, as required.

E. Classroom Training for Operations Personnel:

1. Using projected drawings and photographs, describe and discuss equipment locations in plant and present operational overview of systems. Thoroughly discuss operating and maintenance manuals.
2. Describe purpose and plant function of equipment and systems.
3. Describe operating theory of equipment.
4. Describe start-up, shutdown, normal operation and emergency operating procedures, including discussion of system integration and electrical interlocks, if any.
5. Identify and discuss safety items and procedures.
6. Describe routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
7. Describe operator detection, without test instruments, of specific equipment trouble symptoms.
8. Describe required equipment performance test procedures and intervals.
9. Describe routine disassembly and assembly of equipment if applicable (as determined by City on case-by-case basis) for purposes such as operator inspection of equipment.

F. Classroom Training for Maintenance and Repair Personnel:

1. Theory of operation.
2. Description and function of equipment.
3. Start-up and shutdown procedures.
4. Normal and major repair procedures.
5. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
6. Routine and long-term calibration procedures.
7. Safety procedures.
8. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

G. Field Training for Operations Personnel:

1. Identify locations of equipment components and controls.
2. Review of component functions and theory of operation.
3. Identifying piping and flow options.
4. Identifying valves and explain their functions at various settings.
5. Identifying instrumentation:
   a. Location of primary element.
   b. Location of instrument readout.
   c. Discuss purpose, basic operation, and information interpretation.
6. Discuss, demonstrate, and perform standard operating procedures and round checks, including system start-up and shutdown procedures.
7. Review and perform safety procedures.
8. Perform the required equipment exercise procedures.
9. Discuss and perform preventative maintenance activities.
10. Identify and review safety items and perform safety procedures, if feasible.

H. Field Training for Maintenance and Repair Personnel: In addition to field training specified above for operations personnel, include the following:

1. Describe normal repair procedures.
2. Perform routine disassembly and assembly of equipment, if applicable, for inspections and tests.
3. Perform routine maintenance and repair tasks, including mechanical and electrical operations for troubleshooting, adjustments and calibration.

I. Presentation Media:

1. Presentations shall utilize computer-generated, projected graphics utilizing Microsoft PowerPoint software, including animation as appropriate to enhanced presentation and viewer interest. Graphics shall include text and still and moving images. PowerPoint presentation shall be suitable for incorporation into video record of instruction.
2. Each session shall include mock-ups, samples and other visual aids as appropriate.
3. Each session shall include printed handouts and notes for each participant.
4. Produce sufficient printed materials to provide minimum of 5 unused copies for City's use in subsequent training programs.

J. Video Record: Each training session shall be recorded and reproduced on digital video disc (DVD). Video media shall be labeled with legible, permanent computer-printed labels. Provide City with an electronic copy as a part of the Closeout Materials.

PART 3 - EXECUTION

3.01 PREPARATION

A. Preparation:

1. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
2. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and City's Representatives (through Construction Manager) for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct City's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. City' will furnish through Construction Manager (CM) to Contractor names and positions of participants.

C. 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 City through Construction Manager (CM), with at least ten working days advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

E. Cleanup: Collect used and leftover educational materials and deliver to City through Construction Manager (CM). Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

SECTION **01910**

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. **OPR and BOD** documentation are included by reference for information only.

1.2 SUMMARY

A. **This section includes**:

1. Commissioning: Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the Owner's operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance, and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.
2. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
    a. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
    b. Verify and document proper performance of equipment and systems.
    c. Verify that O&M documentation left on site is complete and that it satisfies a comprehensive Systems Manual
    d. Verify that the Owner's operating personnel are adequately trained.
3. The commissioning process does not take away from or reduce the responsibility of the Contractor to meet the Contract Documents.

B. **Related Sections**:

1. Section 15600 Plumbing
2. Section 15800 Heating Ventilation and Air Conditioning
3. Section 16010 General Electrical Provisions
4. Section 16500 Lighting Fixtures and Controls

1.3 DEFINITIONS

A. **Acceptance Phase**: Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review, and training occur

B. **Approval**: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents

C. **Architect / Engineer (A/E)**: The prime consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer

D. **Owner's Project Requirements**: The Owner's Project Requirements is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The Owner's Project Requirements describes the systems, components, conditions, and methods chosen to meet the intent. Some reiterating of the design intent may be included.

E. **Basis of Design**:

F. **Commissioning Authority (CxA)**: An independent authority, not otherwise associated with the A/E team members or the Contractor, though he/she may be hired as a subcontractor to them. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role.

G. **Commissioning Plan**: An overall plan, developed before or after bidding that provides the structure, schedule, and coordination planning for the commissioning process

H. **Construction Checklist (CC)**: A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment. Construction checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension correct, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some construction checklist items entail simple testing of the function of a component, a piece of equipment, or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word construction refers to before functional testing. Construction checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, Contractors typically perform some, if not many, of the construction checklist items a commissioning authority will recommend. However, few Contractors document in writing the execution of these checklist items. Therefore, for most equipment, the Contractors execute the checklists on their own. The CxA only requires that the procedures be documented in writing and does not witness the completion of construction checklists, except for larger or more critical pieces of equipment.

I. **Contract Documents**: The documents binding on parties involved in the construction of this Project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.)

J. **Contractor**: The general contractor or authorized representative

1. Control system: The central building energy management control system

K. **Data Logging**: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control system

L. **Deferred Functional Tests**: FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that prevent the test from being performed

M. **Deficiency**: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents

N. **Design Intent**: A dynamic document that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

O. **Factory Testing**: Testing of equipment on-site or at the factory by factory personnel with a Project Manager present

P. **Functional Performance Test (FT)**: Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation, and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees, and documents the actual testing, which is usually performed by the installing Contractor or vendor. FTs are performed after construction checklists and startup are complete.

Q. **General Contractor (GC)**: The Contractor for this project. Generally refers to all the GC's subs as well. Also referred to as the Contractor, in some contexts.

R. **Indirect Indicators**: Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed

S. **Installing Contractor (IC)**: Contractor who installs specific equipment and/or systems

T. **Manual Test**: Using hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation")

U. **Monitoring**: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems

V. **Non-Compliance**: See Deficiency

W. **Non-Conformance**: See Deficiency

X. **Over-written Value**: Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50°F to 75°F to verify economizer operation). See also "Simulated Signal."

Y. **Owner-Contracted Tests**: Tests paid for by the Owner outside the GC's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Z. **Phased Commissioning**: Commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time

AA. **Sampling**: Functionally testing only a fraction of the total number of identical or near-identical pieces of equipment. Refer to Part 3.4 F for details.

BB. **Seasonal Performance Tests**: FTs that are deferred until the system(s) will experience conditions closer to their design conditions

CC. **Simulated Condition**: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box)

DD. **Simulated Signal**: Disconnecting a sensor and using a signal generator to send an amperage, resistance, or pressure to the transducer and DDC system to simulate a sensor value

EE. **Specifications**: The construction specifications of the Contract Documents

FF. **Startup**: The initial starting or activating of dynamic equipment, including executing construction checklists

GG. **Subs**: The subcontractors to the Prime Contractor who provide and install building components and systems

HH. **Test Procedures**: The step-by-step process that must be executed to fulfill the test requirements. The CA develops the test procedures.

II. **Test Requirements**: Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements for each system are specified in the respective section of the Contract Documents.

JJ. **Trending**: Monitoring using the building control system

KK. **Variable Refrigerant Flow (VRF)**: Is a ductless multi-split system with multiple indoor fan coil units receiving direct refrigerant that is also connected to single condenser unit located on the roof. Simultaneous heating and cooling can be controlled with these units via a multi-zone controls strategy. These VRF system can be complex and require installation by an approved installing contractor and start-up verification from an authorized manufacturer's representative.

LL. **Vendor**: Supplier of equipment

MM. **Warranty Period**: Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4 COMMISSIONING TEAM

A. **Members Appointed by Contractor(s)**: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement

the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, manufacturer's representatives, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by City:

1. Representatives of the facility user and operation and maintenance personnel.
2. Architect, engineering design, and CxA professionals.

1.5 CITY'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BOD documentation, prepared by Engineer and approved by City, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings.
4. Integrate and coordinate commissioning process activities with construction schedule and installing contractors.
5. Review and accept construction checklists provided by the CxA.
6. Provide for VRF system manufacturer support including pre-functional start-up assistance and support integrating VRF controls with the overall building management system.
7. Complete construction checklists as Work is completed and provide to the Commissioning Authority on a monthly basis.
8. Review and accept commissioning process test procedures provided by the Commissioning Authority.
9. Complete commissioning process test procedures.

1.7 CxA's RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. **Provide** commissioning plan.

C. **Convene commissioning** team meetings.

D. **Provide Project-specific** construction checklists and commissioning process test procedures.

E. **Verify the execution of** commissioning process activities using random sampling. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

F. **Prepare and** maintain the Issues Log.

G. **Witness systems,** assemblies, equipment, and component startup.

H. **Compile test data, inspection reports, and certificates**; include them in the systems manual and commissioning process report.

1.8 SYSTEMS TO BE COMMISSIONED

A. **The following systems are to be commissioned where applicable per the plans and specifications**:

1. HVAC and controls.
2. Lighting and controls
3. Domestic hot water heating
4. Newly installed irrigation controller (if any) for CALGreen compliance

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. **All standard testing equipment** required to perform startup and initial checkout and required functional performance testing shall be provided by the IC for the equipment being tested. For example, the MC of Division 15 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 15, except for equipment specific to and used by TAB in their commissioning responsibilities. The IC shall provide two-way radios, if needed during functional testing.

B. **Special equipment, tools** and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the base bid price to the Contractor and left on site, except for stand-alone data logging equipment that may be used by the CA.

C. **Refer to Part 3 for details** regarding equipment that may be required to simulate required test conditions.

PART 3 - EXECUTION

3.1 MEETINGS

A. **Commissioning Meeting**: Within 60 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan, which will be distributed to all parties.

B. **Miscellaneous Meetings**: Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular contractors. The CxA will plan these meetings and will minimize unnecessary time being spent by contractors. For large projects, these meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

A. **The following procedures** apply to all equipment to be commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified CCs and startup.

B. **General:** Construction checklists are important to ensure that the equipment and systems are hooked up correctly and operational. Checklists also ensure that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full construction checkout. No sampling strategies are used. The construction testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. **VRF System Specifics**: Special attention must be given to a VRF system components and general workmanship to provide the owner with a warranted and long lasting system. Some of the issues that can affect performance and verification in the field include but are not limited to the following

1. Refrigerant piping installation and leak detection
2. Branch controller(s) location and installation
3. System controls integration with overall building management system
4. Access of fan coil units for maintenance and filter change outs

D. **Startup and Initial Checkout Plan**: The CxA will assist the commissioning team members responsible for startup of any equipment in developing detailed startup plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. Parties responsible for construction checklists and startup are identified in the initial commissioning meeting and in the checklist forms.

1. The CxA adapts, if necessary, the representative construction checklists and procedures from the related sections. These checklists indicate

required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

2. The CxA provides these checklists and tests to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.

3. The Contractor responsible for the purchase of the equipment develops the full startup plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

    a. The full startup plan could consist of something as simple as:

        1) The CxA's construction checklists
        2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end
        3) The manufacturer's normally used field checkout sheets and any special testing and forms used by the authorized manufacturer's representative.

4. The contractor submits the full startup plan to the CxA for review and approval.

5. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.

E. Sensor and Actuator Calibration

1. All field-installed temperature, relative humidity, CO, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used if approved by the CxA beforehand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field-calibrated.

2. The VRF manufacturer's authorized representative along with the installing contractor observe and record system's refrigerant suction and pressure conditions.

3. All procedures used shall be fully documented on the construction checklists or other approved forms, clearly referencing the procedures followed and written documentation of initial, intermediate, and final results.

F. Execution of Construction Checklists and Startup

1. Four weeks prior to startup, the contractors and vendors schedule startup and checkout with the GC and CxA. The performance of the construction checklists, startup and checkout are directed and executed by the contractor or vendor. When checking off construction checklists, signatures may be required of other contractors for verification of completion of their work.
2. The CxA will, at their own discretion, observe, at minimum, the procedures for each piece of primary equipment unless there are multiple units. In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the construction and startup procedures. The sampling procedures are identified in the Commissioning Plan.
4. The contractors shall execute startup and provide the CxA with a signed and dated copy of the completed startup and construction tests and checklists.
5. Only installing individuals who have direct knowledge that a line item task on the construction checklist was actually performed shall initial or check off that item.

G. Deficiencies, Non-Conformance and Approval in Checklists and Startup

1. The contractors shall clearly list any outstanding items of the initial startup and construction procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
2. The CxA reviews the report and submits either a non-compliance report or an approval form to the contractors. The CxA shall work with the Prime contractors to correct and retest deficiencies or uncompleted items. The CA will involve the contractors and others as necessary. The installing contractors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated startup report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the A/E using a standard form.
3. Items left incomplete, which later cause deficiencies or delays during functional testing, may result in back charges to the responsible party.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. This subsection applies to all commissioning functional testing for all divisions.

B. **The general list of equipment** to be commissioned is found in this Section. The specific equipment and modes to be tested for each system are found in the respective sections.

C. **The parties responsible** to execute each test are listed with each test in the respective sections.

D. **Objectives and Scope**: The objective of functional performance testing is to demonstrate that each system is operating according to the Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in Divisions 15 and 16, and other parts of the specification.

E. **Development of Test Procedures**: Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements in Divisions 15, and elsewhere, the CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each contractor or vendor responsible to execute a test shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the contractors, who shall review the tests for feasibility, safety, equipment, and warranty protection.

1. The CxA shall review Owner-contracted factory testing or required Owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
2. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
3. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:
    a. System and equipment or component name(s)
    b. Equipment location and ID number
    c. Unique test ID number, and reference to unique construction checklist and start-up documentation ID numbers for the piece of equipment

d. Date

e. Project name

f. Participating parties

g. A copy of the specification section describing the test requirements

h. A copy of the specific sequence of operations or other specified parameters being verified

i. Formulas used in any calculations

j. Required pre-test field measurements

k. Instructions for setting up the test

l. Special cautions, alarm limits, etc.

m. Specific step-by-step procedures to execute the test, in a clear, sequential, and repeatable format

n. Acceptance criteria of proper performance with a Yes / No checkbox to allow for clearly marking whether or not proper performance of each part of the test was achieved

o. A section for comments

p. Signatures and date block for the CxA

F. Test Methods

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. Division 15 Sections and other Sections specify which methods shall be used for each test. The CxA may substitute specified methods or require an additional method to be executed other than what was specified. The CxA will determine which method is most appropriate for tests that do not have a method specified.

2. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55°F, when the outside air temperature is above 55°F, temporarily change the lockout setpoint to be 2°F above the current outside air temperature.

3. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during construction testing.

4. Setup: Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The contractor executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures,

temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

G. Coordination and Scheduling: The contractors shall provide sufficient notice to the CxA regarding their completion schedule for the construction checklists and startup of all equipment and systems. The CxA will schedule functional tests through the A/E, GC and other contractors. The CxA shall direct, witness and document the functional testing of all equipment and systems. The contractors shall execute the tests.

1. In general, functional testing is conducted after construction testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Problem Solving: The CxA will recommend solutions to problems found; however, the burden of responsibility to solve, correct, and retest problems is with the GC, contractors, and A/E.

3.4 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation: The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the contractors for review. The CxA will include the filled-out forms in the O&M manuals.

B. Non-Conformance

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the A/E on a standard non-compliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.

    a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:

1) The CxA documents the deficiency and the Prime contractor's response and intentions, and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the A/E for signature, if required. A copy is provided to the contractor and CxA. The contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested, and sends it back to the CxA.
2) The contractor reschedules the test and coordinates with CxA to establish a time and date that the test is to be repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented on the non-compliance form with the contractor's response and a copy given to the A/E and to the contractor representative assumed to be responsible.
2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the A/E.
3) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The contractor reschedules the test and notifies the CxA of the date and time the test is to be repeated. This will occur until satisfactory performance is achieved.

5. Cost of Retesting

a. The cost for the contractor to retest a construction or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the responsible parties.

b. For a deficiency identified, not related to any construction checklist or startup fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge" to the contractor for their time. However, the CxA's time for a second retest will be charged to the contractor, who may choose to recover costs from the responsible Sub.

c. The time for the CxA to direct any retesting required because a specific construction checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the contractor, who may choose to recover costs from the party responsible for executing the faulty construction test.

6. The contractor shall respond in writing to the CxA at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. The CxA retains the original non-conformance forms until the end of the project.

8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the contractor.

C. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the Owner. In such case, the contractor shall provide the Owner with the following:

1. Within one week of notification from the A/E, the contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the A/E within two weeks of the original notice.

2. Within two weeks of the original notification, the contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions, which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

3. The A/E will determine whether a replacement of all identical units or a repair is acceptable.

4. Two examples of the proposed solution will be installed by the contractor and the CxA will be allowed to test the installations for up to one week, upon which the CxA will decide whether to accept the solution.

5. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval: The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA. The CA recommends acceptance of each test to the Owner and A/E using a standard form. The A/E gives final approval on each test using the same form, providing a signed copy to the CA and the contractor.

3.5 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals to develop a Systems Manual

1. Systems Manuals are required as part of LEED EA c3 Enhanced Commissioning and CALGreen.

2. Special requirements for the TAB contractor are found in Section 15800. The CxA will need assistance from the ICs and GC in compiling the Systems Manual.

3.6 TRAINING OF OWNER PERSONNEL

A. **The GC shall be** responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. **The CxA shall be responsible** for verifying and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. In addition to these general requirements, the specific training requirements of Owner personnel by contractor and vendors is specified in Divisions 15 and 16.

2. Each contractor and vendor responsible for training will submit a written training plan to the CA for review and approval prior to training. The plan will cover the following elements:

3. For the primary HVAC equipment, the TCC shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

4. The mechanical design engineer shall at the first training session present the overall system design concept and the design concept of each equipment section. This presentation shall include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system, and outside air strategies.

5. Lighting controls training shall be developed and implemented by the lighting manufacturer representative. This training should occur during tuning and commissioning of the lighting system.

3.7 WRITTEN WORK PRODUCTS

A. **The commissioning process generates** a number of written work products described in various parts of the Specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them, and the location of the specification to create them. In summary, the written products are:

Product	Developed By
Commissioning plan	CxA
Commissioning meeting minutes	CxA
Commissioning schedules	GC and CxA with other contractors
Equipment documentation submittals	Contractors
Sequence clarifications	Contractors and A/E as needed
Startup and initial checkout forms filled out	Contractors & Manufacturer’s Reps.
Final TAB report	TAB
Issues log (deficiencies)	CxA with responses provided by

Product	Developed By
	contractors
Functional test forms	CxA and Installing Contractors
Filled-out functional tests	CxA and Installing Contractors
Filled-out Lighting Control Tuning and testing	Lighting manufacturer or representative
O&M manuals	Contractors with review by CxA
Systems Manual	CxA
Overall training plan	GC and Installing Contractors
Specific training agendas	Installing Contractors
Final commissioning report	CxA

END OF SECTION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Perform all the demolition and removals as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Demolish and remove existing site improvements including all walks, paving, fences, walls, and foundations as shown on the drawings.
2. Make necessary arrangements and remove abandoned on-site utilities including capping and sealing of underground services at the property line or as shown on the drawings.
3. Clean up and dispose of demolition and removal debris. Dispose of material in a permitted and legal manner.
4. Salvage as directed by Owner, including delivery to Owner's storage.

B. Related Work Specified Elsewhere:

1. Refer to Section 01352 Construction Waste Management and Disposal.

1.02 PERFORMANCE REQUIREMENTS

A. **Reuse, salvage or recycle** demolition waste to the greatest extent economically feasible. Divert demolition waste from landfill disposal.

B. **Landfill Diversion:** 65% minimum allowable total demolition waste from landfill not including land clearing debris or hazardous waste.

1.03 SUBMITTAL PROCEDURES

A. **Final Report:** Submit calculations of total demolition waste recycling rates, salvage rates and landfill rates. Describe compliance with performance requirement. Submit with final application for payment. Application for payment will not be processed without approved demolition waste management summary.

1.04 QUALITY ASSURANCE:

A. **Requirements of Regulatory Agencies**: Secure and pay for demolition and removal permits required by public agencies having jurisdiction.

B. **Public Utilities**: Give required notices, pay fees and charges, and arrange for disconnection and removal of abandoned public utilities and meters.

C. **Provide onsite instruction** of appropriate separation, handling, recycling, salvage, reuse and return methods to be used by all parties during demolition.

1.05 JOB CONDITIONS: Intent of the Drawings is to show existing site and building conditions with information developed from the original construction documents, field surveys, and Owner's records, and to generally show the amount and type of demolition

required to prepare existing areas for new Work. Contractor shall make a detailed survey of existing conditions pertaining to the Work prior to commencing demolition. All discrepancies between Drawings and actual conditions shall be reported to the Architect for instructions, and no Work shall be done where such discrepancies occur prior to receipt of Architect's instructions.

A. **Protection**: Maintain fully charged fire extinguishers and water hoses readily available during all the demolition operations. Test electrical conductors for disconnection prior to removing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 SITE BARRICADES: As specified in Section 01500.

3.02 DEMOLITION AND REMOVALS:

A. **Buildings and Structures (including Pool)**: Demolish and remove structures complete as indicated and required, including walls, footings, foundations, and like structures as noted on the drawings.

B. **Site Improvements**: Remove walks and paving of all kinds (including parking lot areas in limits of work), herbicide treated base courses, and all fences, walls, stoops, and miscellaneous items as noted on the drawings.

C **Underground Utilities**: Expose pipe and conduit and cap at property line or as shown on the drawings with permanent waterproof plugs or seals of concrete or metal. Remove all on-site abandoned pipe and conduit, and backfill the excavations as specified for new construction except where located in mass excavation volume.

3.03 TREES: Remove or protect trees as indicated on drawings or required by Owner/Architect, including roots to 18” below finish grade, and backfill holes with compacted soil. When ordered by Owner, employ skilled nurserymen to transplant trees to the designated locations and maintain until re-established.

3.04 SALVAGE AND DISPOSAL:

A. **General**: Existing items Owner intends to retain will be designated by the Owner prior to start of demolition. Contractor shall carefully remove, salvage, box or bundle as approve and deliver such items to storage at site as directed.

B. **Disposal**: All removed material other than items to be salvaged or reused shall become Contractor's property and shall be removed from Owner’s property. Debris shall be cleaned up and disposed of by Contractor promptly and continuously as Work progresses and not allowed to accumulate. Sprinkle the debris to prevent a dust nuisance. Secure and pay for required hauling permits and pay dumping fees and charges.

END OF SECTION

SECTION 129300

SITE FURNISHINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Trash Receptacles

B. Benches

C. Bicycle Racks

1.2 RELATED WORK

A. None

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide products manufactured by:

1. QCP Corp. (866) 703-3434
   a) C2 Bench (Q2-C272B)

2. Anova Site Furnishings (800) 325-3047
   a) Tandem Bike Rack (#CIRCLEBR)

2.2 MATERIALS

A. Wood: IPE

B. Galvanized Steel: ASTM A53 or A120 pipe; ASTM A123 or A153 zinc coating on fabricated steel parts after fabrication (hot-dip galvanized).

C. Concrete or Non-Shrink Grout: As recommended by site furnishings manufacturer or vendor.

2.3 RECYCLED CONTENT

A. Recycled Material Content: Minimum 90%.

2.4 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer’s standard, baked, polyester, powder-coat finish complying with finish manufacturer’s written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.4 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer’s standard, baked, polyester, powder-coat finish complying with finish manufacturer’s written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.5 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 directional finishes with long dimension of each piece.
2. Directional Satin Finish: No. 4.
3. Dull Satin Finish: No. 6.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Dimensions upon which Work of this Section may be contingent are to be verified at the project site to ensure proper placement and fit of equipment in the allotted areas.

C. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

D. Set site furnishings plumb, level, and true to line with a neat and finished appearance. Include setting each item in its correct place, fastening it, connecting it, or incorporating it into other portions of the Work, as each item may require; testing and operating equipment to assure proper function.

E. Include the providing of anchors and adhesives required for installing and attaching the items specified, in accordance with manufacturer's printed specifications.

F. Keep the premises free from accumulation of waste materials and rubbish caused by this Work. Remove waste materials as specified in other Sections of these specifications.

END OF SECTION 129300

SECTION 02200

SITE PREPARATION

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide and perform site preparation and earthwork as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Site clearing.
2. Excavation, filling, backfilling, and compaction.
3. Imported fill material as required.
4. Sand fill under floor slabs.
5. Control of surface and ground water.
6. Testing and inspection of work of this Section.
7. Clean up and disposal.

B. Related Work Not In This Section:

1. Vapor barrier under floor slabs.
2. Excavating and backfilling for underground utility systems.
3. Landscaping including planting fill and irrigation systems.

1.02 QUALITY ASSURANCE: The Soils Report shall control all aspects of this Work. If a discrepancy occurs between this specification and the Soils Report, the Soils Report shall take presidency.

A. Professional Observation: Perform Work of this Section under the inspection and approval of the Geotechnical Engineer. Give Geotechnical Engineer not less than 48 hours advance notice of readiness for inspection.

B. Source Quality Control: Obtain approval by Geotechnical Engineer of imported fill material before material is brought to site, and same approval of excavated material for use in fills or backfills prior to placing.

C. Requirements of Regulatory Agencies: Conform off-site excavation, backfill, and compaction to requirements of public authorities having jurisdiction. Obtain and pay for required permits and inspections.

1.03 JOB CONDITIONS:

A. Data: Maps, boring logs, geotechnical and foundation investigation reports, and similar reference data, not included in Contract Documents but made available to

Contractor by Architect or Owner, are for information only and the Architect and Owner assume no responsibility for any conclusions Contractor may draw from such information. Contractor shall determine all existing conditions under which he will operate in performing the Work. A copy of the Report of Geotechnical Study for the Proposed Anthony Munoz Community Center Gymnasium 1242 West 4th Street, Ontario, CA by Kleinfelder Project No. 20236170.006A dated June 24, 2023 is provided as a part of the Bid Documents,

B. **Protection**: Provide and maintain protection to retain earth banks and protect adjoining grades and structures from caving, sliding, erosion, or other damage. Provide suitable protection against all bodily injury. Construct all bulkheads and shoring to requirements of State and Local codes and regulations. Shore vertical banks or slope banks back as required for stability and safety. Erect temporary barricades located at least 5-feet away from the top of slopes, and provide temporary berms as required to prevent slope erosion from water.

C. **Shoring**: Contractor shall employ and pay a California registered civil engineer to prepare and stamp drawings and calculations showing the shoring methods, soldier piles, tie back anchoring, wall support systems, and other systems used for protection of all adjacent existing structures and improvements and for all earth banks, shall submit shoring drawings and calculations to Geotechnical Engineer and Structural Engineer for discussions but not for approval, shall obtain Building Department approval prior to start of any construction involving shoring and pay fees and charges, and file three copies of the Building Department approved drawings and calculations with the Architect for record purposes only and not for review or approval. Frequently inspect all shoring for deflections during construction. Refer to the Geotechnical Investigation Report.

D. **Dewatering**: Keep the whole of the excavations continuously free from water and fluids of any kind. Shoring drawings and calculations shall be accompanied by detailed drawings, calculations, and written description of methods, materials, and procedures to be used in dewatering operations, prepared for record purposes only and not for review or approval.

PART 2 - PRODUCTS

2.01 MATERIALS: Provide approved imported material as required if the quantity of approved site and excavated material is insufficient to complete the Work.

A. **Earthwork Materials**: Approved excavated or imported granular earth material such as silty sand of the non-expansive type (that undergoes no undesirable volumetric change with changes in moisture content) and containing not more than 20% by weight of material passing the No. 200 sieve, free from trash, roots, organic material, clay lumps, and rocks over 6" size.

B. Soil Materials:

1. General Materials: Any primarily non-expansive granular materials, imported or from cut areas, that are suitable for intended use in Geotechnical Engineer's opinion, free of rocks or hard lumps larger than 6" size, having at least 40% of material smaller than 1/4" size with a maximum 20% by weight of material passing a No. 200 sieve, free of trash, debris, roots, clay lumps, and organic material. Do not use materials of a perishable, spongy, or otherwise improper kind. Refer to the Geotechnical Investigation Report.
2. Select Material: As specified above for general materials, swell limited to less than 3% when the material is compacted as specified for compacted fills and soaked under an axial pressure of 160 pounds per square foot.
3. Trench Backfill Material: As specified above except materials in the pipe zone and to 12" above the pipe barrel shall contain no rocks or hard lumps over 1" size.

C. Gravel Fill Material: From an approved source, 90% to 100% passing the 3/4" sieve, 0% to 10% passing a No. 4 sieve, and 0% to 3% passing a No. 100 sieve. Crushed rock of same gradation may be used.

D. Pea Gravel Backfill Material: From an approved source, 100% passing 3/4" sieve, 95% to 100% passing 3/8" sieve, 0% to 5% passing the No. 4 sieve, and 0% to 5% passing the No. 8 sieve.

E. Sand Equivalent: ASTM D2419, California Sand Equivalent values not below 80 percent.

2.02 ABANDONED UTILITIES: Abandoned utilities within the proposed building areas should be removed in their entirety. Utilities within the proposed building areas would only be considered for in-place abandonment provided they do not conflict with new improvements, that the ends and all laterals are located and completely grouted, and the previous fills associated with the utility do not pose a risk to the structures.

Utilities outside the building areas should be removed or abandoned in-place by grouting or plugging the ends with concrete. Fills associated with utilities abandoned in-place could pose some risk of settlement; utilities that are plugged could also pose some risk of future collapse or erosion should the leak or become damaged.

2.03 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and

4 mils thick, continuously inscribed with a description of the utility. Color coding shall be according to the American Public Works Association (APWA) standards:

1. Blue – Potable water and fire suppression lines.
2. Green – Sanitary sewer and storm drain lines
3. Orange – Communication, alarm or signal lines
4. Purple – Reclaimed water, irrigation, and slurry lines
5. Red – Electrical power lines, cables, conduit and lighting lines
6. Yellow – Gas, oil, steam, petroleum, or gaseous material lines.

PART 3 - EXECUTION

3.01 SITE CLEARING AND PREPARATION: Before starting grading, remove all trash and strip all vegetation on the site, including roots. After stripping, excavate and remove all existing fill and disturbed natural soils. Excavate to allow for placing of fills and other materials. Remove remaining unsuitable deposits as directed by Geotechnical Engineer and backfill as specified herein for fills and backfills.

3.02 DEWATERING REQUIREMENTS: Contractor shall be experienced in the installation and operation of the types of dewatering system to be used and shall maintain on the job a superintendent of proven experience and capability throughout entire dewatering operation. Dewatering requirements herein apply to this Section and all other Sections which require the performance of earthwork or installation of Work at or below the ground water elevation.

A. **Required**: Provide necessary facilities and equipment to dewater excavations and to construct the below-grade work in the dry and on stable subgrades, including without limitation all necessary shoring, sheeting, sheet piling, lagging, well points, pumps and piping, recharging equipment if required, means to dispose of removed water without damage to existing grades and Work and without pollution of public or private property or receiving waters, and standby pumps and related equipment of adequate capacity to maintain dewatered conditions in case primary dewatering equipment fails. The method of water disposal shall conform to Code. Maintain dewatering systems in place and operable until below-grade construction in dewatered areas is completed, tested as required, and removal is approved.

B. **Operation**: Perform dewatering as a continuous uninterrupted operation until new Work in dewatered excavations is entirely constructed, waterproofing is tested, and backfill placed and compacted to an elevation at least 18" above the highest existing ground water elevation.

C. **Recharging**: At any time during dewatering operations the ground water drawdown or water migration rate is sufficient to endanger the existing soils or

Work in place, immediately install and operate a ground water pumping recharging system to maintain ground water elevation limits that eliminate the danger.

D. **Rock Blankets**: Provide crushed rock blankets as necessary to bring ground water to pumps or well points and provide a stable subgrade.

E. **Backfill In Dewatered Excavations**: Place and compact all backfill located below highest natural ground water elevation in dry dewatered excavation with shoring, sheeting, or sheet piling in place and with dewatering system in place and fully operable. Do not place rocks larger than 1-1/2" size within 6" of waterproofed surfaces. Place and compact the backfill as specified for general earthwork.

F. **Testing of Waterproofed Structures**: After backfilling is placed to above ground water elevation, allow the ground water to rise to natural elevation. Examine structure interior for leakage for at least 10 days. If leakage occurs, perform dewatering, excavation, repair, backfilling, and re-testing until all leakage is eliminated as approved.

3.03 EXCAVATION: Perform excavation to the dimensions and elevations indicated on Drawings, with additional space allowed as required for the installation and stripping of forms, and inspection of the various types of Work, except where authority may be given by Architect to deposit certain miscellaneous concrete directly against earth banks. Avoid loosening of soils in bottoms or sides of excavations.

A. **Adverse Subsurface Conditions**: Notify Architect should unsuitable bearing soil or other adverse subsurface conditions be encountered which are not indicated by the Drawings or Specifications.

B. **Unauthorized Excess Excavation**: If excavations are carried below elevations indicated without written authorization, provide satisfactory construction to correct the fault as approved by Soils Engineer, at no extra cost to Owner.

3.03 TRENCHING: Trenching and excavating for buried piping, conduits and related items is performed under other Sections. Trenching operations shall conform to the following requirements:

A. **Trenches**: Excavate trenches to widths required for proper laying of pipe, with banks as nearly vertical as practicable. Bring bottoms of trenches to required depths, accurately graded to provide uniform bearing on undisturbed soil for entire length of each section of pipe, except where it is necessary to excavate for pipe bells.

B. **Machine Excavation** may be used to rough elevations. Perform fine grading and trimming by hand method.

C. **Trench Backfilling**: Conform to Paragraph "Compaction" except compact backfill to at least 85% of maximum dry density where trenches are located in paved areas or under building or structures. Precautions shall be taken in the placing and compaction of the backfill to avoid damage to the pipes.

3.04 FILLING AND BACKFILLING:

A. **Soil Materials Usage**: Use soil materials as directed by Geotechnical Engineer and according to the following:

1. General material - for earthwork not otherwise specified or directed by the Geotechnical Engineer.
2. Select material - for fill and backfill within the building prism and for the top 24" of rough grade for paved areas outside the building prism area.

B. **Equipment and Operations**: Perform compaction operations with equipment approved by Geotechnical Engineer, of types and design that uniformly compact material to required densities. Use pneumatic or barco-type hand held tampers in areas that are not accessible to wheeled equipment or machines.

C. **Moisture Content**: Before compacting, bring material to uniform moisture content per Soils Report. Obtain approval of moisture content before performing further grading operations.

D. **Preparation for Fills and Backfills**: After completion of clearing, preparation, and excavation, scarify top 8" of exposed material in both cut and fill areas, moisten or aerate to specified moisture content per Soils Report, and compact to the same density specified for fills.

E. **Compaction**: Moisten or aerate material to the specified moisture content, then uniformly compact fills and backfills in loose layers not over 8" in thickness to 90% of maximum dry density determined by ASTM D1557. This is the minimum compaction; average shall be at least 92%. Flooding or jetting is not allowed.

F. **Backfills**: Do not place backfills until after concrete forms have been removed and pointing and patching of concrete and waterproofing is done and approved.

3.05 SUBGRADE PREPARATION FOR CONCRETE: Prepare subgrade for concrete items placed directly on earth by cutting, filling, and grading as required and as specified herein, and bring to optimum moisture content. Finish the subgrade within 3/8" tolerance when measured along a 10-foot straightedge in any direction at any location.

Compact to the density specified for fills, and maintain the moisture content until concrete is placed.

3.06 ASPHALTIC CONCRETE PAVING AREAS: Bring areas to required elevations and grades by clearing and preparation, cutting, filling, grading, and compacting as shown and as specified herein. Allow for thickness of subsequent materials. Rough grade to required elevations plus or minus 0.05 foot and proof-roll the areas with a 3-wheel 10-ton roller or approved equivalent. Excavate soft or moving areas revealed by proof-rolling and replace with compacted fill as specified under "Compaction" above. Final fine grading and compaction is specified as a part of the paving operations. Coordinate with Section 02513 requirements.

3.07 SAND/GRAVEL FILL: A sand and gravel fill is not required as per the Geotechnical Report update dated June 11, 2018, provided a 15 mil moisture barrier is placed directly below the slab and on top of the finished grade.

3.08 LANDSCAPE AREAS: Bring to nominal 0.10-foot below required grades except where topsoil fill occurs, and finish with smoothly curving contours at grade changes and slopes, as approved. Grade to allow for thickness of topsoil fill. Avoid excessive compaction in all areas.

3.09 SOIL FRACTURING: Landscape areas where compaction has occurred due to grading activities and where trees or storm water infiltration areas are located shall be loosened by soil fracturing. For trees a 12’x12’x18” deep area; for storm water infiltration, the entire area shall be loosened. The back-hoe method of soil fracturing shall be used to break up compaction. A 4” layer of compost is spread over the soil surface before fracturing is begun. The back-hoe shall dig into the soil lifting and then drop the soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats. The compost falls into the spaces between the soil chunks created. Fracturing shall leave the soil surface quite rough with large soil clods. These must be broken by additional tilling. Tilling in more compost to the surface after fracturing per the soil report will help create an A horizon soil. Imported or reused topsoil can be added on top of the fractured soil as needed for grading. The Landscape Architect or representative shall be present during this process and provide certification of the soil fracturing.

3.10 DISPOSAL: Remove surplus and rejected earthwork materials from Owner's property to a legal disposal area. Perform trucking and material handling in a careful manner to prevent spillage and dusting or damage to surfaces and structures. Remove planks used to protect surfaces subject to public traffic at finish of each day's operations. Maintain public streets and sidewalks in broom clean condition.

3.11 FIELD QUALITY CONTROL: Refer to Section 01400.

A. Testing: Testing Laboratory will obtain the test samples and perform materials,

moisture content, compaction densities, and other tests to the extent and by the methods ordered or directed by the Geotechnical Engineer.

B. **Professional Certificates**: Upon completion, Geotechnical Engineer shall certify in writing to the Architect, Owner, and public agencies having jurisdiction that earthwork and compaction densities conform to the project requirements.

C. **Certified Survey**: Upon completion, Contractor shall provide certified survey of site conditions with 1" contours, top of wall elevations, buildings, roads and utility line locations/depths on AutoCAD compatible CAD file.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Clearing of plant life and grass, surface rocks and debris.
2. Removal of minor existing construction within Project area, as indicated on Drawings and as necessary to accomplish the Work, including:
   a. Saw-cutting and removal of Asphaltic concrete and portland cement concrete paving.
   b. Removal of utilities services, including capping and identification.
   c. Fencing.
3. Grubbing of root systems of trees and shrubs, abandoned utility lines and structures and other below grade obstructions.
4. Protection of trees, landscaping, site improvements, utilities, and other items not scheduled for clearing, or that might be damaged by construction activities.
5. Handling and disposal of debris.
6. Dewatering of excavations as necessary to control surface and sub-surface water.

B. Related work:

1. Protective measures, including barriers and barricades: As per General Conditions.
2. Excavating and backfilling for utilities: Section 02240.
3. Section 02200 – Site Preparation and Earthwork: Excavations for footings and foundations; building perimeter and site structure backfilling, to subgrade elevations; filling and backfilling to attain indicated grades, including fill under paving and fill under slabs-on-grade; consolidation and compaction; fill for over excavation; excavations and backfilling for underground utilities.

1.02 REFERENCES

A. Standard specifications: Standard Specifications for Public Works Construction ("Greenbook"), 2015 Edition, by Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California.

1. Standard Specifications shall be as amended and adopted by authorities having jurisdiction.
2. Where reference standard refers to "Agency," substitute the word "Owner." Where reference standard is in conflict with the Contract Documents, the Contract Documents govern.

B. Geotechnical Reports:

1. Report of Geotechnical Study Proposed Anthony Munoz Community Center Gymnasium 1242 West 4th Street, Ontario, CA dated June 24, 2024 (Revised March 26, 2026) by Kleinfelder (Kleinfelder Project No. 20236170.006A), 280 Market Street, Suite 300, Riverside, CA 92501.

1.03 SUBMITTALS (Not applicable)

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable Codes, ordinances and regulations of authorities having jurisdiction, including requirements for noise, dust and run-off control, and disposal of debris.

B. Utility Agency Requirements: Coordinate clearing Work with applicable utility agencies and companies.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Fill materials: Comply with recommendations of geotechnical report referenced in the Project Geotechnical Reports.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection: Protect streets, roads, sidewalks, drainage channels, adjacent property, designated trees, and other existing improvements to remain. Refer to general requirements specified in Section 01500 - Construction Facilities and Temporary Controls.

1. Erect and maintain temporary barriers and take other protective measures to prevent spread of debris, to provide for continued use of adjacent properties and to protect existing construction which is not indicated to be altered.
2. Review location and type of construction of temporary barriers with Owner.
3. Barriers shall control dust, debris and provide protection for persons occupying and using adjacent facilities.
4. Maintain protected egress and access at all times, in accordance with requirements of authorities having jurisdiction.
5. The Drawings do not purport to show all below-grade conditions and objects on the site.

B. Identification of above- and below-grade utilities: Contact Underground Service Alert ("Dig Alert") at 800/422-4133 at least 48 hours in advance of starting excavation Work, to locate and mark existing underground utility lines.

1. Contractor shall locate and verify horizontal and vertical location of all existing utilities as a first item of work. Contractor shall notify Architect and Construction Manager if existing utilities are not located as shown on the approved plans.
2. Stake and flag locations.
3. Maintain and protect existing utilities remaining in Project area.
4. Flag centerline of utility lines prior to clearing. Contractor shall set offsets for clearing limits to suit the Work.
5. When the clearing is completed, survey for utility construction.
6. Contractor shall replace all controls and stakes damaged or destroyed, at no change in Contract Time or Contract Price.

3.02 MINOR DEMOLITION

A. Minor demolition of site elements:

1. Use techniques acceptable to authorities having jurisdiction and which will achieve intended results and provide protection of surrounding features to remain.
2. Some items may have been demolished prior to Work of this Contract. Verify existing conditions prior to start of demolition. If items are found to have been demolished, contact the Owner if conditions adversely affect the Work.
3. Some items may require postponement of demolition until late in Contract Time period.
4. Phase demolition as necessary to provide adequate interfacing of related Work.
5. Demolish in an orderly and careful manner. Protect existing foundations, retaining walls, utility structures, other structures and finish materials to remain.

B. Utilities demolition:

1. Disconnect, remove, and cap designated utility services within demolition areas.
2. Mark location of disconnected utilities. Identify and indicate capping locations on project record drawings.
3. Coordinate cutting and capping sequences and procedures with serving utility and those affected by such activities. Remove utilities in a manner to minimize disturbance of portions to remain.

3.03 CLEARING

A. Clearing: Comply with 300-1 in the Standard Specifications.

1. Perform clearing Work within confines of Project area indicated on Drawings or specified elsewhere herein and with strict adherence to the geotechnical recommendations.
2. Remove logs, rocks and other debris.
3. Dispose of debris resulting from clearing and thoroughly clean rights-of-way.

4. Per recommendations as listed in referenced Geotechnical Investigation Report, provide improved support for the building floor slabs, for walks and slabs adjacent to buildings, and for paving, any existing fill soils and all disturbed natural soils should be excavated and replaced as property compacted fill. Any additional fill should be properly compacted per the Project Geotechnical Report

3.04 GRUBBING

A. Grubbing: Comply with 300-1 in the Standard Specifications.

1. At pipelines, remove all trees or stumps within five feet of the pipeline.
2. Perform grubbing where indicated on Drawings or as specified herein. Grubbing shall include removal from the ground of all stumps, roots, buried logs and other vegetation not otherwise indicated to remain, and removal and disposal of resulting refuse.
3. Completely grub areas where unsuitable surface material is to be removed.
4. Per recommendations as listed in referenced Geotechnical Investigation Report, the site should be stripped of all vegetation. The stripped materials should be removed from the site. Any existing fill soils should be excavated. Also, the upper soils, which have been disturbed by cultivation, should be excavated to a depth of at least 1 foot below the existing grade within building areas and at least 6 inches below the planned subgrade level (bottom of base course), within areas to be paved. The clay soils should be over-excavated as necessary to permit the placing of at least 2 feet of relatively non-expansive soils beneath building areas and beneath all concrete slabs and walks.

3.05 DAMAGED VEGETATION (Not Applicable)

3.06 DISPOSAL

A. Debris disposal: Dispose of all cleared and grubbed materials in a legal manner off site.

B. Hazardous materials:

1. Immediately notify the Owner should hazardous materials or suspected hazardous materials be encountered.
2. Dispose of such materials in accordance with all applicable laws and regulations and as directed by authorities having jurisdiction.
3. Unforeseen conditions will be resolved in accordance with provisions of the Conditions of the Contract.

C. Saleable materials (Not Applicable)

D. Burial and burning: Debris shall not be buried or burned on site.

3.07 DUST CONTROL

A. Dust control: Refer to requirements of Section 01500 - Construction Facilities and Temporary Controls.

1. Minimize dust during clearing and grubbing to protect adjoining property and vehicles parked in the vicinity.
2. Comply with requirements of authorities having jurisdiction.

B. Cleaning: Keep public thoroughfares clear of dust and debris by periodic sweeping at least daily at the end of working hours.

3.08 SALVAGED MATERIALS

A. Ownership: Unless otherwise indicated, all materials demolished and removed shall become property of Contractor.

B. Disposal of materials: Contractor shall haul and dispose of all demolished and removed materials to offsite disposal sites in any legal manner.

1. Except where noted otherwise, immediately remove demolished materials from site.
2. Promptly remove from the site and properly dispose of all contaminated, vermin infested, or dangerous materials encountered.
3. Do not burn or bury materials on site.

C. Salvage:

1. Contractor shall take care when removing salvageable material to avoid damaging the material itself and the adjacent or adjoining structures that are to remain.
2. Items of salvable value to the Contractor shall be removed from the site by the Contractor as the Work progresses and transported from the site as they are removed. Storage or sale of salvaged items on the site by the Contractor will not be permitted.

3.09 DEWATERING

A. Dewatering: Dewater site in localized areas as Work progresses.

1. Provide an adequate system to lower and control groundwater in order to permit excavation, construction of structures, and placement of fill materials under dry conditions.
2. Install sufficient dewatering equipment to pre-drain water-bearing strata above and below bottom of structure foundations, drains, sewers, and other excavations.
3. Maintain excavations free of standing water.
4. Provide dewatering 24 hours per day in advance of placement of concrete.
5. Allow no concrete to be placed in standing water.
6. Ensure that trenching and excavations do not cave in due to water.

B. Surface run-off water control:

1. Minimize flow of ground water from adjacent areas into Work areas.
2. Do not restrict flow from adjacent properties such that natural flow is hindered.

C. Water disposal:

1. Dispose of run-off by legal means and as acceptable to authorities having jurisdiction.
2. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of Work under construction or completed.
3. Dispose of water in a manner to avoid inconvenience to others engaged in work about site.
4. Provide sumps, sedimentation tanks, and other flow control devices as required by authorities having jurisdiction.

END OF SECTION

SECTION 02240

EXCAVATING AND BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide excavating and backfilling for utilities complete as indicated, specified, and required.

A. **Work in This Section**: Principal items include:

1. Excavating and backfilling for utilities.

B. **Related Work Not in This Section**:

1. Section 02200 – Site Preparation and Earthwork.

1.02 QUALITY ASSURANCE:

A. **Standard Specifications**: Standard Specifications for Public Works Construction, Current Edition, herein referred to as "SSPWC".

1. Conform to latest Edition and supplements of the SSPWC.
2. In all referenced sections, the term "Engineer" means Architect. The term "Agency" means Owner.
3. All terms and definitions referred to shall not supersede such terms or definitions of General Conditions of these Specifications.
4. Reference paragraphs and sections concerning "Measurement" and "Payment" are deleted.

B. **Qualifications of Workmen**: Provide at least one person who shall be present at all times during execution of the work, who shall be thoroughly familiar with the design requirements, materials, and methods needed for their execution, and who shall direct all work performed under this Section. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed in the methods to be used.

1.03 JOB CONDITIONS:

A. **Protection of Utilities**: Protect existing utilities indicated or made known of.

B. **Protection of Trees**: Protect existing landscaping as indicated on plans or otherwise instructed.

C. **Protection of Persons and Property**: Barricade open excavations occurring as part of this work and post with warning lights those excavations occurring on property adjacent to or with public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

D. **Protection of Workers**: All excavations shall conform to the requirements of the

rules, orders, and regulations of the Division of Industrial Safety of the State of California. Prior to commencing the excavation of a trench 5' in depth or greater and into which a person will be required to descend, the Contractor shall first obtain a permit to do so from the Division of Industrial Safety.

E. **Protection of Existing Improvements**: Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

F. **Access**: Maintain vehicle and/or pedestrian access across or around excavation when within an existing area where vehicles and/or pedestrians normally use such area for access unless otherwise indicated or specified. Owner may allow closure of area to access when authorized prior to commencing construction operations.

G. **Regulations**: The Contractor shall conform to rules, orders, and regulations of the State of California Construction and General Industrial Safety Orders, the Occupational Safety and Health Act, the Construction Safety Act, and the requirements of all agencies having jurisdiction.

H. **Dust Control**: Use all means necessary to control dust on and near the Work and on and near all offsite borrow areas if such dust is caused by the Contractor's operations during performance of the work, or if resulting from the condition in which the Contractor leaves the site. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and to personnel performing work on the site.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. **Classification of Soils**: See Soils Report.

B. **Compaction**: Compaction shall be as specified hereinafter but in no case shall density be less than that of existing soil condition.

C. **Backfill and Fill Materials**: Provide acceptable soil materials for back-fill free from organic matter and other deleterious substances and containing no rocks or lumps over 3" in greatest dimension with not more than 20 percent of the rocks or lumps larger than 2" in greatest dimension. Materials shall also conform to Soils Report.

D. **Backfill Sand**: All material used for structural backfill shall be free from organic substance and other deleterious matter and subject to approval.

E. **Concrete**: Concrete shall be as specified for class use in Section 201 of the SSPWC unless otherwise indicated or specified.

2.02 OTHER MATERIALS: 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.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which excavating, backfilling for utilities are to be performed, and correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsuitable conditions have been corrected.

3.02 FINISH ELEVATIONS AND LINES: Finish elevations and lines shall meet and match the existing unless otherwise shown in the Drawings.

3.03 EXCAVATION:

A. **General**: Perform excavation of every description and of whatever substances encountered to the depths indicated or as otherwise specified. During excavation, store the material suitable for backfilling in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or caving in. Remove all excavated materials not required or suitable for backfill. Provide sheeting and shoring as may be necessary for protection of the work and for the safety of personnel. Sheeting used to support the excavated trench shall be removed by the Contractor, and no such sheeting will be permitted to remain in the trench except when, in the opinion of the Architect, field conditions, the type of sheeting, or methods of construction used by the Contractor, such as the use of concrete bedding, make the removal of sheeting impracticable. In such cases, the Architect may permit portions of the sheeting to be cut off and remain in the trench. All excavation or trenching shall be in accordance with Section 206.1 of the SSPWC.

B. **Option**: Contractor may, at his option, subject to prior approval of the Architect, use the following methods in lieu of open excavations.

1. Jacking operations in conformance with Section 306-2 of the SSPWC except the requirement of submitting drawings of jacking pit bracing, casing (or conduit), and jacking head proposed to be used will be the responsibility of the Contractor.
2. Tunneling operations in conformance with Section 306-3 of the SSPWC.

C. **Excavation for Appurtenances**: Excavation for structures shall be sufficient to leave at least 12" in the clear between the outer surfaces and the embankment or shoring that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed by the Architect, at no additional cost to the owner.

D. **Excavation shall be in accordance with the Project Geotechnical Report.**

3.04 TRENCHING:

A. **General**: Trench to the minimum necessary width as indicated for the proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform slopes as indicated for the utility being installed.

B. **Depressions**: Dig bell holes and depressions for joints after the trench has been graded in order that the pipe will rest uniformly within the prepared trench. Except where rock is encountered, take care not to excavate below the depth indicated of specified. Where rock is encountered, excavate it to a minimum overdepth of 4" below the trench depth indicated or specified. Backfill overdepths in rock and unauthorized overdepths with sand or approved loose granular earth, thoroughly tamped.

C. **Depth**: Where utility runs traverse public property or are subject to Municipal, County, or utility company jurisdiction, the depth, bedding, cover, and other requirements shall be as set forth by the legally constituted authority having jurisdiction but in no case shall be less than specified herein. Where rock is encountered, provide no less than a 4" sand bed beneath the pipe.

D. **Existing Landscaping** shall be protected from damage. Lawns or ground cover, prior to excavation or trenching operations, shall be removed in planks or rolls for easy handling. Store for replacement upon completion of work. The removed turf shall be kept moist and in good condition for replacement. Contractor shall replace ground cover and plantings to match the existing prior to removal.

E. **Covers**: Minimum depth shall be as shown on the approved plans or, otherwise, as indicated below to maintain a minimum cover over the top of the pipe, cable, duct, or concrete encasement of duct of pipe, below the finish grade or subgrade surfaces as follows:

1. Water lines: 30”
2. Concrete encased pipe for water lines: 24”
3. Vehicular traffic area is any area a vehicle may use without obstructions, barriers, or obtain access without the use of a special or temporary ramp of any kind.
4. Where utilities or conduits are on the Owner’s property within an indicated or designated roadway or drive, the requirements for offsite roadways shall be the minimum cover. Where the work is under street, the requirements of the local agency having jurisdiction shall apply but shall not be less than specified above.
5. Where casings or sleeves are indicated or specified and not concrete encased, the minimum cover shall be from the top of the casing or sleeve.
6. Where utilities are under a concrete structural slab or pavement, the minimum depth need by only sufficient to completely encase the conduit or pipe sleeve, and electrical long-radius risers, provided it does not interfere with the structural integrity of the slab or pavement.
7. Where the minimum cover is not practicable, encase the pipes in concrete no less than 4" all around pipe.

8. In the event water line passes under a gravity drainage line, support the drainage line to prevent sagging until work is completed. If the gravity line is a sanitary sewer line, encase sewer in no less than 4" of concrete for 10'-0" to both sides of crossing.

F. Location: Where utilities or conduit are parallel, pipes shall be arranged vertically in such an arrangement that branches or wye connections may pass over adjoining pipes without special fittings. Fire protection water lines shall be placed as specified in Mechanical Sections.

G. Trenching shall be in accordance with the Project Geotechnical Report.

3.05 BEDDING: Place the bedding material as required for the individual utility and in accordance with the Project Geotechnical Report.

3.06 REMOVAL OF UTILITY LINES: When utility lines, that are not made known or indicated, are encountered within the area of operations, notify the Architect in ample time for the necessary measures to be taken to prevent interruption of the service. Service is to be maintained. When it has been determined by the Contractor that the utility is inactive, remove the total line, or where impracticable or possible, remove that portion which interferes with the operation of work. Plug or cap the ends of the remaining portion of the utility in a manner which will make the utility inoperable for use. When all or a portion of the utility will remain indicate location on the record set of drawings (see Section 01700).

3.07 BACKFILLING:

A. General: All backfilling shall be in accordance with Section 306-1 of the SSPWC. Do not backfill trenches until all required inspections and tests have been performed and until the utilities systems, as installed, conform to the requirements specified in Sections covering the installation of the various utilities. Backfill trenches to the ground surface with sand or selected material that is suitable for the specified compaction. Trenches improperly backfilled shall be reopened to a depth required for proper compaction, then refilled and compacted as specified. Do not allow any of the work performed or installation to be covered up or enclosed by work of this Section prior to all required inspections, tests, and approvals, as specified in the individual Section for the utility to be installed. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at not additional cost to the Owner.

B. Compaction: Compaction shall be in accordance with Section 306-1.3 of the SSPWC with the following exceptions.

1. All relative compaction shall be a minimum of 95 percent of maximum dry density.
2. If any portion of the trench is within an area requiring special compaction, the special requirements shall control.
3. Take special care not to damage the coating or wrapping of pipes, and the insulation of distribution system conduits.

C. Adjacent to Buildings: All backfill shall be mechanically compacted with manual stampers or small vibrating compactors to within 10'-0" of buildings or structures.

D. Consolidation of granular backfill by jetting with water will be required outside of buildings. Do not jet clayey soil backfill.

E. Backfilling shall be in accordance with the requirements of the Project Geotechnical Report.

3.08 PLACING OF UTILITY: Pipe or conduit shall be placed as specified in the pertinent Section of these Specifications for the utility and in accordance with Section 306-1.2 of the SSPWC.

3.09 RESTORATION OF SURFACES: Saw-cut edges of existing paving which is to remain. Restore the surface as near as practicable to its original condition. Replace surface in areas of existing improvements as specified in Section 306-1.5 of the SSPWC and as specified in paragraph, "Existing Landscaping".

3.10 ABANDONMENT OF CONDUITS AND STRUCTURES: Abandonment shall be in accordance with Section 306-5 of the SSPWC unless otherwise specified or indicated.

3.11 FIELD QUALITY CONTROL:

A. Quality Control Testing During Construction: The Owner's representative will inspect and approve utilities before backfilling, and provide the following:

1. Ensure that trenches are not backfilled until all performance, pressure, and leak tests are performed and approved.
2. Check backfilling for proper layer thickness and compaction.
3. Verify that all test results of underground construction conform to requirements and that sufficient testing has been performed.
4. Ensure that defective work is removed and replaced properly.

B. Utilities subject to a local agency or company jurisdiction shall be tested and inspected in accordance with the requirements of the agency or company. Approval of the agency or company shall be in writing with copy submitted to the Architect.

C. After the Work has been completely tested, inspected, and approved, make repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, at no additional cost to the Owner.

D. Perform Compaction Tests on backfill for all utility lines including storm drains of 12" or greater diameter or width, unless otherwise specified or indicated.

END OF SECTION

SECTION 02510

WATER DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. **Requirements**: Provide water distribution system, complete, as indicated on the Drawings or inferable therefrom and/or as specified in accordance with the Contract Documents.

1.2 SUBMITTALS

A. **Product Data**: Submit copies of manufacturer's specifications and installation instructions for each material. Include certification or other data verifying compliance with required characteristics. Indicate by transmittal form that copy of each has been distributed to the Installer.

B. **Shop Drawings**: Submit layout and shop drawings as required under Section Submittals. Include details of reinforced concrete structures.

C. **Test Reports**: Submit certified Test Reports showing compliance of the following items in accordance with Section General Conditions.

1. Laboratory test for bedding and trench stabilization materials.
2. Concrete design mix.
3. Compression tests.
4. Water Test Reports: Submit results of water sample tests by State or local health authorities
5. Compaction testing for building and flatwork grading subgrade.

1.3 QUALITY ASSURANCE

A. **Regulatory Requirements**:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. All work to be performed and materials to be used shall be in accordance with the Standard Specifications for Public Works Construction, latest edition and supplements.
3. The Contractor shall have one copy of the Standard Specifications at the job site.
4. The Standard Specifications apply only to performance and materials and how they are to be incorporated into the Work. The legal/contractual relationship sections and the measurement and pavement sections do not apply to this document.
5. Prior to procurement, Contractor shall confirm that all manufacturers and materials have been approved by the City/Utility Company/Fire Authority.

B. **Piping materials shall** bear label, stamp, or other markings of specified testing agency.

C. **Comply with FM's** "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. **NFPA Compliance**: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

E. **NSF Compliance**:

1. Comply with NSF 14 for plastic potable-water-service piping.
2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.4 PROJECT CONDITIONS

A. **Existing Utilities**: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner’s Representative not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner Representative’s written permission.

1.5 DELIVERY, STORAGE, AND HANDLING

A. **Prevent damage to** materials during loading, transportation, and unloading. Store equipment with moving parts off ground on platforms or skids.

1.6 COORDINATION

A. **Coordinate connection** to water main with utility company.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Before procurement, Contractor shall confirm that all Manufacturers have been approved by the City/Utility Company/Fire Authority.

B. **In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection**:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPE AND FITTINGS

A. Before procurement, Contractor shall confirm that all Pipe and Fittings have been approved by the City/Utility Company/Fire Authority.

B. **PVC, AWWA Pipe** (NPS 4 to NPS 12): AWWA C900, Class 200 DR 14, with bell-and-spigot or double-bell ends.

1. PVC to PVC Fittings: Push-on-Joint, PVC Fittings, ASTM 3139, with elastomeric gasket bell ends, conforming to ASTM D2122 for bell measurements.
2. PVC to Metal Fittings, Valves, and Accessories: Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

    a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts. Use corrosion resistant, high strength, low alloy steel, bolts and nuts where in contact with corrosive soil ASTM A 325.

2.3 VALVES

A. Before procurement, Contractor shall confirm that all Valves have been approved by the City/Utility Company/Fire Authority.

B. **AWWA, UL/FM Cast-Iron, Gate Valves**:

1. Available Manufacturers:

    a. Grinnell Corporation; Mueller Co.; Water Products Div.
    b. McWane, Inc.; Clow Valve Co. Div, Tyler Pipe; Utilities Div
    c. United States Pipe and Foundry Company.
    d. Or approved equivalent.

2. Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509 and UL/F.M. approved, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

    a. Minimum Working Pressure: 200 psig.
    b. End Connections: Flanged, push-on rubber gasketed, or mechanical joint, as required.
    c. Interior Coating: Complying with AWWA C550.

2.4 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Before procurement, Contractor shall confirm that all Gate Valve Accessories and Specialties have been approved by the City/Utility Company/Fire Authority.

B. **Valve Boxes**: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and

approximately 5-inch diameter barrel. Fabricate valve box cover to fit snugly to prevent displacement by traffic.

1. Operating Wrenches: Steel tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. **Vertical-Type Indicator Posts**: UL 789, FM-approved, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve with tamperproof electrical supervisory switch for connection to the fire alarm control panel system.

2.5 VALVE APPLICATION

A. Before procurement, Contractor shall confirm that all Valve Applications have been approved by the City/Utility Company/Fire Authority.

B. **General Application**: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FM, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

1. Where specific valve types are not indicated, the following requirements apply:

   a. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated, gate valves with valve box.
   b. Underground Valves, NPS 4 and Larger, for Vertical-Type Indicator Posts: UL/FM, Cast-iron, nonrising-stem gate valves with indicator post.

2.6 WATER METERS

A. **Water meter(s) indicated** on drawings shall be installed by the local water purveyor for the area, unless noted otherwise.

B. Before procurement, Contractor shall confirm that all Water Meters have been approved by the City/Utility Company/Fire Authority.

2.7 BACKFLOW-PREVENTION DEVICES

A. Before procurement, Contractor shall confirm that all Backflow-prevention Devices have been approved by the City/Utility Company/Fire Authority.

B. **Manufacturers**:

1. Ames Co., Inc.
2. Cla-Val Co.
3. Febco Div.
4. Or approved equivalent.

C. **General**: FM Approved, AWWA, UL Classified, Approved by the Foundation for Cross Connection Control and Hydraulic Research at the University of Southern California.

1. Working Pressure: 175 psi minimum, unless otherwise indicated.
2. Interior Components: Corrosion-resistant materials.
3. Exterior Components: Assembly shall be provided with flanged connections, galvanized cast-iron or epoxy coated construction.

D. **Reduced-Pressure-Principle Backflow Preventers**: Suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2, air-gap fitting located between two positive-seating check valves. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

E. **Double-Check-Detector Assembly Backflow Preventers**: Suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

2.8 FIRE HYDRANTS

A. **Before procurement**, Contractor shall confirm that all Fire Hydrants have been approved by the City/Utility Company/Fire Authority.

B. **Wet-Barrel Fire Hydrants**: AWWA C503 or UL 312, one NPS 4 and two NPS 2-1/2 outlets, NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have 150-psig minimum working-pressure design.

1. Manufacturers:

   a. American AVK Co.; Valves & Fittings Div.
   b. Grinnell Corporation; Mueller Co.; Water Products Div.
   c. James Jones Company.
   d. Or approved equivalent.

2. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
3. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
4. Direction of Opening: Open hydrant valves by turning operating nut to left or counterclockwise.

C. **Combined length of bury** and extension shall be as indicated. Where not indicated, install top of hydrant flange 3-inches above finished surface.

D. **Exterior Finish**: “O.S.H.A. safety yellow” Ameritone 719 or approved equal after receiving a prime coat.

PART 3 - EXECUTION

3.1 INSPECTION

A. **Examination**: Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected

3.2 PREPARATION

A. **Field Measurements**: Verify dimensions before proceeding with Work. Obtain field measurements for work required to be accurately fitted to other construction. Be responsible for accuracy of such measurements and precise fitting and assembly of finished work.

3.3 JOINT CONSTRUCTION

A. **Make pipe joints according to the following**:

1. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
2. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.4 PIPING INSTALLATION

A. **Project site water lines** shall terminate approximately 5-feet from buildings, unless otherwise indicated on Drawings. Install temporary cap or plug terminals for future connection to building.

B. **Bury piping with** depth of cover over top at least 36-inches, unless otherwise indicated.

C. **Comply with NFPA 24** for fire-service-main piping materials and installation.

D. **Install PVC**, AWWA pipe according to AWWA M23 and ASTM F 645.

E. **Install underground** piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports for all lines NPS 3 or greater.

F. **Water Main Connection**: Arrange and pay for tap in the water main, water meter, and all associated fees from the water purveyor.

3.5 CLEARANCE OF WATER LINE

A. **Building or Structure**: 2-feet minimum horizontal separation.

B. **Sewer crossing**:

1. Typical Conditions: Lay water mains over sanitary sewers to provide vertical separation minimum 3-feet.
2. Unusual Conditions: If above separation cannot be met, for sewers less than 3 feet below the water pipe, use the following:

    a. Install water line with all joints located at least 4-feet from each side of the sewer pipe.
    b. Sewer pipe encased in 6-inches of concrete around pipe, and extend 4-feet either side of water main.

C. **Parallel to Sewer Line**: Water line shall not be installed in a common trench with the building santitary sewer unless both of the following requirements are met:

1. The bottom of the water pipe, at all points, shall be at least 12-inches above the top of the sewer.
2. The water pipe shall be placed on a solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least 12-inches from the sewer.

3.6 ANCHORAGE INSTALLATION

A. **Install anchorages for tees**, plugs and caps, bends, crosses, valves, and hydrant branches for all lines NPS 3 or greater. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
3. Fire-Service-Main Piping: According to NFPA 24.
4. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. **Gate Valves**: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. Vertical-Type Indicator Post Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post. Include tamperproof electrical supervisory switch for connection to tie the fire alarm control panel system.

3.8 BACKFLOW-PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. **Do not install** backflow preventers with relief drain in vault or other space subject to flooding.

C. **Do not install** bypass piping around backflow preventers.

D. **Support 3-inch** and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

E. **Access and clearance** shall be provided for the required testing, maintenance and repair. Access and clearance shall require a minimum of 1 foot between the lowest portion of the assembly and grade or platform.

F. **Include tamperproof** electrical supervisory switch for connection to tie the fire alarm control panel system.

3.9 FIRE HYDRANT INSTALLATION

A. **General**: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. **UL/FM-Type Fire Hydrants**: Comply with NFPA 24.

3.10 IDENTIFICATION

A. **Install continuous underground** detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. Refer to Division 2 Section "Earthwork" for tape specifications.

3.11 FIELD QUALITY CONTROL

A. **Piping Tests**: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. **Hydrostatic Tests**: The piping shall be subjected for a minimum of two hours to a pressure of one and one-half times the working pressure, but in no case less than 150 psi. Examine all exposed pipe, joints, fittings and accessories during the test period. Replace or repair defective portions of the system, and repeat tests until results are satisfactory.

1. Allowable leakage shall be as specified in AWWA C-600, Table 3.

C. **Prepare reports** of testing activities.

3.12 CLEANING

A. **Clean and disinfect water-distribution piping as follows**:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours, or
b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION

SECTION 02513

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide asphaltic concrete paving complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Subgrade preparation.
2. Soil sterilization.
3. Aggregate base course.
4. Prime coat.
5. Asphaltic concrete paving.
6. Fog seal coat.

B. Related Work Not In This Section:

1. Site preparation and earthwork, including rough grading.
2. Portland cement concrete curbs, drives, and paving.
3. Pavement striping and bumpers.

1.02 QUALITY ASSURANCE:

A. Reference Specifications: Conform to following reference specifications to the extent specified. The term “Engineer" in the reference specifications shall be understood to mean “Architect". Requirements of measurement or payment in the reference specifications are hereby deleted; include Work of this Section under the Contract Sum for entire Work.

1. PWC Spec. The "Standard Specifications for Public Works Construction", Current Edition, published by Building News Inc., Los Angeles, California.
2. State Standard Spec. Standard Specifications of the California Business and Transportation Agency, Dept. of Public Works, Div. of Highways, Current Edition.

B. Proportioning of Plant Mix: Determine exact quantities of bituminous binder and mineral aggregate required to produce a mix equal to mix quality specified.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: Submit the manufacturer's technical Product Data and application directions for soil sterilizer.

B. Certificates and Statement: Submit certificates from asphalt concrete products suppliers that quality, gradation, proportions, and mixing of materials supplied under this Section meet the requirements specified. Materials not conforming to specified requirements are defective. Reject defective materials whether or not

in place. Submit a statement supported by weight tickets showing the following information:

1. Calculations showing minimum amount of asphaltic concrete materials required for total area to be paved.
2. Amounts actually installed.

1.04 JOB CONDITIONS: Provide protection and repair adjacent surfaces and areas which may be stained or damaged as a result of installation. Protect installed paving Work until final acceptance. Repair or replace damaged or defective paving to original specified condition.

1.05 WARRANTY: Refer to Section 01740. Furnish to Owner a written warranty for one year, except warrant against weed or plant growth through paving for two years. Condition warranty to cover any portion of asphaltic concrete in which creeping, shoving, cracking, raveling, or softening occurs or in which weed growth occurs, and all depressed areas which collect water due to improper grading, placing, or defective materials during the warranty period. Repairs include the restoration of adjoining or applied materials and finish items.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. **Soil Sterilizer**: Standard product non-selective borate-chlorate type sterilizer having minimum 46% boron-trioxide equivalent, as approved.

B. **Aggregate Base Course**: State Standard Spec Section 26, CMB, 3/4" gradation maximum.

C. **Prime Coat**: PWC Spec Subsection 302-5.2, Grade SC-250 or SC-70, as approved.

D. **Asphaltic Concrete Surface Course**: SSPWC Spec Subsection 203-6, Type I-C2 PG 64-10 or PG 70-10 if required.

E. **Fog Seal Coat**: Asphalt emulsion SS-1, State Standard Spec Section 37.

PART 3 - EXECUTION

3.01 CONSTRUCTION:

A. **Subgrade Preparation**: Conform to PWC Spec Subsection 301-1, top 12” compacted to a minimum 95% relative compaction at any location. Maintain the subgrade slightly above optimum moisture content until covered with subsequent materials.

B. **Soil Sterilizing**: Apply sterilizer according to manufacturer's directions using the dry or aqueous spray process, minimum quantity of dry undiluted material per 100 square feet of paving conforming to manufacturer's directions for control of medium and heavier weed growth and to meet warranty requirements. If

necessary, apply supplemental watering to fully dissolve all sterilizer and obtain 2" to 3" penetration into the subgrade. Reroll treated subgrade to specified compaction. Do not apply sterilizer during rain or windy weather and prevent contamination of landscaping areas.

C. **Aggregate Base Course**: Conform to PWC Spec Subsection 301-2. Place base course in one or two layers as required to produce 95% relative compaction. Deliver to site as a uniform mixture. Construct to indicated compacted thickness as required by the Soils Engineer.

D. **Prime Coat**: Conform to PWC Spec Subsection 302-5.2, quantity per square yard as approved. Apply on all completed aggregate base course.

E. **Asphaltic Concrete**: Conform to PWC Spec Subsection 302-5 including requirements for smoothness and density. Apply asphaltic cement or emulsion paint binder on abutting concrete. Construct to minimum compacted thickness indicated by the Soils Engineer.

F. **Drainage Test**: Flood paving with water when rolling is completed and asphaltic paving is cool. Remove paving in improperly draining areas and install properly draining paving as directed, at no extra cost to Owner. Correction of low areas by skin patching is not acceptable.

G. **Fog Seal Coat**: Conform to State Standard Spec Section 37. Spray apply at rate of 0.05 to 0.10 gallons per square yard, the exact quantity as required to fully seal the paving surface, as approved. Cover and protect adjoining surfaces from staining.

END OF SECTION

SECTION 02530

SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

A. **This Section includes gravity**-flow, non-pressure sanitary sewerage outside the building, with the following components:

1. Cleanouts.
2. Precast concrete manholes.

1.2 PERFORMANCE REQUIREMENTS

A. **Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating**: 10-foot head of water.

1.3 SUBMITTALS

A. **Manufacturer's product** data for pipe and fittings.

B. **Field quality**-control test reports.

1.4 QUALITY ASSURANCE

A. **Regulatory Requirements:** Products and installation of sanitary sewerage system shall comply with all applicable requirements of authorities having jurisdiction. Where products or installation details are not indicated, comply with standard specifications and standard details as adopted serving sanitary sewer agency.

B. **Protection of Live Sanitary Sewers:** All existing live sewers shall remain in service at all times. Adequate provision shall be made for disposal of existing sewage flow if any existing sewers are damaged. All damage to the existing system shall be repaired to a condition equal to or better than that existing prior to the damage, at no change in Contract Sum and Contract Time.

C. **Connection to Existing Sanitary Sewer System:** The physical connection to an existing manhole or sewer line shall not be made until so authorized by authorities having jurisdiction. Contractor shall not seek this authorization until all upstream lines have been completed, cleaned, inspected and tested.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Prior to procurement**, Contractor shall confirm that all Manufacturers have been approved by the City/Utility Company.

B. **In other Part 2 articles** where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. **Prior to procurement**, Contractor shall verify that all Cast-iron Soil Pipe and Fittings have been approved by the City/Utility Company.

B. **Pipe and Fittings**: ASTM A 74, Service class.

C. **Gaskets**: ASTM C 564, rubber.

D. **Calking Materials**: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 PVC PIPE AND FITTINGS

A. **Prior to procurement**, Contractor shall verify that all PVC Pipe and Fittings have been approved by the City/Utility Company.

B. **PVC Sewer Pipe and Fittings, NPS 15 and Smaller**: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.4 NONPRESSURE-TYPE PIPE COUPLINGS

A. **Prior to procurement**, Contractor shall verify that Nonpressure-type Pipe Couplings have been approved by the City/Utility Company.

B. **Comply with ASTM C 1173**, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

C. **Sleeve Materials**:

1. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

D. **Shielded, Flexible Couplings**: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

    a. Cascade Waterworks Mfg.
    b. Dallas Specialty & Mfg. Co.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

d. Any equivalent manufacturer

E. Ring-Type, Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

1. Manufacturers:

a. Fernco Inc.
b. Logan Clay Products Company (The).
c. Mission Rubber Company; a division of MCP Industries, Inc.
d. Any equivalent manufacturer

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Pipe couplings and fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping, unless otherwise indicated.
   a. Shielded flexible couplings for same or minor difference OD pipes.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, non-pressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
3. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

E. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.2 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, non-pressure, drainage piping according to the following:

1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with non-pressure-type, flexible couplings.

3.3 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."

B. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, not less than 6-inches of concrete with 28-day compressive strength of 3,250 psi.

3.4 FIELD QUALITY CONTROL

A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
   a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
   b. Close openings in system and fill with water.
   c. Purge air and refill with water.
   d. Disconnect water supply.
   e. Test and inspect joints for leaks.
   f. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section.Use test pressure of at least 10 psig.
6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

B. Leaks and loss in test pressure constitute defects that must be repaired.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 02579

PAVEMENT MARKING, BUMPERS TRUNCATED DOMES AND SIGNAGE

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide pavement marking, bumpers, truncated domes and signage as indicated, specified, and required.

A. Work in This Section: Principal items include:

1. Pavement markings.
2. Truncated domes.
3. Accessible signage.

1.02 REFERENCES

A. Standard Specifications for Public Works Construction (SSPWC or "Greenbook"), by Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California. SSPWC shall be as amended and adopted by the authorities having jurisdiction.

B. State of California, Department of Transportation (CALTRANS) Traffic Manual.

1.03 SUBMITTALS

A. Product Data: For paint products, product specification and installation instructions. Submit for Project record only.

B. Truncated Domes: Provide product submittal and color as specified.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. State requirements: Comply with California Building Code (CBC) Chapter 11B, Accessibility.
   a. Accessible parking spaces: Marked as indicated on the Drawings and according to California Building Code (CBC) Section 1129B.5.
   b. Tactile warning lines: Tooled score lines in portland cement concrete paving as indicated on the Drawings, specified in Section 02751 - Portland Cement Concrete Paving and incompliance with California Building Code (CBC) Section 1133B.8.3 and Section 1133B.8.4.
   c. Tactile warnings tiles: Truncated dome tiles as indicated on the Drawings and specified below, conforming to California Building Code (CBC) Section 1133B.8.5.
2. State standard: Conform to State of California, Department of Transportation (CALTRANS) Traffic Manual, Chapter 6, Markings, as amended and adopted by authorities having jurisdiction.
3. Local requirements: Where reference is made to SSPWC, the following shall apply.

a. Perform off-site Work in public rights-of-way in accordance with requirements of authorities having jurisdiction. For conditions not indicated otherwise on Contract Drawings, conform to Standard Details adopted by authorities having jurisdiction, including Standard Details for Public Works Construction, as amended and adopted by those authorities.
b. Perform on-site Work as indicated and referenced on the Contract Drawings and as specified herein.

B. Applicator Qualifications: Company regularly engaged in pavement marking, well-experienced in use of machine-applied painted stripes and other markings, with three years of verifiable experience.

1.05 PROJECT CONDITIONS

A. Application Conditions:

1. Do not apply marking paint when weather is foggy or rainy, or when ambient or pavement temperatures are below 40-degrees F., or when such conditions are anticipated within eight hours of application.
2. Do not apply marking paint when wind causes uncontrollable overspray or excessively rapid drying.

B. Sequence and Schedule: Apply pavement markings after asphaltic concrete and portland cement concrete paving Work are complete and if applicable.

1. Is properly cured, and
2. Sealer has been applied to asphaltic concrete and landscaping Work is complete.

PART 2 - PRODUCTS

2.01 TRAFFIC PAINT: Type specially manufactured for pavement traffic line markings by Dunn Edwards, Wellborn, Sherwin-Williams, Devoe, Sinclair, Pittsburg Paint, Behr, or equal, white color unless otherwise directed by City Specifications for Public ROW projects.

2.02 TRUNCATED DOMES: Provide truncated dome 12” x 12” tiles by Hanover Architectural Products (717) 637-0500, Disability Devices, Inc., (714) 437-9237 or Wausau Tile (888) 380-5575 installed where indicated and noted on the drawings. Standard Grey Color as selected by Architect. The domes are to be ADA compliant and installed in accordance with manufacturers recommendations and specifications.

2.03 PARKING BUMPERS: Custom units as detailed on landscape drawings of minimum 3500 psi concrete and reinforced full length with not less than two No. 4 deformed reinforcing bars, lengths as indicated. Omit stake holes in adhesive secured bumpers.

PART 3 - EXECUTION

3.01 PAVEMENT MARKING AND STRIPING: Paint traffic and parking lines as indicated. Machine-apply paint in accordance with the directions of the paint manufacturer. Unless otherwise shown, paint lines 4-inches wide and as required to achieve complete opacity.

Paint directional arrows, numbering, and lettering in similar fashion and with same paint. Produce completed painting and striping free of holidays and whiskers. Be responsible for paint droppings and overspray. Completely remove droppings and repair injured surfaces in a satisfactory manner. Paint disabled lines and markings a minimum of 3-inches wide with blue color equal to Color No. 15090 per Federal Specification 595B, disabled parking symbols, stall striping, debarkation aisles and path of travel lanes to the extent required by the Code and as enforced by the local jurisdiction where indicated. Parking spaces for the disabled shall be marked according to CBC Section 1129B.5. The tactile warning lines shall be in conformance to CBC Section 1133B.8.3 and 1133B.8.4.

3.02 ACCESSIBLE SIGNAGE: See Graphics and Signage Package, Appendix A of the Project Manual for all signage design and sign locations. Set in accordance as detailed on drawings and required by the California Building Code.

END OF SECTION

SECTION 02620

SUBDRAINAGE SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES: Perforated and unperforated underground drainage piping.

1.02 RELATED SECTIONS

A. Section 02200 – Site Preparation and Earthwork.

1.03 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections.

B. Product Data: Manufacturer's catalog data on pipe drainage products and pipe accessories.

C. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

PART 2 - PRODUCTS

2.01 DRAINAGE PIPE AND FITTINGS

A. Perforated Drainage Pipe: Perforated, PVC sewer pipe and fittings, ASTM D 2729, bell-and-spigot ends, for loose joints. Piping size shall be as indicated on the Drawings.

B. Solid Wall Drainage Pipe: PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, bell-and-spigot ends, for gasketed joints.

C. Special Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant metal tension band and tightening mechanism on each end.

1. Gasket and sleeve Material: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant metal tension band and tightening mechanism on each end.
3. Shielded Flexible Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant metal tension band and tightening mechanism on each end.

D. PVC Cleanouts: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

E. **Vent and Clean-Out Pipe:** Perforated, smooth PVC complying with ASTM D 4216 and ASTM D 2729, with PVC fittings with NPS 4 (DN 100) outlet connection and PVC couplings. Piping size shall be as indicated on the Drawings or, if not indicated, provide minimum 4-inch piping.

1. Provide solid drainage pipe for risers at piping in planting pits for trees, as detailed on Landscape Drawings.
2. Provide solid drainage pipe to conduct water from behind below grade walls, to storm drain lateral.

F. **PVC Pipe Cleanouts:** ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

G. **Fittings:** Provide compatible and complete fittings for installation conditions. Make connections and turns with factory fittings only.

2.02 GEOTEXTILE FILTER FABRICS

A. **Specified Manufacturer:** Carlisle Coatings & Waterproofing Incorporated (CCW), Wylie, TX (800/527-7092).

B. **Acceptable Manufacturers:** Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. JDR Enterprises, Inc., Alpharetta, GA.
2. Solutia, Inc., St. Louis, MO (800/325-4330).

C. **Geotextile Filter Fabric:** CCW MiraDRAIN HP 500, FW 40/10 or FW 70/20, to suit site-specific soil and fill materials, woven geotextile fabric of polypropylene or polyester fibers, or a combination thereof, with flow rate range from 110 to 330 gpm/sq. ft. (4480 to 13 440 L/min. per sq. m) when tested according to ASTM D 4491.

1. Structure Type: Nonwoven, needle-punched continuous filament.
2. Style(s): Flat and sock, to suit installation conditions.

PART 3 - EXECUTION

3.01 EXAMINATION

A. **Examination:** Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.

3.02 PREPARATION

A. **Coordination:** Coordinate installation of drainage piping with site cutting, filling, compacting and grading specified in Section 02200 – Site Preparation and Earthwork.

B. Trenching and Backfilling: Comply with trenching and backfilling requirements specified in Section 02200 – Site Preparation and Earthwork. Excavate trenches to lines and grades required for pipe positions and slopes to drain. Check trenches by instrument to ensure correct slope.

C. Drainage Pipe Installation:

1. Install pipe in configurations shown on Drawings and, for conditions not shown on Drawings, as necessary to achieve positive drainage of required areas, including drains at retaining walls
2. Form piping into a continuous system, using such fittings and accessories as are recommended by manufacturer of pipe materials, starting at point of approved discharge and working upstream to highest required drainage elevation, at not less than required slope to drain.
3. Place pipe with perforations facing down. Mechanically join pipe ends with couplings.
4. Take care to prevent potential blockage of system through inadvertent soil or debris intrusions.
5. Lay pipe to slope gradients noted on Drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
6. Connect drainage piping to storm sewer system with unperforated pipe.

D. Cleanouts: Provide cleanouts to grade at ends of each run for system cleaning and checking.

3.03 BACKFILLING AND COVER

A. Backfilling and Cover: Place and compact backfill in accordance with Section 02200 – Site Preparation and Earthwork.

1. Place bedding aggregate to depths and arrangements shown on Drawings, taking care to provide uniform and solid bearing for full length of each pipe segment.
2. Place gravel fill around perforated pipe in compliance with details indicated on the Drawings and in accordance with Grading Guide Specifications contained in the geotechnical report and its addenda and supplements identified in Geotechnical Data.
3. Backfill carefully to prevent crushing of pipe, damaging of prefabricated in-plane wall drainage composite or filter fabric, and damaging below-grade waterproofing.

END OF SECTION

SECTION 02630

STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. **This Section includes gravity-flow**, non-pressure storm drainage pipe and drainage structures outside the building, connection of building storm water drainage system, catch basins, paved area drainage, manhole access, and site surface drainage.

1.2 PERFORMANCE REQUIREMENTS

A. **Gravity-Flow, Non-pressure, Drainage-Piping Pressure Rating**:

1.3 SUBMITTALS

A. **Product Data**: For each type of product installed.

B. **Field quality**-control test reports.

1.4 REFERENCES

A. Standard Specifications: Standard Specifications for Public Works Construction (SSPWC or "Green Book"), by Joint Cooperative Committee of the Southern California Chapter of the American Public Works Association and the Southern California Districts of the Associated General Contractors of California. Standard Specifications shall be as amended and adopted by Authority Having Jurisdiction (AHJ).

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to applicable requirements of storm drainage Authority Having Jurisdiction (AHJ) for materials and installation of Work specified in this Section, including compliance with Standard Specifications for Public Works Construction as adopted by Authority Having Jurisdiction (AHJ).

B. Environmental Compliance: Comply with applicable portions of local environmental protection agency regulations pertaining to storm sewerage systems.

C. Coordination:

1. Coordinate connection to public storm drain line with Authority Having Jurisdiction (AHJ).

2. Coordinate with other underground utility Work to ensure proper drainage of sanitary sewer and storm drain piping and to ensure avoidance of conflicts with water, natural gas, irrigation system and electrical power and signal systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **In other Part 2 articles** where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PVC PIPE AND FITTINGS

A. **PVC Sewer Pipe and Fittings, NPS 15 and Smaller**: ASTM D 3034, SDR 35, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. **PVC Sewer Pipe and Fittings, NPS 18 and Larger**: ASTM F 679, T-2 wall thickness, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.3 NONPRESSURE-TYPE PIPE COUPLINGS

A. **Comply with ASTM C 1173**, elastomeric, sleeve-type, reducing or transition coupling, for joining underground non-pressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. **Sleeve Materials**:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
2. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. **Shielded Flexible Couplings**: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:
   a. Cascade Waterworks Mfg.
   b. Dallas Specialty & Mfg. Co.
   c. Mission Rubber Company; a division of MCP Industries, Inc.
   d. Any equivalent manufacturer.

D. **Ring-Type Flexible Couplings**: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

1. Manufacturers:
   a. Fernco Inc.
   b. Logan Clay Products Company (The).
   c. Mission Rubber Company; a division of MCP Industries, Inc.
   d. Any equivalent manufacturer.

2.4 CONCRETE

A. **General**: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. **Ballast and Pipe Supports**: Portland cement design mix, 3250-psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.5 CATCH BASINS

A. **Standard Precast Concrete Catch Basins**: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.

1. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
2. Top Section: Eccentric-cone type unless flat-slab-top type is indicated.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

B. **Frames and Grates**: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16 (heavy traffic) structural loading unless otherwise indicated. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. **Pipe couplings and fittings** with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

1. Use non-pressure-type flexible couplings where required to join gravity-flow, non-pressure sewer piping, unless otherwise indicated.

    a. Shielded flexible couplings for same or minor difference OD pipes.
    b. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.2 PIPING INSTALLATION

A. **Install piping beginning** at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

B. **Install proper size** increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

C. **Install gravity-flow**, non-pressure drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
2. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.

D. **Clear interior of piping** and manholes of dirt and superfluous material as work progresses.

3.3 PIPE JOINT CONSTRUCTION

A. **Join gravity-flow, non-pressure drainage piping according to the following**:

1. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with non-pressure-type flexible couplings.

3.4 CATCH BASIN INSTALLATION

A. **Set frames and** grates to elevations indicated.

3.5 CONNECTIONS

A. **Connect non-pressure,** gravity-flow drainage piping to building's storm building drains specified in Division 15 Section "Storm Drainage Piping."

B. **Make connections to existing piping** and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6-inches of concrete with 28-day compressive strength of 3250 psi.

3.6 FIELD QUALITY CONTROL

A. **Test new piping systems**, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.

2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
   a. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
   b. Close openings in system and fill with water.
   c. Purge air and refill with water.
   d. Disconnect water supply.
   e. Test and inspect joints for leaks.
6. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig.
7. Air Tests: Test storm drainage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
   a. Option: Test plastic gravity sewer piping according to ASTM F 1417.

B. **Leaks and loss in test pressure** constitute defects that must be repaired.

C. **Replace leaking piping** using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION

SECTION 02720

SANITARY SEWER MAIN

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide all sanitary sewer main construction replacement or alteration complete as indicated on drawings, specified, and required.

A. Work In This Section: Principal items include:

1. Complete sanitary sewer mains, underdrains, manholes, pipe beddings, trench excavation, services testing. Work within the City of Ontario right-of-way. All work to be done within the City of Ontario right-of-way shall be constructed per City of Ontario Engineering Standard Procedures, Specifications and Drawings.

1.02 QUALITY ASSURANCE:

A. Geotechnical Report:

1.. Report of Geotechnical Study Proposed Anthony Munoz Community Center Gymnasium dated June 24, 2024 (revised March 26, 2026) by Kleinfelder (Kleinfelder Project No. 20236170.006A) , 280 Market Street, Suite 300, Riverside, CA 92501.

B. City of Ontario Engineering Standard Procedures, Water & Sewer Construction Specifications, latest edition.

C. ASTM Standards:

C 1173: Flexible Transition Couplings for Underground Piping Systems.
D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
F 656: Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
F-1336: Poly (Vinyl Chloride) (PVC) Gasket Sewer Fittings.

D. Definitions:

ASTM: American Society for Testing Materials.
PVC: Polyvinyl Chloride.
NPS: Nominal pipe size.

1.03 SUBMITTALS: Refer to Section 01300 for procedures. Submit complete Shop Drawings Section 01300, "Submittals".

PART 2 - PRODUCTS

2.01 MATERIALS: Provide materials and equipment required for completion of work as shown or required on the drawings.

2.02 PIPING MATERIALS FOR GRAVITY FLOW

A. PVC Pipe:

1. Pipe: 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
2. Fittings: 4-inch through 27-inch: ASTM F 1336.
3. Joint Gasket: Elastomeric seal, ASTM F 477.

2.03 SPECIAL PIPE COUPLINGS

A. Gravity Piping: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.04 GRAVITY PIPE CLEANOUTS

A. Piping: Same as sanitary sewer line if possible.

B. Top Cap: Threaded and of same material as piping if possible.

C. Box Size: As required to provide access and allow easy removal and reinstallation of cap.

D. Box Types:

1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.
2. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading.

E. Box Cover Markings: “S.S.,” unless otherwise specified.

F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:

1. Associated Concrete Products, Inc. (Santa Ana, California) (Tel. 714-557-7470).
2. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).
3. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486 7070).

2.05 ACCESSORIES: Provide all hardware, accessories, and miscellaneous items for a complete construction.

PART 3 - EXECUTION

3.01 INSTALLATION: Install sanitary sewer mains properly installed in strict compliance with drawings Work within the City of Ontario right-of-way. All work to be done within the City of Ontario right-of-way shall be constructed per City of Ontario Engineering Standard Procedures, Specifications and Drawings.

END OF SECTION

SECTION 02730

STORM SEWER

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide all storm sewer construction replacement or alteration complete as indicated on drawings, specified, and required.

A. Work in This Section: Principal items include:

1. Complete pipes, manholes, pipe beddings, trench excavation and backfill, testing, riprap, curb inlets. All Work shall be done in strict compliance with the standards and specifications as required by the City and/or Utility Company having jurisdiction and the Standard Specification for Public Works Construction, latest edition.

1.02 QUALITY ASSURANCE:

A. Geotechnical Report:

Installation of Storm Sewer shall conform to the Report of Geotechnical Study Proposed Anthony Munoz Community Center Gymnasium dated June 24, 2024 (revised March 26, 2026) by Kleinfelder (Kleinfelder Project No. 20236170.006A) , 280 Market Street, Suite 300, Riverside, CA 92501.

B. AASHTO:

M 199: Precast Reinforced Concrete Manhole Sections.

C. ASTM:

A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
C 478: Precast Reinforced Concrete Manhole Sections.
C 1173: Flexible Transition Couplings for Underground Piping Systems.
D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
D 2564: Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
F 477: Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
F 656: Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
F-1336: Poly (Vinyl Chloride) (PVC) Gasket Sewer Fittings.

D. Standard Specification for Public Works Construction (Greenbook), latest edition.

E. Caltrans Standard Specifications:

Section 51, Concrete Structures.
Section 52, Reinforcement.
Section 65, Reinforced Concrete Pipe.
Section 70. Miscellaneous Facilities.

1.03 DEFINITIONS

AASHTO: American Association of State Highway and Transportation Officials.
ASTM: American Society for Testing Materials.
NPS: Nominal pipe size.
PVC: Polyvinyl chloride.
RCP: Reinforced concrete pipe.

1.04 SUBMITTALS: Refer to Section 01300 for procedures. Submit complete Shop Drawings Section 01300, "Submittals".

PART 2 - PRODUCTS

2.01 MATERIALS: Provide materials and equipment required for completion of work as shown or required on the drawings.

2.02 PIPING MATERIALS

A. **Reinforced Concrete Pipe**: Designated by Class, rubber gasketed joints. Circular Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-1.02A (1). Class III.

B. **Rubber Gasketed Joints**: Caltrans Standard Specification Section 65-1.06.

1. PVC Pipe and Fittings, 4-Inch and Larger
2. Pipe: 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
3. Fittings: 4-inch through 27-inch: ASTM F 1336.
4. Joint Gasket: Elastomeric seal, ASTM F 477.

2.03 PIPE ANCHORS

A. **Portland Cement Concrete and Reinforcing**: Section(s) 03200 and 03300.

2.04 SPECIAL PIPE COUPLINGS

A. **Plastic**: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

B. **Reinforced Concrete Pipe**: Portland cement collar as indicated.

2.05 CLEANOUTS

A. **Piping**: Same as storm drain line if possible.

B. **Top Plug or Cap**: Same material as piping if possible. Plug or cap to be secure but removable, threaded or non-threaded.

C. **Box Size**: As required to provide access and allow easy removal and reinstallation of plug or cap.

D. Box Types:

1. Non-Traffic Areas: Portland cement concrete box and box cover, light duty.
2. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover to be rated for AASHTO H20 loading.

E. Box Cover Markings: "S.D.," unless otherwise specified.

F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Associated Concrete Products, Inc. (Santa Ana, California) (Tel. 714-557-7470).
2. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).
3. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486-7070).

2.06 CURB INLETS, CATCH BASINS, DROP INLETS, JUNCTION STRUCTURES, AREA DRAINS, ETC.

A. General: Size, shape, configuration, depth, etc. of structure and frame, grate, or cover shall be as indicated.

B. Portland Cement Concrete and Reinforcing: Section 03301.

C. Precast Structure: Rate for AASHTO H20 loading in traffic areas.

D. Steps: ASTM C 478 or AASHTO M 199. Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091).

E. Frames, Grates and Covers: Caltrans Standard Specification Section 75-1.02, 75-1.03 and 75-1.05.

1. Galvanize steel frames, grates and covers.
2. Grates and covers shall be non-rocking.
3. Rate for AASHTO H20 loading in traffic areas.

2.07 MANHOLES

A. General: Size, shape, configuration, depth, etc. of manhole and frame and cover shall be as indicated.

B. Portland Cement Concrete and Reinforcing:

1. Poured-in-Place Portion: Section 03300.
2. Precast Portion: ASTM C 478. Rate for AASHTO H20 loading in traffic areas.

C. **Frames and Covers**: As indicated and in accordance with Caltrans Standard Specification Section 75-1.02.

D. **Steps**: Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A615/A 615M and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step.

E. **Frames and Covers**: As indicated and in accordance with Caltrans Standard Specification Section 75-1.02.

2.08 JOINT SEALANT FOR PRECAST STRUCTURES AND MANHOLES

A. **Mortar**: Caltrans Standard Specification Section 51-1.135.
Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

B. **Gaskets**: Preformed flexible rubber or plastic gasket.

1. Rubber Gaskets: ASTM C443.
2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is “Ram-Nek” as manufactured by the K. T. Snyder Company (Houston TX) or equal.

2.09 ACCESSORIES: Provide all hardware, accessories, and miscellaneous items for a complete construction.

PART 3 - EXECUTION

3.01 INSTALLATION: Install storm sewer in strict compliance with the standards and specifications required by the City and the Standard Specifications for Public Works Construction, latest edition.

END OF SECTION

SECTION 02740

WATER MAIN

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide all water main construction alteration or replacement complete as indicated on drawings, specified, and required.

A. Work in This Section: Principal items include:

1. Complete pipe lines, Fire hydrants, valves/boxes, trench excavation and backfill, testing and joint restraint. Work within the City of Ontario right-of-way. All work to be done within the City of Ontario right-of-way, up to and including the water meter, shall be constructed per City of Ontario Engineering Standard Procedures, Specifications and Drawings.
2. All fire related facilities, including fire hydrants, fire department connections, post indicator valves, double check detector assemblies and reduced pressure principle backflow preventers, shall be constructed per City of Ontario Engineering Standard Procedures, Specifications and Drawings.

1.02 QUALITY ASSURANCE:

A. Geotechnical Report:

Water Main installation shall conform to the Report of Geotechnical Study Proposed Anthony Munoz Community Center Gymnasium dated June 24, 2024 (revised March 26, 2026) by Kleinfelder (Kleinfelder Project No. 20236170.006A) , 280 Market Street, Suite 300, Riverside, CA 92501.

B. City and/or Utility Company

a. All work shall be in strict compliance with the standards and specification required by the City and/or Utility Company having jurisdiction.

C. ASTM:

B 88: Specifications for Seamless Copper Water Tube.
D 1785: Specifications for Poly-Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
D 2564: Specifications for Solvent Cements for Poly-Vinyl Chloride (PVC) Plastic Piping Systems

D. AWWA:

C500: Metal-Seated Gate Valves for Water Supply Service.
C509: Resilient-Seated Gate Valves for Water Supply Service.
C550: Protective Epoxy Interior Coatings for Valves and Hydrants.
C605: Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.
C606: Grooved and Shouldered Joints.
C651: Disinfecting Water Mains.
C800: Underground Service Line Valves and Fittings.

C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fittings, 4 In. Through 12 In. (100mm Through 300mm) for Water Distribution.
C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13mm) Through 3 In. (76mm) for Water Service.
C908: PVC Self-Tapping Saddle Tees for Use on PVC Pipe.
M23: PVC Pipe – Design and Installation.

E. Definitions:

AASHTO: American Association of State Highway and Transportation Officials.
ASTM: American Society for Testing Materials.
AWWA: American Waterworks Association
FM: Factory Mutual.
NFPA: National Fire Protection Association.
PCC: Portland cement concrete.
PE: Polyethylene.
PVC: Polyvinyl Chloride.
UL: Underwriters Laboratory.

F. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.

G. Comply with the following requirements and standards:

1. NSF 61: “Drinking Water System Components-Health Effects” for materials for potable water.
2. NFPA 24: “Installation of Private Fire Service Mains and Their Appurtenances” for materials, installations, tests, flushing, and valve and hydrant supervision.
3. NFPA 70: “National Electric Code” for electrical connections between wiring and electrically operated devices.

H. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Internal Pressures

1. Working Pressures: 150-psi.
2. Test Pressure: 200-psi.

B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

1.04 SUBMITTALS: Refer to Section 01300 for procedures. Submit complete Shop Drawings Section 01300, "Submittals".

PART 2 - PRODUCTS

2.01 MATERIALS: Provide materials and equipment required for completion of work as shown or required on the drawings. Prior to procurement, Contractor shall confirm that all Materials have been approved by the City and/or Utility Company having jurisdiction.

2.02 SMALL SIZE SERVICE PIPES

A. **Copper Pipe**: Sizes ¾-inch through 2-inch.

1. Pipe and Fittings: ASTM B 88, Type K, seamless water tube, annealed.
2. Joints: Restrain by couplings.

B. **PE Plastic Pipe**: Sizes ½-inch through 3-inch.

1. Pipe and Fittings: AWWA C901.
2. Joints: Restrain with clamps or heat-fusion.

C. **PVC Pipe**: Sizes1/8-inch through 3 inch.

1. Pipe and Fittings: ASTM D 1785, Schedule 40
2. Joints: Restrain with solvent cement. Do not use threaded pipe.
3. Solvent Cement: ASTM D2564.

D. **PVC Pipe**: Sizes 4-inch through 12-inch.

1. Pipe:
   a. 4-inch through 12-inch: AWWA C900.
2. Fittings
   a. Standard: AWWA C110, sizes 4-inch through 48-inch.
   b. Compact: AWWA C153, sizes 4-inch through 24-inch.
3. Unrestrained Joints:
   a. Push-On Bell and Spigot Joint: AWWA C900.
4. Restrained Joints:
   a. Push-On Bell and Spigot Joint: Harness assembly as manufactured by Ebaa Iron (Eastland, Tx) (Tel. 800-433-1716) or approved equal.
   b. Plain End PVC to DI Mechanical Joint: Ebaa Iron (Eastland, Tx) (Tel. 800-433-1716) or approved equal.
5. PVC Couplings
   a. Unrestrained Plain End to Plain End Pipe: AWWA C900, as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.
   b. Restrained Plain End to Plain End Pipe: AWWA C900, “Certa-Lock” as manufactured by CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.

2.03 GATE VALVES

A. **Provide on** lines 10-inch and smaller.

B. **Valves, 3-Inch through 20-Inch**: AWWA C509, resilient-seated, non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise. All bolts, nuts and washers, except operating nut, shall be stainless steel. Stem operating nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the stem operating nut to within 2-feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4-feet. Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer's recommendations.

C. **Service Line Valves and Fittings, 2-Inch and Smaller**: AWWA C800

D. **Available Manufacturers**: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
2. M&H Valve Company (Anniston, AL) (Tel. 205-237-3521).
3. Crane Company (New York, NY).

E. **Valve Box and Cover**: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering "WATER". Both the box and the cover shall be rated for AASHTO H20 loading.

2.04 TRACER WIRE

A. **General**: Minimum #12 AWG stranded copper wire with blue THW, THWN, or THHN rated insulation.

2.05 WARNING TAPE

A. **General**: Non-detectable 3-inch warning tape made of solid blue film with continuously printed black-letter message reading "CAUTION—WATER LINE BURIED BELOW."

2.06 PCC THRUST BLOCKS: Provide Portland Cement Concrete and Reinforcing Steel, refer to Section 03300.

2.07 ACCESSORIES: Provide all hardware, accessories, and miscellaneous items for a complete construction.

PART 3 - EXECUTION

3.01 INSTALLATION: Install water mains in strict compliance with the standards and specification required by the City and/or Utility Company having jurisdiction.

END OF SECTION

SECTION 02751

CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Parking lots.
3. Curbs and gutters.
4. Walkways.
5. Plazas and Patios

1.02 RELATED SECTIONS

A. Section 02768: Patterned Concrete Pavement.

1.03 ALTERNATES

A. Refer to Division 1 Section Alternates for description of Work in this Section affected by alternates.

1.04 SUBMITTALS

A. Product Data: Submit for each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Samples for Verification: Cast concrete samples, approximately 12 by 12 by 2 inches, of each color and finish indicated, showing full range of variations expected in these characteristics.

D. Samples: 5-lb sample of exposed aggregate.

1.05 QUALITY ASSURANCE

A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
   1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
   2. ACI 318, "Building Code Requirements for Reinforced Concrete."
   3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Concrete Testing Service: Engage a qualified independent testing agency to design concrete mixes.

E. Field-Constructed Mockup: Cast 6 foot square mockup of each concrete type scheduled to demonstrate typical joints, surface finish, texture, color, and standard of workmanship. Provide control joint (C.J.) and expansion joint (E.J.) in each mockup.
   1. Building mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Obtain Architect's approval of mockups before starting construction.
   4. If Architect determines that mockup does not meet requirements, demolish and remove it from the site and cast another until the mockup is accepted.
   5. Keep approved mockup undisturbed during construction as a standard for judging completed pavement.
   6. Demolish approved mockup and remove from site when directed by Architect.

   7. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section Project Meetings.

   1. Before submitting design mixes, review concrete pavement mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with concrete pavement to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixes.
      c. Ready-mix concrete producer.
      d. Concrete subcontractor.

1.06 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 PRODUCTS

2.01 FORMS

A. Forms: Metal, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal and to provide full-depth, continuous straight, smooth exposed surfaces.
   1. Use flexible or curved forms to form radius bends as required.

B. Form Release Agent: Provide commercial formulation form-release agent complying with local volatile organic compound (VOC) limitations, that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 40, deformed.

B. Welded Wire Fabric: ASTM A 185. Furnish in flat sheets.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars to length with ends square and free of burrs.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's Manual of Standard Practice from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.03 CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement, ASTM C 150 Type I or II.

C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:

   1. Class: 4S.
   2. Maximum Aggregate Size: +3/4 inch nominal.
   3. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Exposed Aggregate: Selected, hard, and durable; washed; free of material that reacts with cementitious material or causes staining; from a single source, with gap graded coarse aggregate as follows:

1. Aggregate Size: 1/4 inch.

E. Water: ASTM C94.

2.04 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.05 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, non-staining, reinforced, waterproof sheet.

B. Water: Potable.

C. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-yellowing, wax free. Loss of water in the water retention test shall not exceed 0.040-gram per square centimeter of surface. Deliver curing compound in unopened labeled containers.
   1. Provide material with maximum volatile organic compound (VOC) rating of 120 g/L.

D. For Integrally Colored Concrete: Compound recommended by manufacturer of color admixture.

2.06 RELATED MATERIALS

A. Control Joint Material:
   1. Metal: "Keyed-Kold" with retained [removable] cap as manufactured by Burke Concrete Accessories, Inc. Phone (213) 7237286.
   2. Preformed Fiber Joint Filler: ASTM D1751 non-extruding preformed bituminous saturated fiberboard units. Plain or punched for dowels as required.

   3. Plastic: T-shaped plastic strip with removable top section, 1 inch minimum depth. W.R. Meadows, Speed-E-Joint or Superior Featherweight Zip-Strip.

   4. Sealant: Two-Component Polyurethane Sealant; Type M, Grade P, Class 25, Medium

Grey Color, Use T. One of the following, or approved equal:
a. N.R.-200 Urexpan: Pecora, Corp.
b. Sonolastic Paving Joint Sealant: Sonneborn.
c. THC-900: Tremco, Inc.

B. Coloring Agent: ASTM C 979, colored water-reduction set controlling admixtures; color stable, nonfading, and resistant to lime and other alkalis.
1. Color: Match Architect's sample.
2. Color: As selected by Architect from manufacturer's full range.
3. Products: Subject to compliance with requirements, provide the following, or approved equal:
a. Davis Standard Colors.

C. Colored Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Color: Match Architect's sample.
2. Color: As selected by Architect from manufacturer's full range.
3. Products: Subject to compliance with requirements, provide the following, or approved equal:
a. Lithochrome Color Hardener; L.M. Scofield Co.

D. Bonding Agent: ASTM C 1059, Type II, Acrylic emulsion or styrene butadiene.

E. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

F. Chemical Surface Retarder: Water-soluble, liquid set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch.
1. Products: Subject to compliance with requirements, provide one of the following, or approved equal:
a. True Etch Surface Retarder; Burke Group, LLC (The).
b. Concrete Surface Retarders; Euclid Chemical Co.
c. Lithotex; L.M. Scofield Co.
d. Rugasol-S; Sika Corporation.

H. Precast Splash Blocks: 2500 psi concrete, 12 inch by 24 inch by 4 inch, with dense troweled sloping trough through center and raised edges on 3 sides. For all locations where downspouts discharge on earth.

I. Concrete Wheel Stops: Precast concrete wheel stops, smooth finish, length as shown,

minimum 3500 p.s.i. compressive strength, with continuous steel reinforcing. Secure to concrete slabs with epoxy adhesive.

1. Epoxy Adhesive: W.R. Meadows Sealtight Rezi-weld gel paste trowel grade epoxy adhesive. Mix and apply per manufacturer's instructions.

J. Tree Grates: Cast iron tree grates, "Century" model, manufactured by Canterbury International, Los Angeles, California 213/936-7111; distributed by David Silverman & Associates, 818/549-0984.
   1. Provide tree grates with light ports and steel angle frame.

2.08 CONCRETE MIXES

A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
   1. Do not use the Owner's field quality-control testing agency as the independent testing agency.
   2. Limit use of fly ash to 15 percent of cement content by weight.

B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28-day): 3000 psi.
   2. Slump Range: 3 inches to 4 inches.

C. Add air-entraining admixture at manufacturer=s prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.

D. Coloring Agent: Add coloring agent to mix according to manufacturer=s written instructions.

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.

B. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
   1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (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.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for

additional compaction. Do not begin paving work until such conditions have been corrected and subbase is ready to receive paving.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving 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. Check completed formwork and screeds for grade and alignment to following tolerances:
   1. Top of Forms: Not more than 1/8 inch in 10 feet.
   2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.

C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.03 PLACING REINFORCEMENT

A. General: Follow CRSI's recommended practice for "Placing Reinforcing Bars" for 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. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.04 JOINTS

A. General: Construct control, construction, and expansion joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
   1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.

B. Tooled Control Joints (CJ):
   1. Form tooled control joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of control joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

2. Jointer Tool: 1/4 inch wide at surface, tapered, with top edges rounded to 1/4 inch radius.
3. Location: As shown on drawings, but in any case not more than 15 feet o.c. both ways. Typical sidewalk joints shall be 5 feet o.c. or as directed by Architect.

C. Plastic Control Joints: Immediately following preliminary troweling, part concrete to depth of 2 inches with #750 Lightweight Cutter Bar. Install plastic joint material so pull-top stiffener is flush with concrete surface. Immediately peel off pull top stiffener. After pull-top is removed, float concrete to fill all voids adjacent to strip. During final troweling, finish edge to a radius not to exceed 1/8 inch using a #335 or #350 slit jointer tool.

D. Metal Joints: Install metal joint form. Set top of stakes 3/8 inch below slab surface elevation. Install with minimum of 5 stakes per 10 foot length. When concrete is not poured continuously over both sides of the joint, bend knock-out anchors at 45 degree angle into pour. Finish concrete to top of joint and burn in with hand trowel.

E. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
1. Prior approval of Architect is required.

F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. Radius: 1/4 inch (6 mm).

G. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
2. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

H. Expansion Joints (E.J.): Form expansion 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 30 feet, unless indicated otherwise.
2. Extend joint fillers full width and depth of joint, not less than 1/2 inch or more than 1 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together. Do not leave gaps between ends of joint filler units.

4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
5. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one half of dowel length to prevent concrete bonding to one side of joint.

I. Installation of sealants is specified in Division 7 Section Joint Sealers.

J. Installation of Sealants: Comply with sealant manufacturer=s instructions. Install sealant to depths recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead:
1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 1/2 inch deep nor less than 3/8 inch deep.
2. Tool joints to form smooth, uniform beads with slightly concave surfaces, with finished joints straight, uniform, smooth and neatly finished. Remove excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition. Do not use tooling agents unless recommended by sealant manufacturer.

3.05 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

C. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.

D. 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.
1. When concrete placing is interrupted for more than 1/2 hour, place a construction joint.

E. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
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 reinforcing, dowels, and joint devices.

F. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

G. 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.

H. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). 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 reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.06 CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

B. Float Finish: Begin floating when bleed water sheen has disappeared and the 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 within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture.

C. Medium Textured Broom Finish: For slopes less than 6 percent, provide a medium texture by drawing a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.

D. Heavy (Coarse) Textured Broom Finish: For slopes 6 percent and greater, provide a coarse finish by straiting surface 1/16 inch to 1/8 inch deep with a stiff-bristled broom, perpendicular

to line of traffic.

E. Smooth Finish: Steel trowel and burnish to a smooth, dense, hard finish.

F. Textured Finish: Steel trowel with circular motion to produce non-slip surface.

3.07 SPECIAL FINISHES

A. Monolithic Exposed Aggregate Finish: Expose course aggregate to pavement surfaces as follows:

1. Immediately after floating, spray-apply chemical surface retarder to pavement according to manufacturer=s written instructions.
2. Cover with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed Aggregate Finish: Immediately after floating, broadcast a single layer of aggregate uniformly onto the pavement surface. Tamp seeded aggregate into plastic concrete, and float to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
1. Spray-apply chemical surface retarder to pavement according to manufacturer=s written instructions.

2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with sniff, nylon bristle broom.
4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistant Aggregate Finish: Before final floating, apply slip-resistant aggregate finish to pavement surfaces according to manufacturer=s written instructions and as follows:
1. Uniformly spread 25 lb./100 sq. ft. (12 kg/10 sq. m) of dampened nonslip aggregate over the surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.

D. Colored Dry-Shake Hardener Finish: After initial floating, apply colored dry-shake materials to pavement surfaces according to manufacturer=s written instructions and as follows:

1. Uniformly apply colored dry-shake materials at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m), unless greater amount is recommended by manufacturer to match pavement color required.
2. Uniformly distribute approximately two-thirds of colored dry-shake material over the concrete surface with mechanical spreader, and embed by power floating. Follow power floating with a second shake application, uniformly distributing remainder of dry-shake material to ensure uniform color, and embed by power floating.

3. After final floating, apply a hand-trowel finish followed by a broom finish to concrete. Cure concrete with curing compound recommended by dry-shake material manufacturer. Apply curing compound immediately after finish finishing.

3.08 CURING AND PROTECTION

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 follow recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to 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. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
   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. 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 roller according to manufacturer=s written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. Curing Compound for Colored Concrete: Apply an even coat of curing compound, following manufacturer's instructions. Do not use curing paper.

3.09 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.
D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer=s recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.10 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. Extend upper portion of dowel 5 inches (125 mm) into wheel stop and lower portion a minimum of 5 inches (125 mm) into pavement.

3.11 FIELD QUALITY CONTROL

A. Testing Services: Testing shall be performed according to the following requirements:
   1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
   2. Slump Tests: ASTM C 143; one test at point of placement for each compressive-strength test but no less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
   3. Compression Test Specimens: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless directed otherwise. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
   4. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day=s pour of each type of air-entrained concrete.
   5. 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 set of compressive-strength specimens.

   6. Compressive-Strength Tests: ASTM C 39; one set for each day=s pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
   7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

   8. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may

waive compressive-strength testing if adequate evidence of satisfactory strength is provided.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.

10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 and 28 day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.
13. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.12 REPAIRS AND PROTECTIONS

A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet requirements of 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 paving with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
D. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION

SECTION 02900

LANDSCAPE PLANTING

I. GENERAL

The provisions of the Standard Specifications for Public Works Construction (SSPWC), latest Edition, Sections 212 and 308 apply except as modified herein.

A. Work Included in this Section:

Finish grading (fine).
Weed abatement.
Soil preparation.
Tree supports, trunk protectors, and root barriers.
Furnishing plants and planting.
Fertilizer, soil amendment.
Watering.
Project maintenance period.
Soils analysis.

B. Work not Included in this Section:

Rough grading.
Finish grading.
Irrigation system.

C. Approvals:

All sprinkler work shall be inspected and approved before starting any work of this section, except that specimen trees shall be installed prior to beginning sprinkler work.

All turf areas shall be planted and all landscape planting shall be installed and approved prior to the commencement of the plant establishment period.

II. MATERIALS

A. Landscape Finish Grading:

Site topsoil material shall be used.

B. Tree Supports:

Stakes for trees shall be round, of Lodge Pole pine, made from the entire bole of the tree with bark removed and completely treated in a solution of pentachlorophenol. They shall be at least 2" or 2 2" in diameter, conically pointed at one end. 10" long tapered point and chamfered at the other end.

Ties shall be "Wonder Tree-Tie" or equal, black in color, install according to manufacturer's specifications.

C. Tree Trunk Protector:

Contractor shall supply and install an approved tree trunk protector device for trees in turf area only, equal to "Tree Boot".

D. Root Barrier:

Root barrier shall be installed on all planted trees within 5'-0" of concrete or asphalt paving. Contractor to supply and install "deep root" barrier by Deep Root Corp: (415) 437-9700 or Shawtown Root Barrier by NDS: (800) 726-1994 or approved equal. Where root barriers parallel curb face or concrete pavement, the barrier shall extend 5' on either side of the tree trunk 10' in length.

E. Landscape Edgings:

Wood Edging:

Provide 2-inch by 4-inch pressure treated Douglas Fir or Redwood construction grade headerboards. Make splices with 1-inch by 4-inch pieces no less than 12 inches long. Place 1-inch by 3-inch by 16-inch stakes at intervals of not more than 5 feet. Cut stakes level and set below top of headerboards.

On sharp turns and curves, four 1/2 inch by 4-inch laminated boards, or two 1-inch by 4-inch laminated boards may be permitted.

Nail stakes and splices with galvanized common nails. Nail as required for solid installation.

Provide header as shown on drawings, laid true to line and grade, protect in-place adjacent improvements, shrubbery and other properties. Place stakes on ground cover side of header.

Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

Aluminum Edging: Standard-profile extruded-aluminum edging, ASTMB221, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with 9-inch steel stakes.

Concrete Mowstrip: 6 inch wide by 6 inch thick concrete mowstrip with 1/2 inch tooled edging and #3 continuous rebar.

F. Plant Materials:

General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Legend shown on Drawings and complying with ANSI Z60.1. Provide plant materials in accordance with the State Department of Agriculture’s regulation for nursery inspections, rules and ratings. Provide plants with a normal habit of growth, sound, healthy, vigorous and free from insect infestations, plant diseases, sunscalds, and other disfigurements. Ensure tree trunks are

sturdy and have well-hardened systems and vigorous and fibrous root systems which are not root or pot-bound. In the event of disagreement as to condition of root system, the root conditions of the furnished plants in containers will be determined by removal of earth from the roots of not less than two plants, or more than 2 percent of the total number of plants of each species or variety. Where container grown plants are from several sources, roots of not less than two plants of each species or variety from each source will be inspected. In the event that the sample plants inspected are found to be defective, the entire lot or lots of plants represented by the defective samples may be rejected. Plants rendered unsuitable for planting due to this inspection will be considered samples and will be provided at no cost to the Owner.

Size of plants will comply with ANSIZ60.1 and correspond with that normally expected for species and variety of commercially available nursery stock or as specified on drawings. The minimum acceptable size of plants measured before pruning with the branches in normal position, must conform to the measurements specified in the plant list. If approved by the Owner, larger sized plants may be used. If larger plants are approved for use, the ball of earth or spread of roots for each plant will be increased proportionately.

Plants not meeting requirements of these specifications are considered to be defective whether in place or not. They must be immediately removed and replaced with new acceptable and approved plants of the required size, species and variety.

Pruning: Do not prune, trim, top or alter the shape of trees or plants except as approved.

Provide plant material true to botanical and common name and variety as specified in Annotated Checklist of Woody Ornamental Plants in California, Oregon and Washington, published by University of California School of Agriculture (latest edition).

Nursery Grown and Collected Stock: Grow under climatic conditions similar to those in locality of project; container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off. Use only liner stock plant material which is well established in removable containers or formed homogenous soil sections.

Select trees which are aesthetically desirable and are good examples of the species. Trees with gashes, misshapen trunks or branches, topped leaders, structural defects, badly crossed branches, or other visual defects will not be accepted. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread to assure symmetry in planting.

Seed: Label seed and provide in sealed containers with signed copies from vendor certifying that each container is fully labeled in compliance with State Agricultural Code and is in compliance with minimum requirements of these specifications. Wet, moldy or damaged seed will not be permitted. Provide seed mix per plan.

G. Soil Amendments and Fertilizer for Bid Purposes:

All turf and groundcover areas shall receive soil amendments per soil analysis recommendations. See specs. (Use the following quantity per 1,000 sq. ft. for bidding purposes).

1. 6 cubic yards nitrogen stabilized organic amendments.

2. 15 lbs. commercial fertilizer (6-20-20 either incorporated into the soil or incorporated into the hydromulch slurry as specified).
3. 20 lbs. of gypsum

H. Turf Seed Mixes:

All seed shall be fresh, clean, new crop seed, premixed by mechanical mixer to proportions specified. Minimum purity and germination as follows:

Turf Mix	Proportion by Weight	Purity	Germination
Ryegrass (50% Pennfine, 50% Derby by count)	20%	95%	90%
Bluegrass (50% Rugby, 50% Parade by count)	40%	98%	80%
Bermuda grass* (certified Arizona Common)	40%	98%	85%

* Hulled seed shall be used if planted April through September. Unhulled seed shall be used if planted October through March.

Seeding rate: 350 pounds per acre. (8 pounds per 1000 square feet).

I. Commercial Fertilizers:

Planting Tablets. Tightly compressed, long-lasting, slow-release fertilizer tablets weighing 21 grams, with a potential acidity of not more than 5% by weight and having an analysis of 20-10-5 derived from the sources listed in the following guaranteed analysis:

Guaranteed Analysis

Total Nitrogen 20.0%
Derived from urea-formaldehyde.
7.0% water soluble Nitrogen, 13.0% water insoluble Nitrogen
Available Phosphoric Acid 10.0%
Derived from calcium phosphate.
Soluble Potash 5.0%
Combined Calcium 2.6%
Derived from calcium phosphates.
Combined Sulfur 1.6%
Derived from ferrous and potassium sulfates.
Iron (expressed as elemental Fe) ..... .35%
Derived from ferrous sulfate.
Potential Acidity: 5% or 100 lbs. Calcium Equivalent per ton.

Fertilizer 6-20-20 XB (for turf & groundcover areas): Premium high performance pre-plant fertilizer compound having an N-P-K ratio of 6-20-20, and shall be derived from the sources listed in the following analysis in a high quality homogeneous pellet.

Guaranteed Analysis

Total Nitrogen 6.0%
Ammoniacal Nitrogen
Available Phosphoric Acid 20.0%
Soluble Potash 20.0%
Sulfur 5.5%
Iron (Fe) expressed as Elemental 1.5%

Potential Zinc 0.75%

Fertilizer 12-12-12 (for Plant Backfill): Fertilizer shall be rapidly soluble prills containing equal amounts of nitrogen, phosphorus, and potash plus sulfur and calcium and derived from the following sources:

Guaranteed Analysis

Total Nitrogen 12.0%
As Ammoniacal derived
Available Phosphoric Acid 12.0%
Soluble Potash 12.0%
Sulfur 15.0%

Fertilizer 16-6-8: (for Maintenance) Fertilizer shall be a fertilizer compound having an N-P-K ratio of 16-6-8, and shall be derived from the sources listed in the following analysis in a high quality homogeneous pellet.

Guaranteed Analysis

Total Nitrogen 16.0%
Ammoniacal Nitrogen
Available Phosphoric Acid 6.0%
Soluble Potash 8.0%
Sulfur 16.0%
Iron (Fe) expressed as Elemental 1.5%
Potential Zinc 0.1%

Ammonium Sulfate: Conforming to the requirements of the Agricultural Code of the State of California.

Iron Sulfate: Ferric sulfate or ferrous sulfate in pelleted or granular form containing not less than 18.5% iron expressed as metallic iron, and shall be registered as an agricultural mineral with the State Department of Agriculture in compliance with Article 2, "Fertilizing Materials", Section 1030 of the Agricultural Code.

Soil Amendment: Standard Specifications Section 212-1.2.4 shall apply. Soil amendment shall be an organic wood base product, Type I, composted Redwood or Cedar only.

J. Shredded Wood Mulch:

Shredded Wood Mulch shall be a minimum of 1" thickness in all shrub and groundcover areas. Type: Forest Floor 0-2, Supplied by: Aguinaga Fertilization Products Phone 949-786-9558. or equal. Submit sample to landscape architect for approval prior to installation.

Organic Mulch: Provide medium grind bark, consisting of organic, fibrous, woody bark mixture of varied particle size such that 90 to 100 percent passes 1 inch sieve, 80 to 100 percent passes 1/2 inch sieve, and 20 to 60 percent passes 1/4 inch sieve, or approved equal. Mulch shall be free of contaminants and weed seed and shall have a pleasant musty or moldy soil-like odor. Putrid, ammonia and sour-smelling materials will be deemed unacceptable. Recycled construction materials will not be permitted.

III. EXECUTION

A. Agronomic Soils Tests Prior to Amending Soil:

After completion of fine grading and prior to soil preparation, the Agency shall obtain agronomic soils tests for all planting and turf areas. A minimum of one sample per two acres of lawn shall be required. Tests shall be performed by an approved agronomic soils testing laboratory and shall include a fertility and suitability analysis with written recommendations for soil amendment, fertilizer, and chemical conditioner application rates for soil preparation, auger hole requirements, and maintenance and post-maintenance fertilization program for all areas.

The agronomic soils report recommendations shall take precedence over the minimum amendment and fertilizer application rates specified herein or on the plans only when they exceed the specified minimums. Additional materials required by the soils report shall be paid for by Change Order.

B. Agronomic Soil Test After Amending Soil:

After the soil amendment procedure has been completed and prior to commencement of planting the Agency Representative will take one sample per two acres of turf of amended soil.

The Agency Representative shall deliver the samples to an approved agronomic soils testing laboratory for analysis and report. Costs of analysis and report shall be borne by the Contractor.

If any deficiencies are found, the elements required to be added to the planting areas to comply with these specifications shall be borne by the Agency. The additional soil testing costs to insure conformance will be borne by the Contractor.

After certification by the laboratory that amendment procedures have been complied with, the Contractor may proceed with planting.

Permissible limits of analytical deviation are as follows:

Items	Permissible Limits
Percentage organic matter	Plus or minus 20%
Mineral nutrients:	
available nitrate plus ammonic nitrogen	Plus or minus 20%
available phosphate phosphorus	Plus or minus 20%
available potassium	Plus or minus 20%

C. Finish Grading:

Before any planting operations start in any area, all trash and deleterious materials on the surface of the ground shall be removed and disposed of. After completion of fine grading and prior to soil preparation, the Contractor shall adhere to the Agronomic Soils Test and Report recommendations as required, except for the minimums specified herein.

All planting areas shall be finish graded per Standard Specifications, Section 308-2.4. Finish grades shall be so graded that required tolerances are met after settlement at the end of the project maintenance period.

D. Weed Abatement:

All weed growth in planting areas shall be removed. Common Bermuda grass found growing in areas not designated to be planted with Bermuda grass, shall be killed with an approved herbicide or fumigant with materials approved by the Agency.

Contractor shall irrigate for a minimum of twenty-one (21) days all banks and other areas that will be hydroseeded with plants other than turf to germinate existing weeds. Weeds shall be removed or killed by a contact herbicide to provide a complete kill. Soil surface shall be free of excessive vegetative material so that hydromulch is in contact with the soil surface.

E. Tree Supports:

Wood Tree Stakes: lodge pole pine, full treated with Coppernaphthanate Wood Preservative in strict accordance with FS TT-W-572 Type I, Composition B, 2-inch minimal normal size diameter by 10 feet long, minimum, with no split stakes.

Ties: Provide cinch ties, size corresponding to tree box size as manufactured by VIT Company or other approved.

F. Planting:

General:

The irrigation system shall be operational and approved prior to planting.
Perform actual planting only during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice, as approved.

Distribute in planting areas only as many plants as can be planted and watered that same day.

Ensure that containers which are opened and plants removed are handled with care such that ball of earth surrounding roots is not broken and that plants are planted and watered immediately. Do not open containers prior to placing plants in planting areas.

Layout:

Mark locations for plants and outlines of areas to be planted before any plant pits are dug. Gain City approval. If underground construction or utility lines are encountered in the excavation of planting areas, other locations for planting may be selected by Owner. Accomplish layout with flagged grade stakes indicating plant names and specified container size on each stake. Confirm location and depth of underground utilities and obstructions.

EXCAVATION FOR TREES AND SHRUB

Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Trim perimeter of bottom leaving center area of bottom raised slightly to support rootball and assist in drainage away from center. Do not further disturb base. Ensure that rootball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation

Excavate approximately two times as wide as rootball diameter.

Do not excavate deeper than depth of the rootball, measured from the root flare to the bottom of the rootball.

Subsoil and topsoil removed from excavations may be used as planting soil backfill.

Strip and stack approved excavation for planting which is encountered within areas for trenches, tree holes, plant pits and planting beds.

Remove from site excess soil generated from planting holes and not used for backfilling.

Protect areas from excessive compaction when trucking plants or other materials to planting areas.

TREE, SHRUB, AND VINE PLANTING

Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1.

Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

Set stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

Use planting soil for backfill.

Container Grown: Cut cans on two sides with acceptable can cutter only. Carefully remove rootball from container without damaging rootball or plant. Superficially loosen edge roots on three sides after removing from can.

Boxed Trees: Remove bottom of plant boxes before planting. Remove sides without damage to rootball after positioning plant and partially backfilling.

Face plants with fullest growth into prevailing wind.

Backfill plants with: 6 parts by volume on-site soil, 4 parts by volume organic amendment, 1 pound 6-20-20 fertilizer mix per cubic yard of mix, 2 pounds iron sulfate per cubic yard of mix. Note: This is for bid purposed only. Specific

backfill recommendations are made as a result of the soils testing described on the planting plan.

Backfill around rootball in layers, tamping to settle soil and eliminate voids and air pockets. Hold plant rigidly and plumb until soil has been firmed around ball or roots. Raise all plants which settle deeper than the surrounding grade. When planting pit is approximately one-half filled, add water to the top of the planting pit and thoroughly saturate rootball and adjacent soil.

Set planting tablets with each plant on top of rootball while plants are still in their containers so the required number of tablets can be verified. After water has completely drained, place planting tablets as follows or in amounts recommended in soil reports from soil-testing laboratory.

1 tablet per 1-gallon container
2 tablets per 5-gallon container
3 tablets per 15-gallon container
4 tablets per 24-inch box
6 tablets per 36-inch box
8 tablets per 48-inch box

Place tablets beside the rootball about 1-inch from root tips; do not place tablets in bottom of the hole.

Continue backfilling process. Construct an earthen basin around each plant after backfilling. Provide basin of depth sufficient to hold at least 2 inches of water. Construct basins with amended backfill. Remove basin in all turf areas after initial watering. Water again after placing and tamping final layer of soil.

Limit pruning to minimum necessary. Remove injured twigs and branches. Pruning may not be done prior to delivery of plants. Paint cuts over 3/4 inch in diameter with tree paint.

Stake or guy trees immediately after planting. Install stakes plumb. Locate stakes so that a straight line drawn between the stakes is perpendicular to the prevailing wind direction.

Do not bring iron sulfate into contact with concrete surfaces due to potential staining. Contractor is responsible for cleaning and replacing stained surfaces.

When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the rootball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the rootball.

All trees shall be planted, staked and tied as noted on drawings and in accord with U.C. Agricultural Extension Service Bulletin AXT-311. Plants shall be planted where shown on plans or as directed by Agency Representative.

Backfill material for plant pits shall be a mixture as noted below. The materials shall be thoroughly mixed to the bottom of the pit so that they are evenly distributed and without clods or lumps. Backfill shall be so placed in the pits that the plant will be at

its natural growing height and the backfill material will be level one inch below surrounding soil after settlement.

Amended backfill for plant holes shall be:

A. 6 parts by volume on site soil.
B. 4 parts by volume organic amendment.
C. 2 lbs. iron sulfate per cubic yard.
D. 1 lb. 12-12-12 commercial fertilizer per cubic yard or 17 lb. 5-3-1 Gro-Power).

GROUNDCOVER AND OTHER SMALL CONTAINER PLANTING

Set out and space ground cover and plants from flats or containers smaller than 1-gallon as indicated on planting plan in even rows with triangular spacing.

Ensure that groundcover remains in the flats until transplanting. Flats' soil must contain sufficient moisture so it will not fall apart when lifting plants.

Use planting soil for backfill. Plant each rooted plant with its proportionate amount of flat soil.

Dig holes large enough to allow spreading of roots.

Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

Protect plants for damage and trampling.

TREE, SHRUB, AND VINE PRUNING

Remove only dead, dying, or broken twigs or branches. Do not prune for shape. Pruning may not be done prior to delivery of plants.

Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

G. Watering:

Apply water to all planted areas during operations and thereafter, until acceptance of work.

Plants which cannot be watered efficiently with the existing water system shall be watered by means of a hose.

Immediately after planting, apply water to each tree and shrub. Apply water in a moderate stream in the planting hole until the material about the roots is completely saturated from the bottom of the hole to the top of the ground.

Apply water in sufficient quantities and as often as seasonal conditions require to keep the planted areas wet at all times, well below the root system of grass and plants.

All ground cover planting shall be immediately sprinkled to avoid drying out until the entire planted area is thoroughly watered and the soil soaked to the full depth of each plant hole.

All hydromulch and seeds should be kept damp at all times and irrigation should be adjusted accordingly. This normally would involve four to six watering periods daily; each watering period (ON) regulated to just dampen the mulch and seed, without creating runoff. Intervals between irrigations (OFF) should be judged by the length of the time mulch and seeds remain damp. Once mulch and seeds begin to dry out, the watering (ON) should be repeated.

H. Project Maintenance:

Project maintenance consists of a minimum 30 day plant establishment period and a subsequent 60 day maintenance period, constituting a total minimum 90 day maintenance period.

The plant establishment period commences when all plants and all turf (grass) has been planted. The establishment period will continue until all turf areas have been mowed to the specified height at least once, but not less than 30 days.

Water turf until acceptance of work. The areas shall be kept moist, but not glistening wet, until time for the first cutting of turf. After first cutting, water turf to maintain a thriving condition. Any areas where the seeds fail to germinate satisfactorily shall be immediately reseeded. The Contractor shall maintain the turf areas until an even, close stand of turf is obtained.

The establishment period shall be extended beyond the 30 day minimum at no cost to the City until all turf areas have been mowed to the specified height and a close stand of turf is attained to the satisfaction of the Agency Representative.

Project maintenance work shall commence after the Agency Representative has approved plant establishment and shall continue for 60 additional days.

Project maintenance work shall consist of applying water, fertilizing all areas, weeding, caring for plants, sweeping walks, litter pickup, and performing all general project maintenance.

The Contractor shall be responsible for detecting nutrient deficiencies and turf diseases and pests as soon as their presence is manifested. He shall take immediate action to identify the problem and shall immediately apply remedies. If the above and following conditions are not complied with, the Contractor shall re-plant the grass and maintain the turf until a healthy, mature turf is re-established, and shall maintain that area for an additional 60 days at no additional cost to the Owner.

During the project maintenance period, all plants and planted areas shall be kept well watered and kept weed free at all times. Weeds, Dallas and Johnson grass, and Bermuda grass shall be removed and disposed of (except Bermuda grass will be allowed to remain in turf areas). Provide special attention for watering slopes planted to lawn on the windward and/or sunny side so that turf will adequately be watered at all times.

Immediately after the second cutting of turf, where trees occur in turf areas, the turf shall be turned under and neatly edged 18" away from the plants. The turf edges shall be maintained in a neat condition until acceptance of the work.

Workmen shall not be allowed to walk on turf areas unnecessarily before, during or after seeding operations. Turf areas that have been damaged or compacted shall be recultivated and reseeded at the Contractor's expense.

The Contractor shall provide supplemental feedings of fertilizer as required by the agronomic soils test to maintain a healthy turf and all other plantings including slope areas. Minimum requirement: 16-6-8 at 6.2 lbs. per 1000 s.f. 35 days after initial planting, and just prior to final inspection.

In order to carry out the project maintenance work the Contractor shall maintain a sufficient number of personnel and adequate equipment to perform the work herein specified from the time any planting is done until the end of the project maintenance period or until the final approval.

The Contractor may be relieved from maintenance work required in these special provisions when the project maintenance work has been satisfactorily completed.

Damage to planting areas shall be repaired immediately.

Contractor shall continue to pick up rocks that surface and are 1" or greater in diameter.

I. Replacement of Plants:

All plants that show signs of failure to grow at any time during the life of the contract, or those plants so injured or damaged as to render them unsuitable for the purpose intended, shall be immediately replaced in kind at the expense of the Contractor.

J. Tree Guarantee:

The Contractor shall guarantee all trees from disease or death and injury resulting from improper planting for a period of one year after final acceptance of the project.

The Contractor shall replace at no expense to the Agency as soon as possible plants that are dead or not in a vigorous, healthy growing condition. Replacement shall be of the same kind and size as originally specified and shall be planted as described on the drawings and in the specifications.

The Contractor shall not be held liable for loss of plant materials during the guarantee period due to lack of care, vandalism or accidental causes.

K. Inspections:

A written notice requesting an inspection should be submitted to the Agency Representative at least ten (10) days prior to the anticipated date. Prior to this inspection, the site must be thoroughly cleaned up and all excess material and debris removed.

The following inspections are required:

Prior to the start of the 90 calendar day plant establishment and project maintenance period, the Contractor will be required to have a complete inspection and approval of all landscape construction items.

At 30th calendar day.

At 60th calendar day.

At completion of the maintenance period.

L. Certification:

Written certifications required which are to be submitted to the Agency Representative upon delivery to the job site include:

Quantity of commercial fertilizer used.
Quantity of soil amendments.
Quantity of seed.
Quantity or iron sulfate.
Quantity of soil sulfur.
Quantity of agricultural gypsum.
Quantity of hydromulch materials.
Quantity of shredded wood mulch.

END OF SECTION

SECTION 02916

PLANTING IRRIGATION (RECLAIMED WATER)

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.

B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as in these specifications, and as necessary to complete the contract.

1.2 CONSTRUCTION DRAWINGS

A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, site utilities and architectural features.

B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification. When a conflict occurs between an item shown on the plan and as shown on the specifications, the Landscape Architect shall have final authority for clarification.

C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in the design. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revisions necessary.

1.3 QUALITY ASSURANCE

A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer’s recommended methods of installation and who shall direct all work performed under this section.

B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnishes directions covering points now shown in the drawings and specifications.

C. All local, municipal and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately.

1.4 SUBMITTALS

A. Materials List:

1. After award of contract and before any irrigation system materials are delivered to the job site, submit to the Landscape Architect a complete list of all irrigation systems, materials, or processes proposed to be furnished and installed as part of this contract.
2. Show manufacturer's name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to the method of installation.
3. No substitutions will be allowed without prior written acceptance by the Landscape Architect or Owner's authorized representative.
4. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Substitutions:

If the Contractor wishes to substitute any equipment or materials for those listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect for approval:

1. A written statement indicating the reason for making the substitution and the difference in installed price if the item is accepted.
2. Catalog cut sheets, technical data and performance information for each substitute item.

1.5 EXISTING CONDITIONS

A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.

B. Irrigation design is based on the available static pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction.

Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.

C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer lines, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect who will arrange for relocations. The Irrigation Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.

D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost, all damage resulting from his operations or negligence.

E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans.

1.6 INSPECTIONS

A. The Landscape Architect shall be permitted to visit and inspect at all times any part of the work and shall be provided safe access for such visits.

B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Irrigation Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Irrigation Contractor's expense.

C. Inspections will be required for the following at a minimum. Landscape Architect may opt to review photographs of pressure test (with image of pressure gauge and time stamps) and sample dripline layout.

1. Pressure test of irrigation main line (Three hours at 150 PSI).
2. Sample layout of dripline irrigation.
3. Coverage test of irrigation sprinkler system.
4. Final inspection prior to start of maintenance period.
5. Final acceptance.

D. Site observations and testing will not commence without the record drawings a prepared by the Irrigation Contractor. Record drawings must be complete and up to date for each site visit.

E. Work which fails testing and is not accepted will be retested.

1.7 STORAGE AND HANDLING

A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the

event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner.

B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

1.8 CLEANUP AND DISPOSAL

A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.

B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

1.9 TURNOVER ITEMS

A. Record Drawings:

1. Record accurately on one set of contract drawings all changes in the work constituting departures from the original contract drawings.
2. The changes and dimensions shall be recorded in a legible and workmanlike manner to the satisfaction of the Landscape Architect. Prior to final inspection of work, submit record drawings to the Landscape Architect for review and approval.
3. Dimensions from/to permanent points of reference such as buildings, sidewalks, curbs, etc. shall be shown. Data on record drawings shall be recorded on a day to day basis as the project is being installed. All lettering on drawings shall be minimum 1/8 inch in size.
4. Show locations of the following items:

    a. Point of connection (including water meters, backflow preventors, master control valves, etc.)
    b. Routing of sprinkler pressure lines (dimensions shown at a maximum of 100 feet along routing and at all changes in direction)
    c. Gate valves
    d. Automatic remote control valves
    e. Quick coupling valves
    f. Routing of control wires
    g. Irrigation controllers
    h. Related equipment (as may be directed)

5. Maintain record drawings on site at all times. Upon completion of work, transfer all as-built information and dimensions to a clean set of bond prints, using red, waterproof ink.

B. Controller Charts:

1. Record drawings must be approved by Landscape Architect before controller charts are prepared.
2. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller.
3. The chart is to be a reduced copy of the actual “record” drawing. In the event the controller sequence is not legible, when the drawing is reduced, it shall be enlarged to a readable size. Print shall be black and white, with a different color used to indicate the area of coverage for each station.
4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 10 millimeters in thickness, with a matte finish.

C. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner’s authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:

   a. Index sheet stating Contractor’s address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
   b. Operating and maintenance instructions for all equipment.
   c. Spare parts list and related manufacturer information for all equipment.
   d. Guarantee Statement.

D. Equipment:

1. Supply as a part of this contract the following items:

   a. One (1) tool for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
   b. Padlock and two (2) keys for backflow enclosure (if used).
   c. Two keys for each automatic controller.
   d. Two quick coupler keys with a 3/4 inch bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
   e. One valve box cover key or wrench.
   f. One 5-foot tee wrench for operating butterfly valves (if used).
   g. Two (2) extra sprinkler heads of each size and type.

2. The above equipment shall be turned over to Owner’s authorized representative at the final inspection.

1.10 COMPLETION

A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner’s authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. At the time

of the post-maintenance period or final inspection, the work will be reinspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.

B. The Owner's authorized representative shall have final authority on all portions of the work.

C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.

D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.

Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs, as determined by the Owner, constitutes an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvements, resulting either from faulty materials or workmanship, shall be repaired at the Contractor's expense.

B. Guarantee shall be submitted on Contractor's own letterhead as follows:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of failure to make such repairs or replacements within the time specified after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:

PROJECT LOCATION:

CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

PART 2 - PRODUCTS

2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.2 PIPING

A. Pressure supply line from point of connection through basket strainer unit shall be Type "K" copper or brass pipe.

B. Pressure supply lines 3 inches in diameter and larger shall be Class 200 PVC with bell-and-gasket joints. Piping shall conform to ASTM D2241.

C. Pressure supply lines 2 inches to 2-1/2" in diameter shall be Class 315 solvent weld PVC. Piping shall conform to ASTM D1784.

D. Pressure supply lines 1-1/2 inches and smaller in diameter shall be Schedule 40 solvent weld PVC. Piping shall conform to ASATM D1784.

E. Non-pressure lines 3/4 inches in diameter and larger downstream of the remote control valve shall be Sch. 40 PVC or as stated on Irrigation Materials Legend on plans. Non-pressure lines 1 inch and larger to conform to ASTM D1784.

F. Reclaimed water PVC pipe to be color coded "purple" in color and marked on two sides with reclaimed water warning statements "CAUTION – RECLAIMED WATER". Reclaimed water piping must be accepted by the local reclaimed water governing agencies.

2.3 METAL PIPE AND FITTINGS

A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.

B. Fittings shall be medium brass, screwed 125-pound class.

C. Copper pipe and fittings shall be Type "K" sweat soldered.

2.4 PLASTIC PIPE AND FITTINGS

A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASATM D2241 or ASTM D1784.

C. All PVC fittings shall be standard weight Schedule 80 for constant-pressure mainline fittings and screwed fittings, and Schedule 40 for non-pressure lateral fittings and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2466 and D2467.

D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.

E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.

F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.

2.5 BASKET STRAINER

A. The basket strainer unit shall be of the manufacturer, size, and type indicated on the drawings.

B. The basket strainer unit shall be installed in accordance with the requirements set forth by local codes.

2.6 VALVES

A. Gate Valves:

1. Gate valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Gate valves shall have threaded ASTM B-62 bronze body, bonnet and wedge, silicon bronze stem, and malleable iron handwheel.
3. All Gate valves shall have a minimum working pressure of not less than 150 psi and shall conform to AWWA standards.

B. Quick Coupler Valves:

1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.

2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have ¾ female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve. Hinge cover shall be the locking type in color constructed of brass with a rubber-like vinyl cover. Vinyl quick coupler cover to be purple with the words "WARNING – RECLAIMED WATER – DO NOT DRINK" permanently marked on the lid.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves shall be electrically operated.
3. Automatic control valves shall include manual flow adjustment.

D. Anti-drain Valves:

1. Anti-drain valves shall be of the manufacturer, size and type indicated on the drawings.
2. Anti-drain valves shall have 18-8 stainless steel springs and valve stems with Buna-N seals.
3. Anti-drain valves will have threaded connections the size of the riser or pipe they are to be installed onto, or the next available size. No slip connection anti-drain valves are allowed.

2.7 VALVE BOXES

A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.

B. The valve box cover shall be purple in color and permanently marked with words "WARNING – RECLAIMED WATER – DO NOT DRINK". Valve box cover shall be secured with a hidden latch mechanism or bolts.

C. The cover and box shall be capable of sustaining a load of 1,500 pounds.

D. Valve box extensions shall be by the same manufacturer as the valve box.

E. Automatic control valve boxes shall be 16 inch x11 inch x12 inch rectangular size. Valve box covers shall be marked "RCV" with the valve identification number "heat branded" onto the cover in 2-inch high letters/numbers.

F. Ball valve and quick coupler valve boxes shall be 10-inch diameter circular size. Valve box covers shall be marked with either "BV" or "QCV" with the valve identification "heat branded" onto the cover in 2-inch high letters.

2.8 AUTOMATIC CONTROLLER

A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.

B. Automatic controller enclosures shall be of the manufacturer, size, and type indicated on the drawings. Enclosure shall be vandal-resistant, ventilated and waterproof.

2.9 ELECTRICAL

A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.

B. All electrical work shall conform to local codes and ordinances.

2.10 LOW VOLTAGE CONTROL WIRING

A. Remote control wire shall be direct-burial AWG-UF type, size in no case smaller than 14 gauge.

B. Connections shall be either epoxy-sealed packet type or Penn-Tite connectors.

C. Ground wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the “Record Drawings” plans located on controller door).

2.11 IRRIGATION HEADS

A. Sprinkler heads shall be of the manufacturer, size, type, with radius of throw, operating pressure and discharge rate indicated on the drawings.

B. Pop-up heads and riser heads shall be used.

C. Pop-up heads and gear driven rotors used on reclaimed water systems shall have a color coded purple cap with reclaimed water warnings embossed on the top surface Riser heads shall have a self-adhesive reclaimed water sticker placed on the riser directly below the sprinkler body. All reclaimed water warnings shall be in English and Spanish and have the international symbol for “Do Not Drink”. All reclaimed water warnings shall be as required by the local water utility.

2.12 DRIP IRRIGATION COMPONENTS

A. Dripline tubing shall be of the manufacturer, model number and distribution (emitter flow and spacing) indicated on the drawings.

B. Drip emitters, bubblers and micro-sprays shall be of the manufacturer and model number indicated on the drawings.

C. Distribution tubing, connectors and insert or compression fittings shall be of the manufacturer and type indicated on the drawings.

2.13 RAIN SENSOR

Rain sensor shall be of the manufacturer, size, and type indicated on the drawings.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspections:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

C. Grades:

1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.

D. Field Measurements:

1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect.

E. Diagrammatic Intent:

The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in

equipment locations as necessary to conform to structures and to avoid obstructions or conflicts with other work.

F. Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventor, and automatic controller.
2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

G. Water Supply

Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.

H. Electrical Service:

1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made.
2. Contractor shall make 120 volt connection to the irrigation controllers. Electrical power source to controller locations shall be provided by others.

3.2 TRENCHING

A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

B. Provide minimum cover of 24 inches on pressure supply lines 4 inches and larger. Provide minimum cover of 18 inches on pressure supply lines 3 inches and smaller.

C. Provide minimum cover of 18 inches for control wires.

D. Provide minimum cover of 12 inches for non-pressure lines.

E. Pipes installed in a common trench shall have a 6-inch minimum space between pipes.

3.3 BACKFILLING

A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 -inch in diameter

B. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.

C. Flooding in lieu of tamping is not allowed.

D. Under no circumstances shall truck wheels be used to compact backfill.

E. Provide sand backfill a minimum of 6 inches over and under all piping under paved areas.

3.4 PIPING

A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.

B. Cutting or breaking of existing pavement is not permitted unless specifically indicated on the drawings.

C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs and reaming. Install pipe with all markings up for visual inspection and verification.

D. Remove all dented and damaged pipe sections.

E. All lines shall have a minimum clearance of 6 inches from each other and 12 inches from lines of other trades.

F. Parallel lines shall not be installed directly over each other.

G. In solvent welding, use only the specified primer and solvent cement and make all joints in accordance with the manufacturer's recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

H. PVC pipe shall be installed in a manner which will provide for expansion and contraction as recommended by the pipe manufacturer.

I. Centerload all plastic pipe prior to pressure testing.

J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape.

K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal. All plastic-to-metal connections shall be made with plastic female adapters.

L. All solvent weld mainline piping is to be secured with minimum one cubic foot thrust blocks at all directional changes. Bell and gasket pipe to have a Leemco joint restraint system installed on all fittings in lieu of thrust blocks.

3.5 CONTROLLER

A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.

B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.

C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area or in accordance with the irrigation schedule provided.

3.6 CONTROL WIRING

A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.

B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.

C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.

E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

F. Pull boxes for low voltage control wires shall be provided at a spacing of 480 feet on center along the wire route. An expansion loop of 24 inches shall be provided at each control wire pull box.

3.7 VALVES

A. Automatic control valves, manual valves, gate valves, and ball valves are to be installed in the approximate locations indicated on the drawings.

B. Valve shall be installed in shrub areas whenever possible.

C. Install all valves as indicated on the drawings.

D. Valves to be installed in valve boxes shall be installed one valve per box.

3.8 VALVE BOXES

A. Valve boxes shall be installed in shrub areas whenever possible.

B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

3.9 BASKET STRAINER

A. Install basket strainer unit.

B. Install basket strainer at location approved in the field and at height required by local codes.

3.10 SPRINKLER HEADS

A. Sprinkler heads shall be installed as indicated on the drawings.

B. Spacing of heads shall not exceed maximum indicated on the drawings.

C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

D. Pop-up sprinkler heads shall not be installed using side outlet openings.

3.11 DRIP IRRIGATION

A. Provide sample layout for one complete drip valve control zone, including all components, dripline and/or emitter spacing and wire staples, for review and approval by Landscape Architect.

B. Thoroughly flush all driplines and distribution tubing prior to installing drip emitters, air relief valves, flush valves and similar components.

C. All drip irrigation shall be installed prior to installation of plant material.

3.12 MISCELLANEOUS EQUIPMENT

A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

B. Quick coupler valves shall be set approximately 12 inches from walks, curbs, header boards, or paved areas where applicable.

C. Unless designed as an integral part of the irrigation head, anti-drain valves will be installed under every head. The anti-drain valve will be the same diameter as the riser and be integral to the riser assembly.

D. Install rain sensors as indicated on the drawings and as recommended by the manufacturer.

3.13 FLUSHING THE SYSTEM

A. Prior to installation of sprinkler nozzles, the valves shall be opened and a full head of water used to flush out the lines and risers.

B. Sprinkler nozzles shall be installed after flushing the system has been completed.

3.14 ADJUSTING THE SYSTEM

A. Contractor shall adjust valves, align heads, and check coverage of each system prior to coverage test.

B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.

C. Automatic control valves are to be adjusted so that the sprinkler heads operate at the pressure recommended by the manufacturer.

3.15 TESTING AND OBSERVATION

A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and/or governing agencies.

B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.

C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.

D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed when it is obviously inadequate, without bringing this to the attention of the Landscape Architect.

E. Final inspection will not commence without completed record drawings as prepared by the Irrigation Contractor.

3.16 MAINTENANCE

During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

3.17 COMPLETION CLEANING

Clean-up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION

SECTION 02920

SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:

1. Section 02230 Site Clearing for topsoil stripping and stockpiling.

1.2 DEFINITIONS

A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

B. Imported Soil: Soil that is transported to Project site for use.

C. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

F. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

G. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

H. USCC: U.S. Composting Council.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Regional Materials: Imported soil, manufactured planting soil, and soil amendments and fertilizers shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 PLANTING SOILS SPECIFIED BY COMPOSITION

A. Planting Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil.

B. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil.

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Bermuda grass, poison oak, nutsedge, Canada thistle, bindweed, bentgrass, ground ivy, perennial sorrel, and bromegrass.

2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
3. Unacceptable Properties: Clean soil of the following:

    a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
    c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.

4. Amended Soil Composition: Blend imported, unamended soil with the soil amendments and fertilizers in the quantities as recommended in the soils report to produce planting soil.

C. Planting-Soil Type: Manufactured soil consisting of manufacturer's basic topsoil blended in a manufacturing facility with sand, stabilized organic soil amendments, and other materials to produce viable planting soil.

1. Additional Properties of Manufacturer's Basic Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
2. Unacceptable Properties: Manufactured soil shall not contain the following:

    a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
    b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 5 percent by dry weight of the manufactured soil.
    c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.

3. Blend manufacturer's basic soil with soil amendments and fertilizers in the quantities as recommended by the soils report to produce planting soil.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.

2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
3. Form: Provide lime in form of ground mollusk shells.

B. Sulfur: Granular, biodegradable, and containing a minimum of 99 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Agricultural Gypsum: Minimum 98 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.4 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: Limited to leaves.
2. Reaction: pH of 6.0 to 7.5.
3. Salinity: Ensure that saturation extract conductivity does not exceed 3.5 millimohs per centimeter at 25 degrees c. as determined by saturation extract method.
4. Moisture Content: 35 to 55 percent by weight.
5. Organic-Matter Content: 30 to 40 percent of dry weight.
6. Particle Size: 95 to 100 percent passing through a 6.33 mm standard sieve; 80 to 100 percent passing through a 2.33 mm sieve.
7. Iron Content: Minimum 0.08 percent dilute acid soluble Fe on dry weight basis.
8. Ash: 0 to 6 percent dry weight.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of dS/m.

C. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.5 FERTILIZER

A. Planting Fertilizer: Pelleted or granular form consisting of the following percents by weight and mixed by commercial fertilizer supplier: 6-nitrogen, 20-phosphoric acid, 20-potash.

B. Planting Tablets: Provide slow-release type with potential acidity of not more than 5 percent by weight containing the following percents by weight of nutrients listed: 20-nitrogen, 10-phosphoric acid, 5-potash, 2.6 combined calcium, 1.60 combined sulphur, 0.35-iron elemental from ferrous sulfate. Provide in 21 gram tablets manufactured by Agriform or other approved.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements of the Agronomic Soils Report recommendations.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2 BLENDING PLANTING SOIL IN PLACE

A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 12 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

C. Soil Fracturing: Landscape areas where compaction has occurred due to grading activities and where trees or storm water infiltration areas are located shall be loosened by soil fracturing. For trees a 12’x12’x18” deep area; for storm water infiltration, the entire area shall be loosened. The back hoe method of soil fracturing shall be used to break up compaction. A 4” layer of compost is spread over the soil surface before fracturing is begun. The back hoe shall dig into the soil lifting and then drop the soil immediately back into the hole. The bucket then moves to the adjacent soil and repeats. The compost falls into the spaces between the soil chunks created. Fracturing shall leave the soil surface quite rough with large soil clods. These must be broken by additional tilling. Tilling in more compost to the surface after fracturing per the soil report will help create an A horizon soil. Imported or reused topsoil can be added on top of the fractured soil as needed for grading. The Landscape Architect or

representative shall be present during this process and provide certification of the soil fracturing.

D. Retain option in "Mixing" Paragraph below if applying compost component of planting-soil mix to surface and lightly tilling in lieu of blending compost throughout planting-soil mix.

E. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.

1. Mix sulfur with dry soil before mixing fertilizer.
2. Mix fertilizer with planting soil no more than seven days before planting.

F. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.

G. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PROTECTION AND CLEANING

A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

SECTION 02951

PALM TREES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Palm trees.
2. Pruning.
3. Removals, backfill.
4. Maintenance.

B. Related Sections:

1. Planting Irrigation
2. Plants

1.2 QUALITY ASSURANCE

A. Source Quality Control:

1. Submit documentation to Architect at least 60 days prior to planting that all plant materials are available. Contractor is responsible for all palm tree materials listed on plant list. Substitutions due to unavailability must be requested in writing prior to confirmation of ordering. All materials are subject to inspection by Landscape Architect at any time after confirmation of ordering.
2. Plants are subject to observation and approval by Architect at place of growth.

1.3 GUARANTEE

A. Newly planted palm trees shall be guaranteed against any and all poor, inadequate, or inferior plant materials and workmanship for two years following planting and acceptance by Owner. Contractor is to review the on-going maintenance during this two-year period including watering and de-watering and is to notify owner and Landscape Architect in writing of any problems.

B. During the guarantee period, any material found dead or not in a satisfactory growth condition shall be removed from the site.

C. These trees and disturbed improvements shall be replaced at no added expense to the Owner, with the same variety and size as originally designated. Palms and all disturbed areas shall be guaranteed for two years from time of planting and re-planting to the satisfaction of the Owner.

D. Contractor is to notify Landscape Architect and Owner in writing when the two-year guarantee period is completed.

1.4 OBSERVATIONS AND PERMITS

A. Observation

1. Notify Owner's representative minimum of 72 hours in advance of observations to schedule required inspections.
2. All palms are to be inspected by a palm expert for disease prior to their preparation for removal from growing site. Contact, schedule and pay for this inspection at no extra cost to the Owner. The inspection will take place from ground level with field glasses. If disease is suspected, provide a man lift for closer inspection at no extra cost to the Owner.
3. The palm expert shall be approved in advance by Owner's authorized representative.
4. All palms will be observed by the Landscape Architect for height, girth, and overall form in meeting design intent. Said observation and approval does not constitute a review of the palm's health, vigor, and required health-free state, for which the Contractor is solely responsible.
5. The Landscape Architect may opt to either visit the tree nursery or review photographs submitted by the Contractor. In either case visit the nursery and select trees conforming to specification prior to review by the Landscape Architect.

6. Observations are as follows:

Observation	Palm Tree Expert	Owners Representative
Observation of trees at source	X	
Observation of planting locations on site prior to digging pits		X
Observations of palm on site prior to planting for verification of conformance to plans and specifications		X
Observation of condition of equipment and typical planting operations (1st planted palm)		X
Pre-maintenance observation		X
Observation at end of maintenance period		X

B. Permits

1. Provide all necessary permits at no additional costs to Owner.

1.5 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS

A. Exercise extreme care in excavating planting or working near existing utilities or irrigation systems.

B. Be responsible for damages to utilities which are caused by work operations or neglect.

C. Check utility drawings and as-built plans for utility and irrigation locations.

D. Replace all plant materials disturbed by excavation or planting. Plant-pit area where palm tree will be replaced will not require replanting. After tree is in place, blend planting of groundcover or turf with existing.

1.6 JOB CONDITIONS

A. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

B. Do not plant palm between October 31 and April 1, unless the approved palm expert provides
written recommendation to do so and unless this recommendation is approved in advance
by the Owner.

1.7 SAMPLES AND TESTS

A. Architect reserves the right to take and analyze samples of materials for conformity to specifications at any reasonable time.

B. Provide samples upon request by Architect.

C. Rejected materials shall be immediately removed from the site at Contractor's expense.

D. Cost of testing of materials not meeting specifications shall be paid by Contractor.

PART 2 - PRODUCTS

2.1 PALM TREE DESIGN STANDARDS

A. All palm trees are to be of uniform quality and appearance, matching representative sample approved by Architect.

B. Trunk condition shall be free of any scarring or blemishes. Contractor to clean trunk and form pineapple per specifications.

C. Brown trunk height shall be per drawings.

D. Trunk diameter per heights stipulated in the drawings shall not vary more than 25 percent.

2.2 PALM BACKFILL SOIL

Backfill mix shall consist of washed concrete sand, and silt plus clay content of this soil shall not exceed 20% by weight with a minimum 95% passing the 2.0 millimeter sieve. The sodium absorption ratio (SAR) shall not exceed 6 and the electrical conductivity (ECE) of the saturation extract of this soil shall not exceed 3.0 millimhos per centimeter at 25 centigrade. The Boron content of this sand shall be no greater than 1 pm as measured on the saturation extract. In order to insure conformance, submit samples of the import sand to the soil laboratory for analysis prior to backfilling and submit report to Owner's representative.

2.3 FERTILIZER

A. After 14 days, then monthly, spray the frond (foliar drench) with the following mixture. No compound should exceed its recommended rate. The following rates are for a 100 gallon gank mix:

1. Kocide* 101 w.p. (3/4 lb.) or Manzate** - 1 quart / 100 gallons
2. W.R. Grace's Minor – Gro (1/2 cup).
3. Hydrated urea (5 cups or 2-1/2 pounds)
4. Spreader Sticker – 8 oz. "Basic H"
5. 1 pound Benlate / 100 gallons of water
6. Option: Add a general insecticide to prevent insect larva infestation. (We have dropped

The insecticide in our mix due to the increased environmental and health risks).
All rates are recommendations only. Do not exceed label directions. Be sure to follow
all label instructions.

B. Fertilizer will not be used at time of planting. After four weeks, use a light application of "Wood Ace Palm Special" available from W.D. Young (619/347-7906) approximately 6 pounds. nitrogen per tree, lightly cultivated into the soil.

PART 3 - EXECUTION

3.1 PALM TREE SOURCE AND PREPARATION FOR PLANTING

A. Obtain source of palms for inspection and approval by palm tree expert and Landscape Architect.

B. Submit documentation and permits (if required) that the source of palm trees is approved. Obtain palms from an approved source and replace or repair damage from palm tree removal.

C. Palms collected for planting shall be grown under climatic conditions similar to those in locality of project.

D. Palms shall be inspected by the palm tree expert to include health, de-fronding, tying and palm removal. Any palms rendered unsuitable for planting because of this inspection shall not be used. Reinspection of suitable palms will be at the Contractor's expense.

E. All palms must be tagged, inspected and approved by the palm tree expert and by the Architect for planting prior to shipment and installation.

F. De-fronding and Tying:

1. In preparing palm trees for relocation, all dead fronds shall be removed and the entire
trunk diamond cut clean to the height of green fronds. Care shall be taken to prevent injury to the trunk of the tree. Green fronds below a horizontal position shall be neatly cut off leaving a 4-inch stub.

2. All remaining fronds above horizontal shall be lifted up and tied together around the crown in an upright position. Due caution shall be taken not to bind or injure the crown. A lightweight rope or cord not less than 1/4 inch in diameter shall be used in tying up the fronds; wire will not be permitted. After tying, the tips of the fronds shall be hedged off above the crown approximately 1/3 to 1/2 of the frond length. De-fronding and tying work shall be completed prior to digging the rootball. Submit documentation that palms have been reviewed by the palm tree expert and that they are disease free.

G. Digging the Rootball:

1. When digging out the rootball, no excavation shall be done closer than 24 inches to the trunk at ground level and the excavation shall extend below the major root system to a minimum depth of 6 feet. The bottom of the rootball shall be cut off square and perpendicular to the trunk below the major root system. Under no conditions shall the Contractor cut down the size of the rootball in width or depth.
2. The Contractor shall not freefall, drag, roll, or abuse the tree or put a strain on the crown at any time. A protective device shall be used around the trunk of the tree while lifting and relocating so as not to scar or skin the trunk in any way. This device shall consist of either a rubber of leather sling made out of timbers sufficiently sized to withstand cable/choker pressure. At no time will trees be balled out and laid on the ground with rootball left exposed to direct sunlight and air. The rootball shall be stockpiled for replanting.
3. Palms shall not be stockpiled for replanting.

3.2 PLANTING OF PALMS

A. Excavation for planting shall include the stripping and stacking of all acceptable topsoil encountered within the areas to be excavated for the tree holes.

B. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.

C. Protect all areas from excessive compacting when trucking plants or other materials to the planting site.

D. Center palm in pit or trench; align with other palms.

E. Set palm plumb and hold rigidly in position until sand has been watered in around roots. The sand needs to be washed into voids around roots to achieve a good interface.

F. All excavated holes shall have vertical sides with roughened surfaces and shall be of a size that is twice the diameter and 24 inch minimum to 4 foot maximum deeper in the ground than the palms originally stood.

G. Root-growth stimulant shall be applied when the backfilling is between 1/2 to 2/3 up the rootball. Application rate shall be one ounce of “Basic H” and 2 tablespoons of “Stem” in a 5-gallon bucket of water. Stimulant shall be poured full strength equally distributed around the rootball, and watered in thoroughly.

3.3 CLEANUP

Following planting work, all remaining excavation shall be backfilled and compacted in accordance with the requirements of the Architect. Burying of debris in holes will not be permitted. All excess soil and debris from the relocation work shall be disposed of off the site by the Contractor. This site shall be left neat and clean to the satisfaction of the Owner.

3.4 MAINTENANCE

A. Be responsible for maintenance and guarantee of all installed new palms and existing palms to the satisfaction of the Owner.

1. Maintenance will include, spraying to control or prevent disease and weekly water
   Management to include soil probing and maintenance of sump clean-out pipe and palm tree pruning.
2. Pruning shall be done with reciprocal saws (chain saws will not be allowed).
3. Saw blades will be sterilized between each tree with 50 percent household bleach and 50 percent water for five minutes.
4. Pruning will be done to maintain a neat appearance as approved by the Architect.
5. Proposed pruning schedule is to be submitted to the Architect for approval.

B. The spring after planting, loosen but do not fully remove rope around fronds. Fully remove rope at end of summer, 60 days after planting.

END OF SECTION

SECTION 03100

FORMS

PART 1 - GENERAL

1.01 DESCRIPTION: Provide forms for all Work constructed of cast-in-place concrete as indicated, specified, and required.

A. Related Work Not In This Section:

1. Furnishing and placing reinforcing for cast-in-place concrete.
2. Furnishing, placing, finishing, and curing of cast-in-place concrete.
3. Placing of embedded anchor bolts and inserts.
4. Screeds for slabs.

1.02 QUALITY ASSURANCE: Construct forms conforming to the tolerances specified in ACI 301, "Specifications for Structural Concrete for Buildings", as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.

A. Accomplish shoring and reshoring design, false work, sequence, erecting and removal so that construction loads do not exceed design loads.

B. Construction loads exceeding basis of design loading, consisting of superimposed dead load plus specified live load, shall not be supported on unshored portions of the structure.

C. The Contractor shall be responsible for the adequacy of all work. The Contractor shall provide adequate and safe support, bracing shoring, reshoring and stabilize all concrete forms. The Contractor shall comply with all requirements of the Division of Industrial Safety, State of California.

D. Contractor shall be responsible for the accuracy of all formwork so that the end result of formed surfaces produces surface finishes conforming to reference standards.

E. Design Intent:

1. Finished architectural concrete surfaces shall be uniform in color and texture when viewed from distance of 3 feet, as approved by the Architect.
2. Concrete edges shall be sharp and undamaged.
3. No form joints will be permitted between reveal strips shown on the drawings.

F. 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 formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

1.03 REFERENCE STANDARDS

A. **California Building Code** (CBC), 2022 Edition, Section 1808.8.5.

B. **American Concrete Institute:**

1. ACI 117 “Standard Tolerances for Concrete Construction and Materials.
2. ACI 347 “Recommended Practice for Concrete Formwork.”
3. ACI 318 “Building Code Requirements for Structural Concrete”

C. **American** Plywood Association (APA).

D. **U. S. Department of Commerce**, PS-1-current edition U.S. Product Standard for Construction and industrial Plywood.

E. **West Coast Lumber** Inspection Bureau (WCLIB).

1.04 SUBMITTALS:

A. **Shop Drawings**: Submit Shop Drawings showing form pattern layouts of all exposed exterior and interior concrete dimensioned to precisely locate grooves, form panel jointing, and similar features. Review and approval will not include form strength and adequacy.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING: Deliver materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish materials conforming to the following requirements:

Form lumber:	WCLIB "Construction" grade or better, WWPA No. 1 or better, or equal.
Form plywood:	PS 1-current edition, Group I, Exterior B-B Plyform or better, minimum 5-ply and 5/8" thickness, grade marked, not mill oiled. Plywood having medium or high density overlay is acceptable.
Form ties:	Prefabricated rod, flat band, wire, or internally threaded disconnecting type, not leaving metal within -1/2" of concrete surface.
Form coating:	Resin type coating free of oil, silicone, wax, and non-drying material, not grain-raising.

2.02 FORM-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 number of joints.

1. Lumber for formwork: WCLIB “Construction” grade or better, Douglas Fir WWPA No. 1 or better.
2. Lumber for rough carpentry: Standard common, Douglas Fir.

3. Forms:
   a. 5-ply plywood, 3/4" thick minimum, high (HDO), medium (MDO) density overlay finish, moisture resistant, WPA "Plywood", except any thickness may be used when used as a liner for board formwork.
   b. Provide smooth overlay finished plywood forms for all exposed concrete surfaces, except where otherwise specified for beams and girders. Similar to "Multi-Pour HDO", by Simpson Timber Co. or equal.
   c. Medium Density Overlay Plywood (MDO) – (Soffit deck forms only) "B" face, "C" back, "C" inner plies, 100% Douglas Fir, exterior glue. Overlay 64#/MSF phenolic impregnated paper with 35% resin content and meet Structural 1 Specification for U.S. Product Standard PS 1-09.
   d. High Density Overlay Plywood (HDO) (Wall, column, beam, girder and soffit): "B" face, "C" back, "C" inner plies, 100% Douglas Fir, exterior glue. Overlay: 100/30 HDO consisting of minimum of 1 layer of 64#/MSF MCO phenolic paper overlaid with 1 layer of HDO 100#.msf phenolic paper on the face and 1 layer of 30#/MSF HDO phenolic paper on back and meet Structural 1 Specification per U.S. Product Standard PS 1-09.
   e. Coated Form Plywood (HDPE): Plastic overlaid plywood factory coated with a form coating release agent is acceptable in lieu of the HDO plywood specified above. Product -'Dura-Pour' or equivalent - as manufactured Sylvan Industries Inc. (800) 842-1990
   f. Metal, or other approved panel materials.
4. Forms for Beams: Only steel or aluminum forms shall be used except for transfer girders where HDO plywood may be used.
5. Tempered Hardboard: Conform to F.S. LLL-H-35.

B. Chamfer Strips:

1. "CSF" Type - Burke Concrete Accessories, Inc.,
2. Poly-Comp' ¾" x ¾" corner strip chamfer - Sylvan Industries Inc. (800) 842-1990.
3. Or equivalent.

C. Stripping Gaskets: Resilient, rectangular material, non-absorbent and non-staining at junctions of formwork as required to permit their removal without damage to concrete surfaces and demonstrated successfully on the sample panel.

D. Styrofoam: Closed cell polystyrene foam. Install in locations and thickness as shown on the Drawings or where required.

E. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2. Steel and Aluminum Forms: Provide a non-staining, 100% virgin based V.O.C. compliant oil (vegetable oils) or fatty acids for the reactive break mixed with either mineral oil or (highly refined petroleum hydrocarbon) mineral spirits, as the carrier. No waxes, silicones, diesel distillates, or carcinogens allowed. "Crete-Lease 727-VOC" by Cresset Chemical Co. Inc. or equivalent.
3. Wood Forms: Water-based dissipating resinous, non-staining, non-silicone, non-petroleum, non-grain raising, free of fuel oils, kerosene, waxes or resins, non-residual clear coating commercial formulation compatible with concrete hardener, concrete sealer, integral color sealants, other finishes specified or applied over concrete, and as acceptable by the Architect. The releasing agent shall not adversely affect the bonding of plaster, paint, waterproofing or other materials applied to the concrete or affect the natural concrete finish/color. Apply per manufacturer's printed instructions.
   a. "Formshield" by A.C. Horn, Inc.
   b. "Release" by Burke Concrete Accessories.
   c. "Cast-off" by Sonneborn Building Products.
   d. "Rich Cote E " By Richmond.
   e. "Debond" by L&M Construction Chemicals.
   f. "Chemical Form Release" by Nox-Crete Chemicals.
   g. Or equivalent.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish adjustable prefabricated rod, flatband, wire, internally threaded disconnection, type that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface. Ties shall be equipped with a plastic cone of not less than five-eighths inch (5/8") diameter and one inch (1") long which will completely cover hole and prevent leakage of mortar.
3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

G. Through Joints (Typical Non-Metallic Expansion at grade): Preformed expansion joint fillers of type, size and thickness required or noted on Drawings. Materials shall be of such character as not to be deformed or broken by ordinary handling when exposed to atmospheric conditions. Pieces of the joint filler which have damage shall be rejected.

1. Fiber expansion joint fillers conforming to ASTM D1751.
2. Flexible isomeric polymer foam expansion joint filler, ASTM D1752 Modified, vinyl and polyethylene foams are acceptable. Ceramar by W. R. Meadows or equal, joint filler and back-up material for use in either horizontal vertical applications. Approved for joints in sidewalks, driveways and slabs on grade.
3. Sealant materials in accordance with Section 07920, Joint Sealants.

H. **Reglets:** 24 gage galvanized steel for concealed locations and 0.020 in. stainless steel for exposed locations, by Fry Reglets Corp., Pittcom, or equivalent.

I. **Pipe sleeves** shall be galvanized iron or steel.

PART 3 - EXECUTION

3.01 FORM ERECTION AND REMOVAL: Conform to ACI 301 and ACI 347 "Recommended Practice for Concrete Formwork" except as exceeded by requirements of Code, regulatory agencies, or herein.

A. **Construction**: Coat forms with the specified resin coating, not form oil. Construct forms to exact shapes, sizes, lines, and dimensions required to obtain level and plumb and straight surfaces. Provide openings, offsets, keys, anchorages, recesses, reglets, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, location and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing of concrete. Coordinate installation of inserts in forms according to Shop Drawings and instructions of other trades.

B. **Camber**: Place suitable jacks, wedges, or similar means to induce camber and to correct settlement in forms before or during concrete placing. Induce camber of 1/8" per 10-feet of span plus 1/4" for beams except post-tensioned beams or post-tensioned slabs, and 1/8" per 10-feet of span plus 1/8" for slabs other than 2-way slabs. For 2-way slabs see plans for required camber.

C. **Reglets and Rebates**: Form all required reglets and rebates to receive flashing, frames, and other equipment. Obtain dimensions, details, and precise positions from related trades and form concrete accordingly.

D. **Recesses, Drips, and Profiles**: Provide smooth milled wood or preformed rubber or plastic shapes of types shown and required.

E. **Re-Use**: Clean and recondition form material before re-use.

F. **Shoring for Tributary Loads**: Set temporary shoring for steel beams supporting cast-in-place concrete slabs. Such shoring is not required where the beams are partially or totally encased with concrete nor for steel beams supporting walls resting on the beams.

3.02 EMBEDDED PIPING AND ROUGH HARDWARE: Consult with trades needing openings for passage of pipes, conduits, ducts, and other inserts. Necessary pipe sleeves, anchors, or other required inserts shall be accurately installed by respective trades so as to not reduce the strength of concrete. No aluminum material shall be placed in concrete.

A. **Conduits or Pipes**: Do not place conduits or pipes in the plane of slabs or walls.

B. **Sleeves**: Pipe Sleeves may pass though slabs or walls if not exposed to rusting

or other deterioration and are of uncoated or galvanized iron or steel. Provide sleeves of diameter large enough to pass any hub or coupling on the pipe, including any insulation.

3.03 MISCELLANEOUS CONCRETE WORK: Provide forms for concrete areaways, cast-in-place valve boxes, pits, bases, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.04 FIELD QUALITY CONTROL:

A. **Supervision**: Perform Work of this Section under the supervision of a capable concrete form superintendent.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide reinforcing steel complete.

A. Work In This Section: Principal items include:

1. Reinforcing bars and mesh for cast-in-place concrete.
2. Furnish & deliver to site steel bar reinforcing for masonry.

B. Related Work Not In This Section:

1. Installation of reinforcing bars in masonry.

1.02 QUALITY ASSURANCE:

A. Source Quality Control: Sampling and testing of reinforcing steel is not required.

B. Identified Bars: Bars shall be delivered from the mill, identified as to the heat number, accompanied by the mill analyses and mill test reports, and properly tagged with Identification .

1.04 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit including complete layouts, sections, and details for congested conditions, typical bending diagrams and offsets, splice lengths and locations, proposed layout where vertical and horizontal bars intersect, and where welding is proposed, detailed to conform to AWS and Code requirements.

B. Codes: 2022 C.B.C. Building Codes and latest Supplements thereto.

C. Standards: (As Applicable)

1. ACI-301 - Specifications for Structural Concrete for Buildings.
2. ACI-315 - Details and Detailing of Concrete Reinforcement.
3. ACI-318 - Building Code Requirements for Reinforced Concrete.
4. ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
5. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
6. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
7. ASTM A615 - Deformed and plain Billet-Steel Bars for Concrete Reinforcement.
8. ASTM A706 - Low-Alloy Steel deformed bars for Concrete Reinforcement.
9. AWS.D1.4 - Structural Welding Code Reinforcing Steel.
10. CRSI - Manual of Practice.
11. CRSI-10th Edition - Recommended Practice for Placing Reinforcing Bars.

12. CRSI-10th Edition - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING: Deliver materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish materials meeting the test requirements of Paragraph "Source Quality Control" hereinbefore, as applicable, and following requirements:

Reinforcing bars:	ASTM A615, Grade 60.
Reinforcing bars to be welded:	ASTM A706.
Reinforcing mesh:	ASTM A185, mesh size and gage as indicated, 60 ksi minimum tensile strength.
Tie wire:	Annealed steel, 16 gage minimum.
Welding electrodes:	AWS D5.1, 80 of 90 Series, low hydrogen Type AWS D1.4.

2.02 FABRICATION OF REINFORCING BARS:

A. **Bending and Forming**: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Maintain tolerances as noted in ACI Detailing Manual SP-66 (20) and or CRSI Manual of Standard Practice. Do not heat reinforcement for bending. Bars with unscheduled kinks or bends are subject to rejection. Use only tested and approved bar materials.

B. **Welding**: Perform welding where shown or approved, by the direct electric arc process in accordance with AWS D1.4. Do not tack weld bars. Clean metal surfaces to be welded of all loose scale and foreign material. Cut out welds or parts of welds found defective with chisel and replace with proper welding. Employ only experienced certified welding operators. Prequalification of welds shall be in accordance with Code. Reinforcing bars to be welded shall be ASTM A706, Grade 60 rebar.

C. **Marking and Shipping**: Bundle bars, tag with identification and transport and store so as not to damage any material. Keep a sufficient supply or tested and approved bars at site to avoid delays.

PART 3 - EXECUTION

3.01 INSTALLATION OF REINFORCING: Provide additional bars at sleeves and openings as required. Before placing bars, and again before concrete is placed, clean bars of loose mill scale, oil, or other coating that might destroy or reduce bond.

A. **Securing in Place**: Accurately place bars and wire tie in precise position where bars cross. Bend ends of wire ties away from forms. Wire tie bars to corners of ties and stirrups. Support bars according to current edition of "Recommended Practice for Placing Bar Supports" of the Concrete Reinforcing Steel Institute, using approved accessories and chairs. Use precast concrete cubes with

embedded wire ties to support reinforcing steel bars in concrete placed on grade and in footings.

B. **Exposed Surfaces**: Provide stainless steel or plastic tipped chairs, bolsters, and accessories where exposed on exterior or interior concrete surfaces not to be painted or covered.

C. **Clearances**: Maintain minimum clear distances between reinforcing bars and face of concrete as indicated or directed. Maintain $1.0d_b$ or 1" clear between bars in layers and $1.5d_b$ or 1 1/2" clear between main bars of columns.

D. **Splices**: Do not splice bars at points of maximum stress except where indicated. Lap splices as shown or required to develop the full strength or stress of bars. Splices in walls, slabs, and footings shall be staggered at least 4'-0" and shall be placed such that not more than one-third of the bars in a later are spliced at any one location. Splices to be in contact.

E. **Field Welding of Bars**: As specified for fabrication.

F. **Maintaining Bars In Position**: Assign a competent ironworker mechanic at every concrete placing location to inspect reinforcement and maintain all bars in the correct positions.

G. **Reinforcing Mesh**: Lap two full mesh spaces at splices, wire tie, and support the same as specified for bars.

3.02 MISCELLANEOUS CONCRETE WORK: Provide reinforcing for areaways, cast-in-place valve boxes, pits, splash blocks, bases, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.03 FIELD QUALITY CONTROL: Refer to Section 01400.

A. **Supervision**: Perform Work of this Section under the supervision of a capable superintendent.

B. **Inspection**: Obtain inspection and approval of reinforcing before concrete is placed.

C. **Welding Inspection**: Whether welding is done in the shop or at the site, perform welding of reinforcing bars under inspection of the Testing Laboratory Welding Inspector.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide all Work constructed of cast-in-place concrete complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Furnishing, placing, patching, and initial curing of cast-in-place concrete unless otherwise specified.
2. Vapor barrier.
3. Site concrete.
4. Off-site concrete and miscellaneous concrete work.
5. Grout and drypack work, except as otherwise specified.
6. Placing of embedded anchor bolts and inserts.

B. Related Work Not In This Section:

1. Preparation and grading of earth subgrade under concrete.
2. Furnishing, erection, and removal of forms.
3. Furnishing and placing reinforcing for cast-in-place concrete and grouting of masonry.
4. Final finishing and curing of cast-in-place concrete.
5. Gravel fill under interior floor slabs.

1.02 QUALITY ASSURANCE:

A. Concrete Manufacturer: Furnish all concrete from licensed commercial ready-mix concrete plants conforming to ASTM C94 and approved by Building Official. The requirements herein govern when exceeding ASTM C94.

B. Allowable Tolerances: Construct concrete conforming to tolerances specified in ACI 301, "Specifications for Structural Concrete for Buildings", as applicable, unless exceeded by requirements of regulatory agencies or otherwise indicated or specified.

C. Source Quality Control: Refer to Section 01400 for general testing requirements and to following paragraphs for specific procedures. Concrete materials which, by previous tests or actual service, have shown conformance may be used without testing when approved by Architect and Building Official. Testing Laboratory shall perform following conformance testing.

1. Portland Cement: Furnish Mill Certificates, acceptable to the Architect and Building Official, showing conformance with requirements specified; otherwise the Testing Laboratory shall test each 250 barrels of cement in accordance with ASTM C150.
2. Aggregate For Normal Weight Concrete: Test the aggregate before and after concrete mix is designed and whenever character of aggregate varies or source of material is changed. Include a sieve analysis. Obtain samples of aggregates at source of supply or at the

ready-mix concrete plant in accordance with ASTM D75 and perform tests for the following properties:

Sieve analysis:	ASTM C136.
Organic impurities:	ASTM C40, fine aggregate color not darker than the reference standard color.
Soundness:	ASTM C88, loss after 5 cycles not over % of coarse aggregate or 10% of fine aggregate.
Abrasion:	ASTM C131, weight loss not more than 10-1/2% after 100 revolutions, 42% after 500 revolutions.
Aggregate:	ASTM C33.
Materials finer than No. 200 sieve:	ASTM C117, not over 1% for gravel, 1.5% for crushed aggregate, per ASTM C33.
Reactivity potential:	ASTM C227, C289, and C342, ratio of silica released to reduction in alkalinity not to exceed 1.0; include full report for Architect's evaluation.
Sand equivalent:	ASTM D2419, California Sand Equivalent values not below 80 percent.

1.03 CONCRETE MIX DESIGNS: Testing Laboratory shall design, seal, and sign concrete mixes for all concrete. Contractor shall bear all costs for concrete mix designs.

A. **Strength Requirements**: Design mixes for structural concrete for minimum 28-day compressive strengths required by Drawings and Specifications. The trial batch strength for each mix shall exceed indicated or specified strength by 750 psi or a lesser amount based on standard deviations of strength test records according to ACI 318. Refer to Section 01400 for requirements pertaining to costs of mix design.

B. **Basis of Mix Designs**: Design concrete mixes for workability and durability of concrete. Control mixes in accordance with Chapter 4, ACI 318 "Building Code Requirements for Reinforced Concrete". Make adjustments in cement content as necessary for required concrete strengths at the Contractor's or sub-contractor's expense. Do not exceed water-cement or cement plus fly ash ratio by weight as indicated on the drawings.

C. **Admixtures**: Admixtures shall be used for workability and/or water reduction. The admix may contain an air-entraining agent producing air content of 3.5% to 6.5% by volume and adjusted for weather conditions. All mixes shall contain a polymer based water reducing admixture. Do not use admixtures containing chloride ions.

D. **Maximum Aggregate Sizes**: Not exceeding 3/4 of minimum clear space between bars and between bars and forms, no larger than 1/5 of least dimensions between the forms. Design the mixes with 3/4" maximum size, except maximum 1-1/2" size may be used for foundations. Concrete mix designs shall contain a blend of sand, fine, and coarse aggregate; “pea-gravel” mixes shall not be used except where specifically approved by the Structural Engineer.

E. Test for Structural Concrete:

1. Special Inspection: Testing Laboratory will take test specimens and inspect placing of all reinforced concrete which is required to have a structural design compressive strength in excess of 2,500 psi.
2. Mix Design: Submit mix design for each class of concrete to Independent Testing and Inspection Agency and to Architect for review prior to commencement of Work.
3. Field Certifications: For all concrete, provide signed copy of batch plant's certificate stating quantity of each material, amount of water, admixtures, departure time and date accompanying each load of materials or concrete. Deliver certificates to Owner.
4. Site Inspections and Tests of Concrete: Perform tests in accordance with requirements of California Building Code (CBC), Section 1705.3 and ACI 318, Chapter 5. Refer to Section 01 45 00 - Quality Control.
   a) Concrete placement inspection: California Building Code (CBC) Section 1705.3.
   b) Strength tests of concrete: Compressive strength tests, according to California Building Code (CBC) Section 1705.3 and ACI 318 Chapter 5.
   c) Cement and Aggregates Testing: Field tests of cement and aggregates may be performed to ensure conformance with specified requirements.
5. Batch Plant Testing and Certification: By Testing Laboratory, continuous batch plant inspection shall be performed for transit-mixed concrete.
6. Compressive Strength Tests: Comply with ASTM C 31 - Method of Making and Curing Concrete Test Specimens in the Field.
   a) Take four test cylinders for each 150 cubic yards, or take not less than once for each 5,000 sf of surface area of slabs or walls or fraction thereof, for each grade of concrete placed, with minimum of one test for each day's placement of each grade of concrete placed.
   b) Test one cylinder at 7 days and two at 28 days after placement.
   c) Maintain fourth cylinder to be tested only if other tests fail to meet strength requirement.
   d) Take one additional test cylinder during cold weather and hot weather concreting and cure it at job site under same conditions as concrete it represents.
   e) Test cold weather and hot weather cylinder at 28 days.
7. Floor Slab Moisture Testing and Mitigation: As specified in applicable flooring Section in Division 09 - Finishes.
8. Additional Testing: Perform additional tests and analyses as required due to defective concrete, when directed and in accordance with provisions of the General Conditions of the Contract.

1.04 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit the following items:

1. Slab and Beam Construction Joint Plan. Submit Shop Drawings showing dimensioned locations and types of construction details and expansion joints.

2. Product Data. Submit manufacturer's technical data for products, methods and control procedures. Submit applicable Building Department approved reports for proposed materials and methods.

B. Samples: Refer to Section 03345.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING: Deliver materials in timely manner to ensure uninterrupted progress. Store materials by methods that prevent damage and permit ready access for inspection and identification.

1.06 JOB CONDITIONS: Do not place concrete during rain or adverse weather conditions without means to prevent any damage. Conform to ACI 305 "Recommended Practice for Hot Weather Concreting" and ACI 306 "Recommended practice for Cold Weather Concreting" as required except do not use calcium chloride or accelerators.

1.07 Warranty for Vapor Barrier: Warrant materials for (Life) against manufacturing defects, when installed in accordance with manufacturer instructions.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish materials meeting the test requirements of Paragraph "Source Quality Control" hereinbefore, as applicable, and following requirements:

Portland cement:	ASTM C150, Type as indicated on the structural drawings, low alkali. Do not change brand without prior approval.
White Portland cement:	ASTM C150, Type I, from one approved source. Use for integrally-colored concrete.
Stone aggregates:	ASTM C33, from approved pits, free from vegetable matter and of opaline, feldspar, and siliceous magnesium substances; clean, hard, fine-grained sound crushed rock or washed gravel; not over 5% by weight of flat, thin, elongated, friable or laminated pieces (pieces having the major dimension over 5 times average dimension) or over 2% by weight of shale or cherty material.
Lightweight aggregates:	ASTM C330. Submit for approval to Architect, expanded shale product; coarse aggregate, dry loose weight minimum 38 pounds per cubic foot and maximum 9/16" size; fine aggregate, dry loose weight of 62 to 66 pounds per cubic foot, uniformly graded from #8 to #0 sizes; all aggregates vacuum or thermally fully saturated for pumped concrete.
Admixture:	ASTM C494, All material shall be non-corrosive and have chloride content not exceeding water: Type A - Water-reducing. Type C - Water-reducing, accelerator. Type D - Water-reducing, retarded. Type F or G - High range water reducing, optional subject to approval of Structural Engineer.
Pozzolan:	ASTM C618, Class F Fly Ash.

Air-entraining admix:	ASTM C260.
Water:	From potable domestic source.
Joint filler:	ASTM D1751 and D1752, as specified.
Curing compound:	ASTM C309, fugitive dye dissipating type.
Curing sheet:	ASTM C171, non-staining white types.
Evaporation retardant and finishing aid:	Master Builders "Confilm", or equal.
Vapor barrier:	Provide Stego Wrap vapor barrier, (877) 464-7834, conforming to ASTM E 96 and ASTM E 1745, 15 mil thickness, install in accordance with manufacturers specifications, provide 6” laps with minimum 2" wide waterproof plastic tape, self-adhering type, seal all penetrations in accordance with manufacturer’s recommendations. Refer to Section 03310 for requirements.
Surface retarder:	L.M. Scofield "Lithotex Retarder", Sika Type S or B "Rugasol", Chem-Masters "Exposee H", or equal.
Color admix:	L.M. Scofield Co., "Chromix", "Colorfull Concrete Color" by Admixtures, Inc., Irwindale, Calif., both standard and retarder types as required for field placing conditions, or prior approved equal.
Non-shrink grout:	Master Builders "Embeco" 636 885, or equal, non-gas-forming type, free of oxidizing catalysts and inorganic accelerators, performance characteristics when mixed to fluid consistency meeting CRD-611 and CRD-631, non-staining type in exposed areas.
Bonding and Repair:	1. Bonding material shall be a polyvinyl acetate compound for use in areas not subject to moisture. 2. Epoxy adhesive shall be a two-part compound suitable for wet or dry areas. 3. Patching mortar shall be free-flowing, polymer-modified cementious coating. 4. Bonding admixture shall be a latex, non-wettable type.

2.02 CONCRETE MIXING: Furnish ready-mixed concrete from an approved commercial offsite plant. Conform to ASTM C94, except materials, testing, and mix designs as specified herein. Use transit mixer trucks equipped with automatic devices for recording number of revolutions of drum.

A. **Limitation of Mix Water**: Do not deliver ready-mixed concrete to site with total amount of mixing water included. Withhold 2-1/2 gallons of water per cubic yard at the plant unless a lesser amount is approved by the Structural Engineer, then add to mix before concrete is discharged from the mixer truck under supervision of Inspector. Each mixer truck shall arrive at the site with full water tank; if the tank is not full and concrete tests to a slump greater than specified, entire load is subject to rejection.

B. **Slump**: Adjust quantity of water so concrete at time of placing does not exceed the slumps indicated on the Drawings at discharge from the truck when tested according to ASTM C143. Use the minimum water necessary for workability required by part of structure being cast. The maximum slumps shall not be exceeded unless approved by the Structural Engineer. No more than 90

minutes shall have elapsed between concrete batching and concrete placement. Concrete exceeding this time limit shall be rejected.

PART 3 - EXECUTION

3.01 PREPARATION FOR CONCRETE PLACING: Remove free water from forms before concrete is deposited. Remove hardened concrete, debris, and all foreign materials from forms and from surfaces of mixing and conveying equipment.

A. **Wetting**: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain concrete workability.

B. **Earth Subgrade**: Lightly dampen subgrade 2 hours before placing concrete but do not muddy. Re-roll where necessary for smoothness and remove loose material.

C. **Gravel Fill**: Recompact disturbed gravel and bring to correct elevation.

D. **Vapor Barrier**: Install under interior floor slabs on grade as shown on drawings. Lap all joints 6" in the direction of concrete spreading and tape seal. Seal the joints at walls and around penetrations with tape.

E. **Screeds**: Set screeds at all walls and maximum 8-foot centers between. Set to provide level floor. Check with an instrument level, transit, or laser during placing operation to maintain level floor.

F. **Screeds Over Vapor Barrier**: Use weighted pad or cradle type screeds and do not drive stakes through vapor barrier. Check with instrument level, transit, or laser.

3.02 CONCRETE PLACING:

A. **Joints In Concrete**: Locate joints only where designated on drawing. Obtain prior approval for points of stoppage of any pour. Clean and roughen surface of construction joints by removing entire surface and exposing 1/4" of clean aggregate solidly embedded in mortar matrix by sandblasting, chipping, or equal. Water and keep hardened concrete wet for not less than 24 hours before placing new concrete. Cover horizontal surfaces of existing or previously placed and hardened concrete with fresh concrete less 50% of coarse aggregate just before balance of concrete is placed. Carefully control amount of moisture applied so that no free water will be present at any time.

B. **Conveying and Placing**: Do not place concrete until reinforcing steel, forms, or metal decking have been approved by the Inspector and other authorities having jurisdiction. Do not use aluminum tubes or any aluminum equipment for pumping concrete, nor allow concrete to free fall from its point of release at mixer, hoppers, tremies, or conveying equipment more than 6 feet for concealed concrete and 3 feet for exposed concrete. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one portion to another. Place concrete in horizontal layers not more than 18" thick within 45 minutes after water is first added to the batch. Place concrete by methods that prevent segregation of materials. For special exposed concrete do

not use first batch of concrete at each start up.

C. **Vertical Elements**: Stop placement of concrete in walls and columns 1 1/2" bottom of beams or supported slabs. Stop placement at sills and heads of wall openings in same manner. Allow concrete to be in place at least 2 hours and/or until vertical shrinkage has ceased before placing concrete for floor framing.

D. **Consolidation**: Vibrate each layer of concrete as placed with mechanical vibrators or equivalent equipment to accomplish thorough consolidation where required. Supplement by hand rodding or spading adjacent to forms. Do not vibrate forms. Compact concrete into corners and angles of forms and around reinforcement and embedded fixtures. Recompact deep sections with heavy congestion due to reinforcing steel.

E. **Operation of Vibrators**: Do not transport concrete in forms with vibrators nor allow vibrators to contact forms or reinforcing. Push vibrators vertically into preceding layers that are still plastic and slowly withdraw, producing maximum obtainable density in concrete without creating voids or segregation. Under no circumstances disturb concrete that has stiffened or partially set. Vibrate at intervals not exceeding two-thirds the effective visible vibration diameter of the submerged vibrator and generally at 18" on centers. Avoid excessive vibration and conform to ACI 309 "Recommended Practice For Consolidation of Concrete".

F. **Re-Vibration**: Place concrete containing retarding admixture by a schedule that allows layers of concrete to be in place and compacted for at least 30 minutes before the next layer of concrete is placed. Remove bleed water on the concrete surface and from forms and re-vibrate the concrete down as far as the concrete is plastic before placing the next layer.

G. **Correction of Segregation**: Before placing next layer of concrete, and at top of last placement for vertical elements, remove concrete containing excess water or fine aggregate or showing deficiency of coarse aggregate and fill the space with compacted concrete of correct proportions.

H. **Slabs**: Strike off excess concrete by screeding to bring top surface to proper grade. The screed template should be removed across the concrete in a sawing manner as it is brought forward. Use a darby or bull-float after the screed operation, to eliminate high and low spots. Compact and tamp concrete, and bring 1/8" to 3/16" of coarse mortar to surface. Wood float to straightedges and screeds after water sheen has disappeared. Do not use steel or plastic floats of any kind for initial floating operations. Do not apply finishes until all surface water disappears and surface is sufficiently hardened. Remove bleed water and laitance as it appears. Section 03345 covers final slab finishing curing.

1. On Grade Slab Areas: Place with maximum 40-foot edge dimension. Generally locate slab joints along column lines and at re-entrant corners. Exact locations to be determined by Contractor.
2. On Grade Slab Construction with Contraction Joints: Power saw cut the same day as the concrete pour, as soon as concrete has attained its initial set with ¼” max width by slab thickness divided by 4 or 1” minimum

depth. Conform to approved submittal.

3. Expansion Joints: Conform to details and the approved submittal. Provide expansion joint filled finished flush with slab surface except for those joints shown to be sealed with sealant. Conform to Section 07900 where sealant sealed joints are shown or specified, including the polymer joint filler or backing.

3.03 CURING FORMED CONCRETE: Keep forms containing concrete in a wet condition until removed. Keep concrete continuously moist for at least 7 days after placement, unless other methods submitted to Engineer and/or Architect are approved in writing. Keep concrete moist with a fine fog water spray until protected by curing media. During times of dry or excessive winds, high ambient temperature, low humidity, or other conditions causing rapid drying, use specified evaporation retardant and finishing aid material in accordance with manufacturer's instructions and cure concrete with a fine fog spray of water, or equal, applied both during and after finishing and continued until final curing operations are started. Use water curing method, curing sheet material, or a clear liquid membrane forming curing compound except as otherwise specified. Do not use any type of finishing or curing materials or methods that interfere with the correct application, color, texture, or bonding of subsequent materials; verify exact requirements with all applicable trades.

3.04 PATCHING FORMED CONCRETE: Remove fins, projections, and offsets. Where rock pockets, honeycomb, and other defects to sound concrete occur, notify Structural Engineer with proposed method for correcting prior to proceeding. Saturate form tie holes with water and fill all voids and patches with flush smooth-finished mortar of same mix as concrete (less coarse aggregate), cure, and dry.

3.05 GROUTING AND DRYPACKING: Install as indicated or required except for the items grouted by other trades.

A. **Mixing**: Mix the approved non-shrink grout material with sufficient water per manufacturers recommendations, so it flows under its own weight for grout, and to just moisten and bind the material together for drypack.

B. **Placing and Curing**: Place drypack by forcing and rodding to fill all voids and provide complete bearing under plates. Place fluid grout from one side only and puddle, chain, or pump for complete filling of voids; do not remove the dams or forms until grout attains initial set. Finish exposed surfaces smooth and cure with damp burlap at least 3 days.

3.06 SITE CONCRETE WORK: Use bituminous type joint filler. Cure all concrete for at least 10 days with liquid curing compound or sheet material except as otherwise specified. Construct all site concrete of 2,500 psi concrete unless otherwise indicated or specified. Provide reinforcing bars or mesh only where indicated.

A. **Concrete Curbs**: Provide 1/2" thick expansion joints at beginning and at end of curves, intersections, and 20-foot intervals between, set plumb, square, and to same profile as the curbs. Edge curb tops to 1/2" radius and vertical joints to 1/4" radius. Apply smooth finish followed by fine hair brush finish.

B. **Concrete Gutters**: Provide 1/2" thick expansion joints as above for curbs and apply a light broom finish with a 3" wide steel trowel finish at flow line.

C. **Combination Curb and Gutter**: As above for curbs and gutters including expansion joints, 3" troweled flow line at base of curb.

D. **Concrete Walks**: Provide 1/2" expansion joints as specified for curbs and where walks abut rigid structures, aligned with joints in curbs where adjoining, an apply a light broom finish perpendicular to traffic direction. Provide scoring as shown or directed.

E. **Control Joints**: Provide for concrete walks, patio slabs as detailed and exterior concrete pavement as indicated. Provide "Zip Strip" distributed by S.C.A., or equal. Install tops of the joints flush with the concrete surface and depth of joint a minimum of 1/4 the thickness of slab.

3.07 OFF-SITE CONCRETE WORK: Provide new concrete items where indicated, and replace existing items damaged by Contractor's operations. Secure and pay for required permits, inspections, engineering, and surveying.

3.08 MISCELLANEOUS CONCRETE WORK: Provide areaways, cast-in-place valve boxes, pits, splash blocks, bases, and other miscellaneous concrete as shown and required to complete all Work. Conform to applicable requirements herein.

3.09 FIELD QUALITY CONTROL: Refer to Section 01400.

A. **Supervision**: Perform Work of this Section under the supervision of a capable concrete superintendent.

B. **Level of Floors**: Continuously monitor concrete placing operations to maintain level floor by use of an instrument level, transit, or laser. All concrete tolerances shall conform to those established by ACI 117 as follows:

1. Floor finish tolerance (section 4.5.7) - measured by placing a freestanding, unleveled 10 foot straightedge anywhere on the slab and allowing it to rest upon two high spots within 72 hours after slab concrete placement. The gap at any point between the straightedge and the floor (and between high spots) shall not exceed 3/16".
2. Level alignment of top of slabs (section 4.3.1) – the location relative to the specified datum elevation shall not be more than +/- 3/4".

C. **Continuous Inspection**: Construct all structural concrete of strength exceeding 2,500 psi under continuous inspection of an Inspector. Obtain inspection and approval of forms and reinforcing by Building Department as required and by the Inspector before placing structural concrete.

D. **Testing of Concrete**: Testing Laboratory shall perform following tests:

1. Compressive Strength Tests: Cast one set of three or more test cylinders from each day's concrete placing and each 150 cubic yards, or take not less than once for each 5,000 sf of surface area of slabs or walls or fraction thereof, for each grade of concrete placed, with minimum of one test for each day's placement of each grade of concrete placed. Date test cylinders, number, and tag showing the location from which sample was

taken. Indicate slump test result of each sample. Do not make more than two series of tests from any one location or batch of concrete.
Test one cylinder at 7 days and two at 28 days after placement. If fourth cylinder is cast, test only if other tests fail to meet strength requirement. Take one additional test cylinder during cold weather and hot weather concreting and cure it at job site under same conditions as concrete it represents. Test cold weather and hot weather cylinder at 28 days.

2. Test Cylinders: Cast according to ASTM C31; 24 hours later, store cylinders under moist curing conditions at about 70°F. Test according to ASTM C39; one cylinder at 7 and two cylinders 28 day ages.
3. Control Test Cylinders: Cast a set of two or more cylinders for each day's placing of concrete for slabs supported on shoring. Place on slabs represented by cylinders and cure same as slabs. Test cylinders to determine proper times for removal of shores and reshoring.

E. **Core Tests**: Should tests show the strength of any concrete falls below required minimum, additional testing of concrete which unsatisfactory tests represent may be required. Make core tests according to ASTM C42. Fill the core holes with drypack concrete of strength required for concrete. Contractor shall bear cost of tests for below-strength concrete even if such tests indicate concrete has attained required minimum compressive strength.

3.10 DEFECTIVE CONCRETE

A. **Defective Concrete:** The following concrete will be deemed to be defective, and shall be removed promptly from the job site.

1. Concrete which is not formed as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades and levels.
2. Has voids or honeycomb that have been cut, resurfaced, or filled, unless acceptable to the Architect.
3. Has exposed reinforcement or inadequate cover over reinforcement.
4. Has sawdust, shavings, wood, or embedded debris.
5. Has moisture vapor emissions at level exceeding acceptable criteria.
6. Does not conform fully to requirements of the Contract Documents.

B. **Repairs and Replacements:**

1. Defective concrete may be removed and repaired with pneumatically-placed concrete (shotcrete) or other acceptable methods, when and as directed by the Architect (Structural Engineer).
2. Where defective concrete is found after removal of the forms, remove the defective concrete, if necessary, and make the surfaces match adjacent surfaces.
3. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.
4. Removal of defective concrete shall be performed in such a manner so as to leave all reinforcement in place and undamaged.

C. **Floor Slab Moisture Mitigation:** As specified in applicable flooring Section in Division 9 - Finishes.

3.11 FLOOR AND SLAB CURING AND FINISHING SCHEDULE

Location	Finishing	Curing and Sealing
Interior floors to remain exposed, in service areas and equipment rooms and in Art Center spaces.	Trowel and burnish finish; F_F45-F_L35 SOV (Specified Overall Value) / F_F30-F_L25 MLV (Minimum Local Value).	Moist cure only; do not use curing compound. After curing is completed, clean floor with suitable cleaning agents and apply concrete hardening and sealing compound.
Interior concrete floors to receive adhesively-applied floor covering.	Smooth trowel finish; F_F45-F_L35 SOV (Specified Overall Value) / F_F30-F_L25 MLV (Minimum Local Value).	Moist cure only; do not use curing compound. After curing is completed, clean floor with suitable cleaning agents to dustfree condition, leaving surface suitable for adhesive application of finish floor coverings. Verify moisture vapor transmission rate.
Interior floor slabs, to be covered by direct (thinset or medium setting bed) application of ceramic, porcelain and quarry tile.	Smooth trowel finish with light broom texture; F_F35- F_L25 SOV / F_F24-F_L16 MLV.	Moist cure only. Do not apply sealer or hardener.
Concrete slabs on grade to receive color stain finish and remain exposed.	Burnished trowel finish; F_F35-F_L25 SOV / F_F24-F_L16 MLV.	Apply curing compound recommended by color stain manufacturer. After curing is completed, clean concrete floor with specified color concrete cleaner, leaving surface suitable for color stain application. Apply color stain according to manufacturer's instructions and recommendations. After stain has set, neutralize and clean floor and apply specified sealer. Match appearance of accepted mock-up.
Exterior slabs (not paving).	Trowel finish with medium broom texture, F_F20-F_L15 SOV, sloped to drain.	Moist cure only; do not use curing compound. After curing, clean concrete and apply concrete hardening and sealing compound.

END OF SECTION

SECTION 03310

UNDER-SLAB VAPOR BARRIER/RETARDER

PART 1 – GENERAL

1.01 SUMMARY

A. Products supplied under this section:

1. Vapor barrier, seam tape, and mastic for installation under concrete slabs.
2. All accessories required for a proper installation.

B. Related sections:

1. Section 02200 Site Preparation and Earthwork
2. Section 03300 Cast-in-Place Concrete

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
2. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.
3. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
4. ASTM F 1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
5. ASTM E 1643 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

B. American Concrete Institute (ACI):

1. ACI 302.2R Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.03 SUBMITTALS

A. Quality control/assurance:

1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
2. Manufacturer’s samples, literature.
3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS: Equivalent products of other manufacturers, including W.R. Meadows, polyolefin film or Permalon –Division of Reef Industries, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

2.02 MATERIALS

A. Vapor barrier must have all of the following qualities:

1. Permeance as tested before and after mandatory conditioning (ASTM E 1745 Section 7.1 and sub-paragraphs 7.1.1 - 7.1.5): less than 0.01 Perms [grains/(ft^2 · hr · inHg)].
2. Other performance criteria:
   a. Strength: ASTM E 1745 Class A.
   b. Thickness: Minimum of 15 mils thickness.

B. Vapor barrier products:

1. Specified Manufacturer: Stego Wrap Vapor Barrier (15-mil) by Stego Industries, (877) 464-7834 www.stegoindustries.com.
2. W.R. Meadows, polyolefin film, (15-mil)
3. Permalon –Division of Reef Industries, (15-mil)
4. Or approved equal, refer to section 01600 for Substitutions

2.03 ACCESSORIES: Or equal by W.R. Meadows

A. Seam tape:

1. Stego Tape by Stego Industries LLC, (877) 464-7834, www.stegoindustries.com.

B. Vapor-proofing mastic:

1. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

C. Perimeter/edge seal:

1. Stego Term Bar by Stego Industries LLC, (887)464-7834 www.stegoindustries.com.

D. Pipe Boots: Field fabricated from vapor retarder sheet material and pressure-sensitive adhesive tape, according to manufacturer's instructions.

1. Stego Term Bar by Stego Industries LLC, (887)464-7834 www.stegoindustries.com.

PART 3 – EXECUTION

3.01 PREPARATION

A. Underslab Vapor Retarder Installation: Comply with manufacturer's instructions and recommendations for vapor retarder membrane installation, recommendations of geotechnical report - Geotechnical Data and ASTM E 1643.

1. Place sheets directly over prepared aggregate base, without damaging sheeting, lapping premolded membrane according to manufacturer's instructions (minimum of 6-inches at sides and ends).
2. Place membrane sheets continuous between footings or foundation walls, without voids.
3. Turn up membrane sheets for full thickness of slab on grade, along face of perimeter footings or foundation walls, and bond with adhesive mastic. Apply adhesive to both surfaces, allow approximately 10 minutes to set up and then press together smoothly and evenly, without gaps or fishmouths, for full contact bond.

3.02 INSTALLATION

A. **Install vapor barrier in** accordance with manufacturer’s instructions and ASTM E 1643.

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
2. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
3. Seal vapor barrier to slab perimeter/edge using Stego Term Bar or similar.
4. Overlap joints 6 inches and seal with manufacturer’s tape.
5. Seal all penetrations (including pipes) per manufacturer’s instructions.
7. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
8. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

B. Penetration Seals: Comply with manufacturer's standard details and custom instructions to suit conditions of the Work.

1. Fit fabricated membrane boots around reinforcing, structure framing, pipe and conduit penetrations and make positive seal according to manufacturer's instructions and recommendations. Seal boot in place to sheet membrane.

END OF SECTION

SECTION 03345

CONCRETE FINISHING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Perform and provide all concrete finishing required to complete the Work, except for concrete finishing specified to be performed under other Sections.

A. Work In This Section: Principal items include:

1. Samples and submittals.
2. Finishing of exposed formed concrete.
3. Final slab finishing and curing.
4. Concrete stair finish.

B. Related Work Not In This Section:

1. Furnishing, erection, and removal of forms.
2. Furnishing, placing, patching, and initial curing of cast-in-place concrete unless otherwise specified.
3. Polished stained concrete finish as specified in Section 03352.
3. Coordinate with Landscape drawings for site concrete colors and finishes. Provide color and finish to Building concrete matching site concrete when surfaces abut unless indicated otherwise.

1.02 QUALITY ASSURANCE: As specified in Section 03300.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: Submit for the following:

1. Curing-sealer-hardener.

B. Site Samples: Prepare following Samples at the site, cast in the directed locations and orientations. Prepare as many Samples of each type of concrete as are required for approval. Remove Samples from the site when no longer needed and removal is approved. Approved Samples may be part of permanent construction if meeting all other requirements shown and specified and are so approved. Use form and concrete materials previously approved under Section 03100 and 03300.

1. Slab Samples: Prepare minimum 4-foot square Samples of each required slab finish excluding only monolithic trowel and steel float finishes. Include a transverse expansion joint, scoring, and edging.

C. Slab Scoring Plan: Submit proposed slab scoring plan for Architect's approval prior to pouring the slab.

PART 2 - PRODUCTS

2.01 MATERIALS: Furnish materials conforming to Section 03300, as applicable and following requirements:

Curing-sealer-hardener:	Ashford Formula by Curecrete Chemical Company, Inc. distributed by BMSA inc. (949) 233-2127 or UniSeal by Unitex (816) 231-7700 or approved equal, applied and warranted as specified herein.

PART 3 - EXECUTION

3.01 SLAB FINISHES: Produce finish slab surfaces level or sloped as shown with maximum deviation of 1/8" from a 10-foot straightedges. Keep surface moist with a fine fog spray of water as necessary. Dusting with dry cement or sand during finishing operations is not permitted. Finish all slab edges and joints with an edging tool. Match the approved Sample panels. Apply the following finishes as indicated, specified, directed, and applicable.

A. **Rough Slab Finish**: After initial set, coarse broom the slab surface and expose coarse aggregate. Apply on slabs to receive deferred mortar setting beds or cementitious toppings or slabs.

B. **Monolithic Trowel Finish**: For slab and flatwork surfaces not indicated or specified to receive another finish. After surface water disappears and floated surfaces are adequately hardened, steel trowel and retrowel concrete to a smooth surface. After concrete has set sufficiently to ring the steel trowel, retrowel to a smooth uniform finish free of trowel marks and blemishes. Avoid excessive retroweling that produces burnished areas.

C. **Steel Float Finish**: Same as for monolithic trowel finish except omit the second retroweling. Apply on following areas and surfaces:

1. Resilient floor covering areas.
2. Carpeted areas.
3. Thin-set tile areas.
4. Slabs to receive polished stained concrete floor finish.
5. Slabs to receive athletic wood flooring system.

D. **Swirl Non-Slip (Sweat Trowel) Finish**: Same as for monolithic steel trowel finish less second retroweling. When ready, produce non-slip finish by circular motion and slight lifting of trowel, done in regular pattern. At walking areas, apply smooth finish 1" wide at all edges, expansion joints, and scoring. Apply on following surfaces:

1. Exterior vehicle traffic slabs.
2. Exterior concrete walks.
3. Other slabs where specified or directed.

E. **Medium Broom Finish**: Prepare same as steel float finish, and then apply a uniform approved medium broom finish as approved by Architect, by sliding a wire or stiff bristle broom in one direction along a straightedge guide placed at right angles to the direction of traffic. At walking areas, apply smooth finish 3" wide at edges, expansion joints and scoring.

F. **Scoring**: Provide scoring pattern layout for Architect's approval or where shown or directed, using tool of approved size and profile. Run score lines straight and of uniform appearance. If scoring is not indicated, obtain Architect's instructions not less than two working days before the day slab concrete is placed.

3.02 SLAB CURING: Promptly apply curing media as soon as finishing is complete without marring surfaces and in any case on same day. Apply liquid compound in accordance with the manufacturer's published application rates; apply 2 spray coats, with second coat at right angle to first coat. Cover adjoining surfaces. Equip spray nozzles with wind-shield suitable for wind conditions.

A. **Curing Period and Protection**: Maintain all curing media intact and sealed for 10 days minimum after application. Keep foot traffic on the curing surfaces to minimum possible and completely off liquid compound cured surfaces; vehicular traffic is not permitted on the surfaces until curing is completed. Immediately restore all damaged or defective curing media.

B. **Restriction**: Do not apply liquid membrane-forming curing compounds on any concrete to receive or bond to concrete or mortar, or on any surfaces to receive subsequent material or finish unless such use and the specific compound used are approved by manufacturer of the material or finish to be applied, and verify all such use with related trades. Do not apply curing compounds on slabs to receive elastomeric or bituminous type coatings.

C. **Liquid Membrane-Forming Curing Compound**: Use on exterior slabs and paving but subject to above restriction. Do not use on interior slabs.

D. **Sheet Curing**: Use the specified curing sheet material. Seal all laps and edges with plastic pressure-sensitive tape, and immediately repair tears during the curing period. Verify that surfaces remain damp for the full curing period; if necessary, lift sheet, wet surfaces with clean water, then replace and reseal the sheeting. Use on surfaces where curing compound is not permitted.

E. **Water Curing**: Option to either liquid membrane-forming curing compound or sheet curing method. Keep concrete continuously wet for entire curing period.

F. **Curing Compound**:

1. General: Employ material manufacturer's authorized applicator. Issue manufacturer's 20-year material and 10-year labor warranty to Owner. Use either one application of Ashford Formula, applied immediately following slab finishing as curing agent, or one coat of "UniSeal". Apply on following surfaces:
   a. Exterior concrete walking slabs.
   b. Exterior vehicle traffic slabs.

2. Option: Curing compound may be used to cure interior slabs to receive resilient floor covering or carpet, subject to requirements of Paragraph "Restriction" above, and to cure all other exterior slabs and paving. Materials may be applied by Contractor's personnel and the warranty is not required.

3.03 CONCRETE STAIR FINISH: Slope stair treads 1/8" from base of the risers to the nosings. Run nosings straight and level to rigid templates. Form risers as indicated or directed, and apply burnished steel trowel finish. On landings and treads, apply broom finish across stair run and cure all concrete stair surfaces. Provide 2” contrasting color warning strip 1” maximum from edge of noising of each exterior stair and top and bottom noising only on interior stairs.

END OF SECTION

SECTION 03352

POLISHED/STAINED CONCRETE FLOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes decorative, interior slab with the following:

1. Polished stained concrete with aggregate.
2. Hardener and sealer.
3. Grinding to expose aggregate.
4. Polishing.
5. This Section supplements the provisions of Section 03300 and 03345. All other requirements of Section 03300 govern the work of this Section.

B. Related work:

1. Division 3 for naturally colored concrete, and for all other concrete finishing.
2. Division 9 for concrete sealer on typical exposed concrete slabs.

1.02 REFERENCES

A. American Society for Testing and Materials:

1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
2. ASTM G23-81, Ultraviolet Light & Water Spray.
3. ASTM C805, Impact Strength.

B. American Concrete Institute: ACI 302 1R-89, Guide for Concrete Floor and Slab Construction.

C. Other test: Reflectivity.

1.03 SUBMITTALS

A. Data:

1. Manufacturer's specifications and test data.
2. Data describing product to be provided, giving manufacturer's name and product name for the specified material proposed to be used.

B. Samples:

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1. Submit 12-inch square by one-inch thick concrete samples of floor finish applied to stained concrete with ground aggregate, and polished as specified.

C. **Certificates**: Prior to beginning the work of this section, submit a letter from the sealer/hardener/ polish manufacturer verifying its acceptance of the substrates as satisfactory to receive this work.

D. **Manufacturer's instructions**: Submit manufacturer-prepared instructions concerning the proper surface preparation and finishing.

E. **Qualification statements**: Submit a letter from the manufacturer verifying its acceptance of the concrete floor finish applicator.

1.04 QUALITY ASSURANCE

A. **Applicator's qualification**: A firm certified or approved in writing by the coating manufacturer using manufacturer-recommended methods and equipment.

B. **Manufacturer's inspections**:

1. Obtain materials only from manufacturer who will send a qualified technical representative to the Project site before start of this work to verify substrate acceptability, and as required thereafter to review installation procedures and completed work, and to issue warranty specified.
2. Repair unsatisfactory conditions disclosed by the manufacturer's visits to the site.
3. Do not begin or resume work until after reinspection of affected areas by the manufacturer.

C. **Mockup**:

1. Provide at the Project site a mockup of the ground/polished stained concrete slab for the Architect's review and approval.
2. Provide mockup in size and with features selected by the Architect, or as indicated on the Drawings, but in no case less than 4 feet square.
3. Test concrete floor coating and concrete sealer to determine which product will produce results acceptable to Architect.
4. Modify mockup or remove and construct additional mockup(s) as necessary to achieve results satisfactory to the Architect.

D. **Regulatory requirements**: Coefficient of friction of finished polished concrete floor system shall be not less than 0.6 for level surfaces and 0.8 for ramps when tested in compliance with ASTM C 1028 (field test) or ASTM D 2047 (laboratory test).

1.05 HANDLING

A. **Delivery**: Deliver materials to project site in original unopened containers, clearly labeled with manufacturer's labels intact, legible and indicating manufacturer's name, brand, type, expiration date and grade.

B. **Storage**: Keep containers tightly closed and stored away from direct sunlight, combustible materials and sources of heat.

C. **Handling**:

1. Handle products to avoid damage to container and contamination.
2. Inventory should be rotated. Do not use products whose shelf life has expired.

1.06 PROJECT CONDITIONS

A. **Environmental requirements**: Comply with manufacturer’s instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance of the finished topping slab.

B. **Project conditions**:

1. Cure concrete a minimum of 45 days, or at a time recommended by the coatings manufacturer, before application of sealer/hardener/polish, and grinding, and finish complete and uninhibited concrete slab 10 days prior to installation of equipment and Substantial Completion.
2. Prevent petroleum staining of slabs to be treated as specified. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from concrete surfaces.
   a. To avoid undesirable staining of the concrete, hydraulic powered equipment used on slabs to be treated as specified must be diapered.
   b. To avoid rust stain, do not place steel on slabs to be treated as specified.
   c. Do not use pipe cutting machines on the slabs to be treated as specified.
   d. Do not park vehicles on the slabs to be treated as specified. If parking on slabs becomes necessary, provide and maintain waterproof drop cloths under vehicles at all times.
3. Close areas to traffic during and after application for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.01 MANUFACTURER/PRODUCTS

A. **Concrete**: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

B. Stain/Coloring pigments:

1. Stain/Color admixture: Stain as selected by Architect
2. Other acceptable manufacturers include the following, provided stain and textures are match to approved samples to the Architect's satisfaction:
   a. LM Scofield Co.
   b. Colorful Admixtures, Inc.
   c. Davis Colors.
   d. Tamms Industries.
3. Verify stain/pigment compatibility with other admixtures used with the other concrete ingredients.
4. Pigmented Micro Stains: Fine pigment particles ($<3.9 \times 10^{-4}$ inches) suspended in

C. Aggregates: Match Architect's sample for sizes and approved samples.

D. Concrete hardener/polish: This product shall not affect the stain that will be applied to the concrete surfaces. If "Retro Plate 99" by Advanced Floor Products is acceptable by the stain manufacturer of not provide an approved equal.

2.02 CONCRETE MIX DESIGN/TESTING

A. Comply with requirements of applicable Division 3 Sections for concrete mix design, sampling and testing, and quality control and as herein specified.

B. Design mix to produce normal-weight concrete consisting of Portland cement, aggregate, water- reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture and water to produce the following properties:

1. Compressive strength: 3000 psi, minimum at 28 days, unless otherwise indicated.
2. Slump limits: 8-inch minimum for concrete containing high-range water-reducing admixture (superplasticizer); 3-inch for other concrete.
3. Air content: 5 percent.

C. Stain/Color Additives: Mix in accordance with manufacturer's instructions. Mix until stain/color additives shall be uniformly dispersed throughout mixture and disintegrating bags, if used, have disintegrated.

D. Do not retemper mix by adding water in field.

E. Rate of stain/color additive shall not exceed 10 percent of weight of cementitious materials in mix, unless required to obtain required stain floor finish as approved by the Architect.

2.03 SOURCE QUALITY CONTROL

A. **Assure batch-to-batch uniformity** with good concrete mix control. The weight of cement must be accurate.

1. When pigments are batched from bags, use a whole number of bags per truck.
2. When more than one truckload of concrete is required, use the same size truck for all loads.
3. Schedule delivery of concrete to provide consistent mix time from batching until discharge.

PART 3 - EXECUTION

3.01 EXAMINATION/PREPARATION

A. **Placing concrete**:

1. Examine surfaces to receive concrete. Correct unsuitable conditions before proceeding further.
2. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.
3. Locate, place and support reinforcement as specified in Division 3 Sections, unless otherwise indicated.
4. Place concrete by methods that prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator.
5. Keep vibrator away from joint assemblies, reinforcement, or side forms.
6. Use only square-faced shovels for hand-spreading and consolidation.
7. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
8. Deposit and spread concrete in a continuous operation between transverse joints as far as possible. If interrupted for more than 1/2 hour, place a construction joint.
9. Place and finish concrete to be 1/8 in. above completed elevation.
10. Cover stained concrete surfaces with 5/8” thick plywood during construction to protect surfaces prior to completion of the stain and grinding process.

B. **Finishing concrete**:

1. Hand seed additional aggregate to provide uniform finish. Embed aggregate into concrete with a bull float.
2. Burnish concrete with steel trowel to provide a dense surface.
3. Sawcut control joints at locations shown on Drawings.
4. Wet cure concrete for a minimum of 7 days. Cover concrete with concrete curing blanket, Transguard by Reef Industries or equal.
5. Install backer rod and sealants in all expansion joints and control joints as specified in Section 07900, no sooner than 50 days after installation of concrete.

C. Grinding and polishing concrete:

1. Verify that surfaces to be ground, coated and polished are clean, dry and free of dust, dirt, oil, grease and other foreign material which would affect the application and finishing work.
2. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.
3. Protect adjacent surfaces from staining and damage by masking, covering them with impermeable coverings securely taped in place, or other appropriate form of protection, as required.
4. Test application:
   a. Before performing the work of this section, including bulk purchase and delivery of products, prepare a small application in an unobtrusive location and in a manner approved by Architect to demonstrate the final effect (visual, physical, and chemical) of planned application.
   b. Proceed with work only after Architect’s review of test application.
5. Surface preparation: Clean surfaces to be polished of foreign debris, and prepare surface for stabilizer in compliance with the polishing manufacturer's instructions. Fill all holes, cracks, sawcuts or expansion joints with sealant matching colored concrete prior to grinding slab.
6. Start floor finish applications in presence of manufacturer's technical representative. All grinding and polishing to be completed prior to installation of walls.
7. Grinding and polishing: To be coordinated with Architect.
   a. Grinder concrete floor with a six-grit, metal bonded diamond abrasive disk. Use initial 16 grit first, then reduce to 25, 40, 80 and complete with a 150 grit disk.
   b. The overall depth of grinding will be approximately 1/8 in. plus or minus to achieve the specified finished floor elevation.
   c. Once the finish floor elevation is reached, the polished process will continue using 100 and 200 grit resin bonded diamond abrasive disks along with the application of Retro-Plate 99 densifier.
   d. Polishing will continue using 400 and 800 grit polishing wheels, finishing with a 3,000 grit disk to match the mock-up that was approved by the Architect.
   e. When the finish matches the mock-up, apply Retro Plate per the manufacturer’s recommendations and polish using a high speed, propane powered walk behind polisher.
8. Dispense hardener/sealer/polish material from factory numbered and sealed containers.
   Maintain record of container numbers.
   a. Apply materials using recommended methods and equipment.
   b. Do not exceed the application rate recommended by the manufacturer.
9. Polishing shall be done a minimum of 10 days prior to installation of equipment and Substantial Completion.

3.02 CLEANING

A. **The premises shall** be kept clean and free of debris at all times.

B. **Remove spatter** from adjoining surfaces, as necessary.

C. **Repair damages** to surface caused by cleaning operations.

D. **Remove debris** from jobsite.

E. **Dispose of materials in** separate, closed containers in accordance with local regulations.

3.03 PROTECTION

A. **Protect finished work** with 1/4 in. thick plywood in walkways. Do not allow traffic in unprotected surfaces.

END OF SECTION

SECTION 04220

REINFORCED CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Concrete** unit masonry.

B. **Mortar** and grout.

C. **Reinforcement** for masonry.

1.02 RELATED SECTIONS

A. **Section 03200 - Reinforcing Steel**: Steel reinforcement for masonry.

B. **Section 05090 - Anchors and Fasteners**: Non-shrink grout for baseplate and equipment anchoring.

C. **Section 07900 – Calking and Sealants**: Control joint backing and sealants.

D. **Section 09900 - Field Painting**: Finish applied to exposed, interior concrete unit masonry.

1.03 REFERENCES

A. **The Masonry Society (TMS)** TMS-402 - Building Code Requirements for Masonry Structures

B. **Concrete Masonry Association of California and Nevada (CMACN)** - Typical Details for Concrete Masonry.

1.04 DEFINITIONS

A. **High-Lift Grouting**: Grouting method as developed for use in reinforced concrete unit masonry is intended for use on wall construction where openings, block pattern arrangements, special reinforcing steel, or embedded structural steel details do not prevent the free flow of grout or inhibit the use of mechanical vibration to properly consolidate the grout fill in all cells or horizontal grout spaces. Horizontal reinforcing should be positioned in a single vertical plane at each curtain of steel to allow maximum accessibility to the cell spaces.

B. **Pour: "Pour" is considered** as the entire height of grout fill placed in one day and is composed of a number of successively placed grout lifts.

C. **Lift: A "lift" is the** layer of grout placed in a single continuous operation.

1.05 SUBMITTALS

A. **Product Data**: List of materials and manufacturer's catalog data for proprietary products.

B. **Shop Drawings**: Large scale wall elevations with reinforcing layout.

1. Include composite masonry wall penetration drawings, indicating size and location of each wall penetration and opening as necessary by all affected trades.
2. Submit penetration elevations along with corresponding reinforcing steel shop drawings and steel embedment drawings.
3. Include proposed control joint locations. Provide control joints at maximum 30'-0" on center.

C. **Manufacturer's Instructions**: Cleaning of masonry containing liquid polymeric admixture.

D. **Certificates of Conformance**: Submit manufacturer's certificates for concrete unit masonry and cement.

E. **LEED Compliance Submittals**: Indicate source, address, quantity and recycled content of all concrete masonry components, including masonry units, mortar and grout.

1.06 QUALITY ASSURANCE

A. **Regulatory Requirements**: Comply with applicable requirements of California Building Code (CBC) Section 2105 - Quality Assurance, including Section 2105.1 and TMS-602 - Specifications for Masonry Structures.

B. **Sample Panel**: Construct sample panel to verify selections made under sample submittals and to demonstrate compatibility of materials and effects of the materials and construction procedures on the final appearance of wall. Construct sample panels for each type of exposed unit masonry construction in sizes approximately 60-inches (1500 mm) wide by 48-inches (1200 mm) high by full thickness

1. Use specified materials.
2. CMU sample panels erected shall represent range of texture and color permitted for the project.
3. Prepare more than one sample batch of mortar, especially when coloring pigments are added to the mortar, to establish desired aesthetics and performance.
4. Perform all construction procedures on sample panel, including cleaning and application of coatings and sealants.
5. Retain sample panel during construction as standard for judging completed masonry work. Acceptance of sample panel does not constitute approval of deviations from materials contained in sample panel, unless such deviations are specifically approved in writing by Construction Manager.

C. **Field Inspection**: Placement of reinforcement, laying of masonry units and grouting of masonry shall be continuously inspected by a special masonry inspector. Refer to requirements specified in Section 01400 - Quality Control and in PART 3 herein, in Article titled FIELD QUALITY CONTROL.

1.07 DELIVERY, STORAGE AND HANDLING

A. **Delivery**: Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

B. **Storage**:

1. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
4. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 PROJECT CONDITIONS

A. **Hot Weather Conditions**: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90 degrees F or greater in the shade and when relative humidity is less than 50 percent.

B. **Cold Weather Conditions**: Do not lay or grout masonry when ambient temperature in the shade is less than 40 degrees F, unless approved methods are used during construction to heat Work area and to maintain minimum required temperature for mortar and grout curing.

1. Maintain minimum 40 degrees temperature for a period of at least 96 hours after mortar and grout are placed and prevent masonry from freezing for minimum of 7 days after placement and grouting.
2. All materials used shall be free from frost and masonry shall not be place on frozen substrate.

PART 2 - PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. **Specified Manufacturer:** ORCO Block Co., Inc., Stanton, CA (714/527-2239).

B. Acceptable Manufacturers: Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 – Material and Equipment.

C. Hollow Load-Bearing Concrete Masonry Units: Complying ASTM C90, two-core type, modular sizes as indicated on Drawings.

1. Grade and Type: Grade N, Type I, moisture-controlled units, open end bond-beam design, except provide closed ends at corner and wall end conditions. Provide bond-beam units at all locations with horizontal reinforcing steel bars, to provide minimum vertical opening at all cross webs 3-inches high by 3-inches wide. See Structural Drawing for unit types to be used at stack bond.
2. Weight Classification: Medium (normal) weight.
3. Strength: As specified on Structural Drawings.
4. Recycled content block: Containing at least 10 percent post-consumer recycled content for LEED contribution.
5. Face designs and colors: As indicated on the Drawings.

D. Solid Concrete Masonry Units: Modular size, color and finish to match hollow core units, conforming to California Building Code (CBC) Section 2103.1, Grade N, Type II. Provide solid units for exposed tops of walls, window sills, veneer and other conditions as indicated on the Drawings.

1. Special Shapes:
   a. Provide end, corner, pilaster and cap units as necessary.
   b. Provide deep cut type bond beam block.
   c. Include abrasive burnished surface finish on exposed exterior surfaces.

2.02 REINFORCEMENT AND ANCHORAGES

A. Reinforcing Steel: ASTM A 615, yield grade as indicated on Drawings; deformed billet steel bars; plain finish. Comply with requirements specified in Section 03200 - Reinforcing Steel.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar and Grout Materials, General: Comply with TMS-402 – Specification for Masonry Structures.

B. Portland Cement: ASTM C 150, Type as indicated on (Structural) Drawings, gray color, from one manufacturer only.

C. Mortar: Pre-blended Type M or S MAC Plus Mortar by ORCO Blended Products, or equal, conforming to ASTM C 270 and complying with TMS-402 Specification for Masonry Structures with integral water repellent and color. Color shall be as selected by Architect. Allow for custom color to blend with color of concrete masonry units.

1. Mortar aggregate: ASTM C 144, standard masonry type, clean, dry, protected against dampness, freezing, and foreign matter.
2. Hydrated lime: ASTM C 207, Type as noted on Structural Drawings.
3. Premix mortar: ASTM C 387, using gray cement, Normal strength.
4. Quicklime: ASTM C 5, non-hydraulic type.
5. Mortar pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes, colors as selected by Architect. Use only pigments with a record of satisfactory performance in masonry mortar. Provide one of the following or equivalent products of other manufacturers according to the "or equal" provision specified in Section 01600 - Product Requirements.
   a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
   b. Davis Colors; True Tone Mortar Colors.
   c. Soloman Grind-Chem Services, Inc., SGS Mortar Colors.

D. Grout Materials:

1. Grout Aggregate, General: Comply with ASTM C 476 - Standard Specification for Grout for Masonry and complying with TMS-402 – Specification for Masonry Structures, Chapter 2, except when other gradations are specifically approved by Architect (Structural Engineer) and Authority Having Jurisdiction (AHJ).
2. Grout Coarse Aggregate: Maximum 3/8-inch size; 200 percent by volume.
3. Grout fine aggregate: Washed river sand; 225 percent by volume.
4. Grout Admixture:
   a. Specified manufacturer: Sika Corporation, Lyndhurst, NJ (regional office, Santa Fe Springs, CA; 562/903-3650).
   b. Acceptable manufacturers: None. No substitutions will be accepted without approval of Authority Having Jurisdiction (AHJ).
   c. Admixture: Sika Grout Aid, blend of expanding, water-reducing agents for portland cement grout, to provide slow, controlled expansion prior to grout hardening. Provide dosage according to manufacturer's recommendations and reviewed grout mix.

E. Grout Mix: In compliance with TMS-402 – Specification for Masonry Structures and ASTM C 476.

1. Grout shall be high-slump workable mix, preferably placed by pumping to permit continuous pouring.
2. Grout shall be worked into all voids. Mechanical vibrators shall be used for consolidation. Where job conditions preclude such use, other methods may be employed if approved in advance by Authority Having Jurisdiction (AHJ).
3. Because of high water/cement ratio used in this type of grout, it is essential that grout be reconsolidated after it has taken on plastic consistency but prior to taking initial set. Reconsolidate grout to overcome settlement

shrinkage, separation from reinforcing steel and promote bond to concrete masonry unit walls.

4. Sufficient water may be added to make workable mix that will flow into all voids of masonry without separation or segregation. When grout is placed in masonry units with typical rates of absorption, slump of grout shall be approximately nine to ten inches (9-inches to 10-inches) depending on temperature and humidity conditions.
5. Where least lateral dimension of cells to be filled exceeds five inches, coarser aggregate may be used in grout fill if mix is designed in accordance with California Building Code (CBC), Section 1905. The maximum size of aggregate shall not exceed 1-inch. Water per sack of cement may be greater than is shown in California Building Code (CBC), Table 19-A-8 to allow for absorption by masonry units and with sufficient workability to meet requirements stated in paragraph above.
6. Incorporate admixtures in grout mixes in accordance with manufacturer's instructions and recommendations.
7. Plasticizer: Water-reducing type which reduces porosity and absorption to increase bond strength; if used, only as reviewed and approved by Architect (Structural Engineer) and Authority Having Jurisdiction (AHJ).

F. **Water**: Clean, fresh, potable and free of mineral or organic matter detrimental to mortar and grout, in quantity only as necessary to produce mortar of specified strengths according to reference standards.

2.04 MORTAR AND GROUT MIXES

A. **Mortar and Grout Mixes, General**: Comply with TMS-402– Specification for Masonry Structures and ASTM C 476. Shovel measures shall not be allowed. Lime shall be last material added to mixes. Admixtures shall be acceptable on if included in reviewed mix designs. Admixtures shall be approved by Authority Having Jurisdiction (AHJ).

B. **Mortar Mix**: Comply with TMS-402 – Specification for Masonry Structures.

C. **Admixtures**: Admixtures shall be acceptable only if included in reviewed mix designs. Dosages shall be according to manufacturer's recommendations and reviewed grout mix. Admixtures shall be approved by Architect (Structural Engineer) and Authority Having Jurisdiction (AHJ).

D. **Design Strengths**: Include admixtures in mix designs.

1. Combined compressive strength, masonry unit and mortar assembly: As specified on Structural Drawings.
   a. For F'_m, strength shall be verified by unit strength method or masonry prism tests in compliance with TMS-402 – Specification for Masonry Structures. For F'_m = 2,500 psi, strength shall be verified by masonry prism tests in compliance with TMS-402 – Specification for Masonry Structures.
2. Mortar compressive strength: As noted on Structural Drawings.

3. Grout compressive strength: As noted on Structural Drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Preparation: Contact surfaces of all foundations and floors that are to receive masonry Work shall be thoroughly cleaned and roughened in accordance with ACI 530.1 – Specification for Masonry Structures, Chapter 3 before start of laying of masonry. Protect roughened surface during construction to ensure good bond between grout fill and concrete surface.

3.02 REINFORCING STEEL

A. Reinforcing Steel Condition: Verify that reinforcement is clean, free of scale, dirt, or other foreign coatings which would reduce bond to grout.

B. Reinforcing Steel Placement: Place steel reinforcement in concrete masonry walls as indicated on (Structural) Drawings and in accordance with ACI 530.1 – Specification for Masonry Structures, Chapter 3, precisely located and supported and secured against displacement. Vertical reinforcing shall be tied to horizontal reinforcing at spacing not to exceed 4'-0".

1. All reinforcing bars shall be straight. Do not "dog leg" bars at splices and do not use bent bars unless specifically indicated on Structural Drawings.
2. Lapped reinforcement shall have same clearance as bars being lapped.
3. Maintain 1/2-inch minimum clearance from interior face of masonry unit.
4. Maintain position of reinforcing within 1/4-inch of indicated dimension, while also maintaining minimum clearances.

C. Clearances for Reinforcing Steel:

1. Where vertical reinforcing is indicated at both faces of wall, ensure that 1/2-inch minimum clearance is maintained to inside faces of masonry cell at all sizes of masonry.
2. Carefully maintain clearance dimensions within placement tolerance indicated above, including lapped bars.
3. Provide steel spacers to secure vertical reinforcing in required and proper position before, during and after grouting operations.

3.03 MASONRY UNIT PLACING AND BONDING

A. Placing and Bonding, General:

1. Lay masonry to lines and levels indicated, plumb and true, using only dry masonry units.
2. Use only concrete masonry units containing integral water-repellent CMU admixture for exterior load-bearing wall construction.

3. Use only mortar containing integral liquid polymeric water-repellent mortar admixture, mixed at the manufacturer's recommended addition rate and mixed according to the manufacturer's recommended instructions for construction of water-repellent CMU exterior walls.
4. Fill head and bed joints for full thickness of the faceshells to provide the greatest resistance to water penetration.
5. High-Lift and Low-lift construction shall comply with TMS-402 - Specification for Masonry Structures.

B. **Cutting**: Make jobsite cuts with proper tools to provide straight unchipped edges and to fit masonry construction to final form. Take care to prevent breaking masonry unit corners or edges.

C. **Laying**: Concrete masonry units need not be wetted before laying except in dry areas where contact surfaces of units shall be moistened immediately before laying to prevent excessive drying of mortar.

1. Lay masonry for proper jointing with other Work.
2. Fill all head and bed joints solidly with mortar for distance in from face of unit not less than thickness of face shell. Take care in placing mortar to minimize droppings into block cells. Arrange open-end concrete masonry units in stacked bond so closed ends are not abutting.
3. Buttering corners of joints, or excessive furrowing of mortar joints will not be accepted.
4. Remove excess mortar as Work progresses.
5. Do not shift or tap masonry units after mortar has taken initial set.
6. Where adjustment is necessary, remove mortar and replace.

D. **Pattern**: Lay masonry in running and stacked bonds, as indicated on the Drawings. Align vertical cells for continuity of reinforcement and grout. Course one block unit and one mortar joint to equal 8-inches or as indicated on Architectural Drawings. Make vertical and horizontal joints equal and of uniform thickness.

E. **Horizontal and Vertical Face Joints**:

1. Nominal thickness: 3/8-inch, uniform.
2. Tooling: Tool joints when thumb-print hard with joint tools to compress mortar to ensure full contact with block surfaces and to provide greatest resistance to water-penetration.
3. Joint shapes: As indicated on the Drawings and as follows.
   a. Masonry exposed in completed construction: Concave.
   b. Masonry concealed under tile mortar bed, Portland cement plaster or applied paneling: Flush.
   c. Veneer masonry exposed in completed construction: Raked joint at exposed exterior and interior conditions.

F. **Cavity Protection**: Cover the top of ungrouted masonry to protect it from the weather and to prevent accumulation of water in cores of CMU.

G. **Internal Cavity Cleaning**: Remove mortar protruding into cells of cavities to be reinforced or filled.

H. **Intersections and Corners**: Fully bond intersections, external and internal corners.

I. **Joining Masonry Work**: Provide expansion joints in accordance with reference standards. When joining fresh masonry to set or partially set masonry construction, clean exposed surface of set masonry and remove loose mortar prior to laying fresh masonry.

J. **Construction (Cold) Joints**: If necessary to stop off a horizontal run of masonry, rack back one-half block length in each course.

1. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.
2. In high-lift grouting method, intermediate horizontal construction joints shall not be permitted.
3. Plan the Work for one continuous pour of grout to top of wall in 4-foot layers or lifts during same working day.
4. Section of wall to be grouted in any one pour shall be limited to length in which successive lifts can be placed within one hour of preceding lifts.
5. Vertical control barriers shall be placed between pour sections in locations approved by Architect (Structural Engineer) and Authority Having Jurisdiction (AHJ).
6. Should blow-out, breakdown in equipment or any other emergency occur, cease grouting operation.
7. Alternate procedure may be used with approval of Architect (Structural Engineer) and Authority Having Jurisdiction (AHJ).

K. **Cleanouts**: Provide cleanout openings for all walls, at bottom of each pour, in accordance with TMS-402 – Specification for Masonry Structures.

1. Cleanout openings shall be made prior to start of laying of masonry and be of sufficient size and location to allow thorough flushing away of all mortar droppings and debris.
2. After laying of masonry units is completed, cells shall be cleaned, reinforcing positioned and inspection completed.
   a. Thoroughly remove all mortar droppings and overhangs from foundation or bearing surface, cell walls and reinforcing.
   b. An acceptable method shall be provision of 2- to 3-inch blanket of dry sand over exposed surface of foundation, dislodging any hardened mortar from cell walls and reinforcing with pole or rod and removing mortar debris with sand cover prior to clean up and grouting.
3. Close cleanouts by inserting face shells of masonry units or covering openings with forms.
4. Face shell plugs shall have two-day minimum curing time and shall be adequately braced to resist pressure of fluid grout.

L. **Initial Cleaning**: Remove excess mortar before mortar sets. Clean surfaces at exposed masonry to present even surface texture and color.

1. Remove "primary" efflorescence from masonry walls exposed in the finished construction in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-3A.
2. Remove soiling or stains from masonry walls exposed in the finished construction in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-2A.
3. Promptly remove excess wet mortar containing integral water-repellent mortar admixture from the face of the masonry as work progresses. Do not use strong acids, overaggressive abrasive blasting or high-pressure cleaning methods.
4. Dispose of residues in compliance with applicable environmental regulations.

3.04 BUILT-IN WORK

A. **Built-In Work**: As Work progresses, install hollow metal door frames and other items to be built into the Work and specified in other Sections.

1. Avoid cutting and patching. Coordinate placement of built-in products specified in other Sections so built-in products are placed as masonry is laid.
2. Install bolts, anchors, nailing blocks, sleeves, inserts, frames, vent flashings, conduit and other built-in products as masonry Work progresses.
3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
4. Do not build into masonry construction organic materials that are subject to deterioration.
5. Solidly grout spaces around built-in products.

3.05 PARGING

A. **Parging**: At masonry to receive tile mortar setting bed or Portland cement plaster finish.

1. Dampen masonry walls prior to parging.
2. Scarify each parging coat to ensure full bond to subsequent coat.
3. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch (19 mm).
4. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot (1 mm/m).
5. Strike top edge of parging at 45 degrees.

3.06 GROUTING

A. **Grout Mixing**:

1. Mixing of grout shall comply with TMS-402 – Specification for Masonry Structures. When possible, mix and deliver grout in accordance with requirements for transit- mixed concrete.
2. Time admixture addition in strict accordance with manufacturer's instructions and recommendations. Procedure used for adding admixture to grout mix shall provide for good dispersion.

B. **Inspection Holes**: Provide inspection and cleanout holes at base of vertical cell grout lifts in excess of 5'-4". Clean concrete grout spaces of excess mortar and debris before grouting.

C. **Grouting, General**: Grout all cells of units with coarse grout unless otherwise indicated. Work grout into cores and cavities to eliminate voids. Do not displace reinforcing steel when placing grout.

D. **Low-Lift Grouting**:

1. Limit height of pours to 12-inches (300 mm).
2. Limit height of masonry to 16-inches (400 mm) above each pour.
3. Pour grout only after vertical reinforcing is in place; place and tie horizontal reinforcing before grout is poured. Prevent displacement of bars as grout is poured.
4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

E. **High-Lift Grouting**: Comply with TMS-402 – Specification for Masonry Structures.

1. To prevent "blow-outs," pour no grout until the mortar has been set and cured. However, grout the walls as soon as possible after mortar has cured to reduce shrinkage and cracking of the vertical joints. All cleanout closures, reinforcing, bolts and embedded connection items are to be secured in position before grouting is started.
2. Handle grout from the mixer to the point of deposit in the grout space as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry unit surfaces not being immediately encased in the grout lift.
3. Depending upon weather conditions and absorption rates of the masonry units, the lift heights and waiting periods may be varied. Under normal weather conditions, with typical masonry units, the individual lifts of grout are limited to four feet in height with a waiting period between lifts of 30 to 60 minutes.
4. Place the first lift of grout to a uniform height within the pour section and mechanically vibrate thoroughly to fill all voids. The grouting team should be organized to enable the vibration to follow closely behind and at the same pace as the pouring operation.

5. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and alternate cells vibrated 12-inches to 18-inches into the preceding lift. Do this in such a manner as to reconsolidate the preceding lift and close any plastic shrinkage cracks or separations from the cell walls.
6. If, because of unavoidable job conditions, the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding lift, reconsolidate each lift by reworking with the mechanical vibrator as soon as the grout has taken its settlement shrinkage.
7. Repeat the waiting, pouring and reconsolidation steps until the top of the pour is reached.
8. Reconsolidate the top lift after the required waiting period to fill any space left by settlement shrinkage.

F. **Cleaning after Grouting**: Immediately after the wall has been fully grouted, hose off with water under pressure through a jet nozzle, to remove all the scum and stains which have percolated through masonry units and joints.

G. **Grout Curing**: Coordinate proper curing of mortar joints and grout pour. Concrete masonry faces and top of grout pour shall be kept damp to prevent too rapid drying during hot or dry weather, and drying winds.

H. **Construction Joints**: When grouting is halted for one hour or longer, horizontal construction joints shall be formed by stopping the pour of the grout 1-1/2 inches below top of uppermost unit.

I. **Inspection Hole Filling**: After inspection of concrete grout spaces, plug cleanout holes with masonry units. Brace against wet grout pressure.

3.07 FIELD QUALITY CONTROL

A. **Field Quality Control, General**: All masonry work shall be continuously inspected during laying and grouting by Testing Laboratory, employing inspector specially approved for such purpose by Authority Having Jurisdiction (AHJ).

1. Testing Laboratory will take test samples and perform such tests as required by TMS-402 - Building Code Requirements for Masonry Structures.
2. Testing Laboratory will check materials, details of construction and construction procedures.
3. Testing Laboratory will submit verified report that the Work covered by the report has been performed and materials use and installed in every particular in accordance with and in conformance to the approved Contract Drawings and Contract Specifications.

B. **Field Testing Mortar and Grout**: Comply with requirements of TMS-402 - Building Code Requirements for Masonry Structures.

C. **Core Tests**: When required by masonry assemblage not meeting design strength requirements, Testing Laboratory will make core tests of completed masonry construction in accordance with TMS-402 - Building Code Requirements for Masonry Structures.

1. Testing Laboratory will inspect coring of masonry walls and prepare report of coring operations.
   a. In this report, the number, the location and the condition of all cores cut on the project will be stated.
   b. Particular attention will be paid to description of bond between grout fill and cell walls of masonry unit.
   c. Report will also include description of difficulties encountered in coring operation which might impair strength of sample.
2. One-half of cores will be tested for bond strength of joint between masonry units and grout. This test will determine the unit force required to shear masonry unit face shells from grout core for each face.

D. Mortar and Grout Testing: Comply with requirements of TMS-402 - Building Code Requirements for Masonry Structures.

3.08 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16-inch (1.6 mm).

B. Maximum Variation from Plane of Wall: 1/4-inch in 10 ft (6 mm/3 m) and 1/2-inch in 20 ft (13 mm/6 m) or more.

C. Maximum Variation from Plumb: 1/4-inch (6 mm) per story non-cumulative; 1/2-inch (13 mm) in two stories or more.

D. Maximum Variation from Level Coursing: 1/8-inch in 3 ft (3 mm/m) and 1/4-inch in 10 ft (6 mm/3 m); 1/2-inch in 30 ft (13 mm/9 m).

E. Maximum Variation of Joint Thickness: 1/8-inch in 3 ft (3 mm/m).

3.09 POINTING, CLEANING AND PROTECTION

A. Pointing:

1. At final completion of unit masonry Work, fill holes in joints and tool.
2. Cut out and repoint defective joints.
3. Dry brush masonry surface after mortar has set, at end of each day's Work and after final pointing.
4. Leave Work and surrounding surfaces clean and free of mortar spots and droppings.

B. Progress Cleaning:

1. Clean masonry as Work progresses by dry brushing surface after mortar has set.
2. Clean surfaces again at end of each day's Work and after final pointing.
3. Leave masonry and surrounding surfaces clean and free of mortar spots and droppings.

C. **Final Cleaning**: After mortar is thoroughly set and cured, clean exposed masonry.

1. Dry brush masonry surface. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's review of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
5. Prepare joints for application of sealants.

D. **Protection**: Without damaging completed Work, provide protective boards at exposed external corners which are subject to damage by construction activities.

1. Protect sills, ledges and off-sets from mortar drippings or other damage during construction. Remove misplaced mortar or grout immediately.
2. Cover top of walls with non-staining waterproof coverings when Work is not in progress.

E. **Repairing Masonry**: Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units.

1. Install new units to match adjoining units.
2. Install new units in fresh mortar and grout, pointed to eliminate evidence of replacement.

END OF SECTION

SECTION 05081

GALVANIZED FINISHES ON STEEL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Zinc finish on iron and steel** products, applied after manufacture or fabrication, for corrosion resistance. Zinc finish, at Contractor's option, unless otherwise specified, may be by hot-dipped galvanizing or by thermal spray zinc metallizing.

1. Products to receive zinc finish shall be those subject to weather exposure and those located in moist and high-humidity conditions.
2. Products include but are not limited to:
   a. Structural steel members exposed outside of building enclosure.
   b. Steel decking (factory-galvanized with finish touch-up as specified in this Section).
   c. Steel fabrications, including bollards, fixed metal ladders (roof access ladders) and trash enclosure gates.
   d. Steel forgings and iron castings.
3. Steel fabrications, including ornamental metal fencing and gates, handrails and guardrails, and trash enclosure gates.
4. Fasteners and miscellaneous hardware.

B. **Field touch-up of zinc** coatings, including but not limited to field welded areas and abraded areas.

1.02 RELATED SECTIONS

A. **Section 05310 - Steel Decking:** Factory galvanizing of decking.

B. **Section 05500 - Miscellaneous Metal Fabrications:** Metal fabrications to be zinc coated, noted as "galvanized."

1.03 REFERENCES

A. **American Galvanizers Association (AGA):**

1. AGA - Inspection of Products Hot-Dip Galvanized After Fabrication.
2. AGA - The Design of Products to be Hot-Dip Galvanized After Fabrication.
3. AGA - Recommended Details of Galvanized Structures.

B. **Research Council on Structural Connections of the Engineering Foundation:** Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

C. **ASTM International (ASTM):**

1. ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A 143 Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

3. ASTM A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A 384 Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Articles.
5. ASTM A 385 Providing High-Quality Zinc Coatings (Hot-Dip).
6. ASTM A 767 Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
7. ASTM A 780 Repair of Damaged Hot-Dip Galvanized Coatings.

1.04 QUALITY ASSURANCE

A. Coating Applicator's Qualifications:

1. Company specializing in hot-dip galvanizing after fabrication and following the procedures of the Quality Assurance Manual of the American Galvanizers Association.
2. Company specializing in flame spraying zinc and zinc-aluminum alloy onto steel products for corrosion resistance.

1.05 SUBMITTALS

A. Certification: In accordance with provisions of Section 01450 - Quality Control, submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A 123, A 767 or A 153 (as applicable).

1.06 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Store and protect products in compliance with requirements specified in Section 01600 - Product Requirements and requirements specified herein.

B. Delivery, Storage and Handling, Galvanized Products:

1. Stack and bundle during transport and store to allow air flow between galvanized surfaces.
2. Load for transport to permit continuous drainage should wetting occur.
3. Do not rest galvanized products on cinders or clinkers.

C. Handling: Handle all articles to be galvanized in such a manner as to avoid mechanical damage and to minimize distortion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE COATING APPLICATORS

A. Hot-Dipped Galvanizing Applicator: Member of American Galvanizers Association. List of members is available from American Galvanizers Association (AGA).

2.02 STEEL MATERIALS

A. Steel Materials, General: Material for galvanizing shall be geometrically suitable for galvanizing as described in ASTM A 384 and A 385. Steel materials suitable for galvanizing include structural shapes, pipe, sheet, fabrications and assemblies.

1. Material shall be chemically suitable for galvanizing. Comply with AGA criteria and recommendations for determining suitability of steel for galvanizing.
2. Advise galvanizer of chemical properties of steel in advance so that determination can be made whether material is galvanizable and whether or not special processing techniques shall be performed.

B. Steel Materials for Hot Dip Galvanizing: Recommended steel materials for hot-dip galvanizing include but are not limited to:

1. Structural shapes and plates: ASTM A 36, A 242 type 2, A 283, A 441, A 500, A 501, A 529, A 572 and A 588.
2. Steel for fasteners:

General Category	Bolt Material	Nut Material
Carbon Steel High Strength	A 307 Gr A or B, A 325 Type 1	A 563 Gr A, A 563 Gr DH
Tower Bolts	A 394	A 563 Gr A
Quenched & Tempered Carbon Steel Bolts	A 449	A 563 Gr C
Quenched & Tempered Alloy Steel Bolts	A 354 Gr BC	A 563 Gr DH

3. Steel for sheet metal articles: ASTM A 569 or A 570.
4. Steel for pipe or tubing: ASTM A 53, A 120 or A 595 Gr A or B.

CAUTION: Avoid use of steel with an ultimate tensile strength greater than 150 ksi because these steels have been shown to have a potential for hydrogen embrittlement due to pickling prior to galvanizing.

2.03 FABRICATION REQUIREMENTS

A. Product Fabrication, General: Fabricate products to be zinc coated in accordance with Recommended Details for Galvanized Structures by American Hot Dip Galvanizers Association, Inc.

1. Comply with applicable portions of ASTM A 143, ASTM A 384 and ASTM A 385, except as otherwise specified herein. Avoid techniques which could cause distortion or embrittlement of steel.
2. Notify Architect before and during submittals review and before fabrication proceeds, of potential warpage problems which may require design modification.

B. Structural Steel Fabrication: Fabricate structural steel in accordance with Class I, II, III guidelines as described in AGA - Recommended Details for Galvanized Structures.

1. Fabrication practices for Products shall be in accordance with the applicable portions of ASTM A 143, A 384, and A 385, except as specified herein. Avoid fabrication techniques that could cause distortion or embrittlement of the steel.
2. Fabricator shall consult with Architect and responsible engineer and hot-dip galvanizer regarding potential problems or potential handling problems during the galvanizing process that may require modification of design before fabrication proceeds.

C. Joints: Whenever possible, bolted connections and slip joints shall be used to minimize field welding of material.

2.04 PRODUCT PREPARATION FOR ZINC COATING

A. Preparation, General:

1. Remove all welding slag, splatter, anti-splatter compounds and burrs prior to delivery for zinc coating.
2. Provide holes and lifting lugs as necessary for handling during galvanizing process and only at positions approved by Architect.
3. Remove grease, oil, paint and other deleterious materials by solvent, steam or power washing.
4. Abrasive (blast) clean near-white (SSPC SP5) for hot-dipped galvanizing and white (SSPC SP10) for zinc metallized coating. For zinc metallized coating, use angular grit to achieve anchor-tooth with 2 to 4 mil profile.
5. Do not use unsuitable marking paints on steel prior to galvanizing. Consult with the galvanizer about removal of grease, oil paint and other deleterious material prior to fabrication.
6. Use blast cleaning or other method as necessary if surface contaminants and coatings cannot be removed by normal chemical cleaning process.

B. Surface Preparation, Hot-Dipped Galvanizing:

1. Pre-clean using caustic bath, acid pickle and flux.
2. Alternatively, pre-clean by blast cleaning and fluxing.
3. Conform to ASTM A 123 and ASTM A 386, as applicable, for steel members, fabrications and assemblies.
4. Conform to ASTM A 153 for bolts, nuts and washers, and steel hardware components.
5. Conform to ASTM A 143 for protection against embrittlement.

C. Surface Preparation, Metallized Zinc Coating: Comply with manufacturer's instructions and recommendations, cleaning surface by abrasive blasting to remove all paint, corrosion, mill scale, slag, oily substances and soiling. Surface shall be white metal clean.

2.05 HOT-DIP GALVANIZING

A. Hot-Dip Galvanizing, General:

1. Ferrous metal fabrications shall be galvanized only as specified or noted on the Drawings.
2. Where galvanized finish is specified or noted, ferrous fabrications shall galvanized in accordance with applicable referenced ASTM standards, after fabrication.
3. Galvanizing shall be by hot dip method only, unless otherwise specified.
4. Galvanize steel members, fabrications and assemblies after fabrication by the hot-dip process in accordance with ASTM A 123.
5. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with ASTM A 153.
6. Safeguard products against steel embrittlement in conformance with ASTM A 143.
7. Galvanize reinforcing steel in accordance with ASTM A 767.

B. Portions Not to Receive Galvanizing: Protect portions of parts to be embedded in concrete from galvanizing, except galvanize anchors and sleeves built into concrete and masonry.

C. Galvanizing Bath: Use not less than 98.0 percent zinc.

D. Coating Weight: conform with paragraph 5.1 of ASTM A 123, Table 1 of A 767, or Table 1 of ASTM A 153, as appropriate.

E. Coating Surface Finish: Wipe down surfaces after dip to remove pin holes, scale, drips, runs and points. Finish shall be continuous, adherent, smooth and evenly distributed, free from defects detrimental to intended end use and finishing of coated product.

F. Coating Adhesion: Withstand normal handling consistent with the nature and thickness of the coating and normal use of the article.

2.06 ZINC METALLIZED COATING

A. Specified Manufacturer: ZincNation, Inc., Anaheim, CA (714/231-6190).

B. Acceptable Manufacturer: None identified.

C. Zinc Metallized Coating: As alternative to hot-dip galvanizing, apply proprietary zinc metallized coating to prepared steel fabrications by thermal spray method. Comply with SSPC CS Guide 23.00 - Coating System Guide for Thermal Spray Metallic Coating Systems and ANSI/AWS C218.93 - Guide for the Protection of Steel With Thermal Spraying Coating of Zinc. Zinc coating shall have no volatile organic compounds (VOCs) and shall be applied under factory conditions if feasible.

1. Apply 99.9 percent pure zinc.

2. Minimum zinc coating thickness shall be 0.004-inch (4 mils) except handrails, gates and other products subject to abrasion shall be 0.020-inch (20 mils).
3. Finished coating shall be visibly free of lumps, blisters and loosely adhering particles.
4. Prepare surface for field-applied primer and paint as specified in Section 09905 - Field Painting.

2.07 SOURCE QUALITY CONTROL

A. Inspection and Testing: Comply with requirements specified in Section 01450 - Quality Control.

1. Inspection and testing of hot-dip galvanized coatings shall be performed according to guidelines provided in AGA - Inspection of Products Hot-Dip Galvanized After Fabrication.
2. Include visual examination and tests in accordance with ASTM A 123, ASTM A 767 or ASTM A 153 as applicable to determine the thickness of the zinc coating on the metal surface.
3. Furnish Notarized Certificate of Compliance with ASTM Standards and Specifications herein listed.
   a. Certificate shall be signed by galvanizer and contain detailed description of material processed.
   b. Certificate shall include information as to the ASTM standard used for the coating.

PART 3 - EXECUTION

3.01 FIELD REPAIRS OF DAMAGED ZINC COATING

A. Field Repairs of Damaged Zinc Coating: Repair areas damaged by welding, cutting, bolting and abrasion. For metallized zinc coating repair, also comply with manufacturer's recommendations.

1. Use zinc-based solder coating where steel product is intended to remain unpainted. Use cold-galvanizing compound where steel product is intended to be field primed and finish coated (painted). If intention is not clear, provide zinc-based solder coating.
2. Maximum area to be repaired shall be defined in accordance with ASTM A 123 Section 4.6 current edition, as determined in advance of field repairs by mutual agreement between Architect and Contractor.
3. Repair damage in accordance with manufacturer's instructions and recommendations and ASTM A 780.
4. Minimum thickness requirements for the repair shall be those described in ASTM A 123 section 4.6 current edition or in ASTM A 780.

B. Hot Zinc Repair: Comply with manufacturer's instructions and recommendations and ASTM A 780.

1. Clean surface and apply flux.
2. Heat steel with torch to application temperature, which is above melting point of repair solder.

3. Tin surface by rubbing with solder stick after which melt more solder and spread evenly over surface.
4. Apply thick, uniform layer of solder.
5. Remove flux residue with wet cloth.
6. Coordinate surface preparation with applied finish paints and coatings, if applicable.

C. Cold-Galvanizing Compound Repair: Prepare substrate and apply cold-galvanizing compound in compliance with manufacturer's instructions and recommendations. Comply also with ASTM A 780. Coordinate curing time and compatibility with applied finish paints and coatings, if applicable.

END OF SECTION

SECTION 05090

ANCHORS AND FASTENERS

PART 1 - GENERAL

0.01 SECTION INCLUDES

A. **Anchors and fasteners for** connection to concrete and steel construction.

B. **General requirements for** welding of steel products.

C. **Shrinkage-resistant grout** and grouting of structural framing baseplates, equipment anchors and miscellaneous metal fabrications.

0.02 RELATED SECTIONS

A. **Section 05500 - Metal Fabrications:** Fabrications to be fastened, welded and grouted.

B. **Section 07600 - Sheet Metal:** Fabrications from sheet metal, for weather protection.

C. **Section 09900 - Painting:** Field priming requirements, applicable to areas damaged during welding and other anchoring and fastening operations.

D. **Division 15 - Plumbing:** Equipment and other mechanical and plumbing components to be fastened, welded and grouted.

E. **Division 16 - Electrical:** Equipment, fixtures and other electrical components to be fastened, welded and grouted.

0.03 QUALITY ASSURANCE

A. **Inspection:** Testing Agency will provide special inspection during all field welding, and high-strength bolt installations and tightening operations, expansion bolt installations and installations of epoxy-type anchors in concrete, in accordance with California Building Code (CBC) requirements.

1. Minimum qualifications of qualified welding inspector shall be those required for AWS Certified Welding Inspector (CWS), as defined in provisions of AWS QCI - Standard Guide for Qualifications and Certification of Welding Inspectors, published by American Welding Society.
2. Additionally, all welding inspectors shall be approved by Authority Having Jurisdiction (AHJ).

3. For expansion bolts and epoxy-type anchors in concrete, comply with ACI 318, Chapter 17.

B. Welder Qualifications: Welders shall be qualified by tests as prescribed in AWS Standard Qualification Procedure, B3.0-41, to perform the type of welding required.

C. Field-Verified Dimensions: Prior to fabrication, field verify dimensions and details of construction. Immediately report variances in writing to Architect.

0.04 PROJECT CONDITIONS

A. Field Inspection of Fabricated Products: Prior to installation, inspect products for damage and verify markings and dimensions against reviewed submittals.

B. Environmental Conditions: Do not install products intended for interior locations when spaces are uncovered and unprotected from inclement weather.

C. Coordination: Coordinate metal fabrications Work with Work specified in other Sections so that related Work shall be accurately and properly joined.

PART 1 - PRODUCTS

1.01 ANCHORS, FASTENERS AND ACCESSORY MATERIALS

A. Anchors and Fasteners, General: Same material, color and finish as the metal to which applied, unless otherwise indicated.

B. Exterior Exposure: Provide stainless steel.

C. Type, Size and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate.

D. Screw Head, Typical: Unless otherwise noted, exposed screws shall be Phillips oval or flat head, countersunk.

E. Standard Bolts and Nuts, Steel: ASTM A 307, Grade A, hexagonal head.

F. High-Strength Threaded Fasteners:

1. Heavy hex structural bolts: ASTM A 325, Type 1, Supplementary Requirements S.1, with threads included in shear plane and marked "A325T," unless otherwise noted on Contract Drawings.
   a. Conform to the provisions of California Building Code (CBC), Chapter 22.
   b. Manufacture with identifying mark placed on top of the head.
2. Washers:
   a. Hardened Type: ASTM F 436, Type 1, style as required.
   b. Direct Tension Load Indicating Type: ASTM F 959 Type 325 or

Type 490.

3. Nuts: ASTM A 563, Heavy Hex, Grade DH, plain (non-zinc coated).
4. Option: At Contractor's option the following bolts may be used with standard washers instead of direct tension load indicating type, where required:
   a. Load Indicator Bolts, manufactured by Bethlehem Steel Corporation.
   b. Tension Steel Bolts, manufactured by Bristol Machine Company.
   c. Tension Control Bolts, manufactured by Lejeune Bolt Company.

G. Threaded Rod: For threaded stud anchors, comply with ASTM A 36. For threaded anchor rods, comply with ASTM F 1554.

H. Lag Screws and Bolts, Steel: ANSI B18.2.1, type and grade best suited for the purpose, hexagonal or square head.

I. Wood Screws, Steel: ANSI B18.6.1, with Phillips or square drive head.

J. Plain Steel Washers: FS FF-W-92, round, carbon steel.

K. Lock Washers: FS FF-W-84, helical spring, carbon steel.

L. Toggle Bolts: Not permitted for structural connections. Depending upon substrate, use expansion anchor or use screw into appropriate backing material.

M. Concrete Anchors, Epoxy Adhesive Type: Manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Authority Having Jurisdiction (AHJ). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

N. Concrete and Masonry Anchors, Wedge-Type: Manufacturer, product, type and size as identified on Structural Drawings.

1. Equivalent products of other manufacturers, if approved by Authority Having Jurisdiction (AHJ), will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
2. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and as approved by Authority Having Jurisdiction (AHJ), will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

O. Concrete and Masonry Screws, Self-Threading: Manufacturer, product, type and size as identified on Structural Drawings. If products are not indicated on Drawings, then provide anchors as directed by the Architect (Structural Engineer) and approved by Authority Having Jurisdiction (AHJ). Equivalent products of other manufacturers, if acceptable to Authority Having Jurisdiction (AHJ), will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

P. Fiber Plugs and Screws: Not permitted.

Q. Lead Expansion Shields: Not Permitted.

R. Powder-Actuated Driven Fasteners: Comply with notes on Drawings.

S. Welding Rods and Bare Electrodes: As indicated on (Structural) Drawings for welding of structural (load-bearing) members. If not indicated, select rods and electrodes in accordance with AWS D1.1 - Code for Welding in Building Construction, applicable to metal alloy to be welded.

1.02 GROUTING COMPOUNDS

A. Specified Manufacturers: Products of the following manufacturers are specified and will be acceptable provided they comply with referenced standards all other requirements of the Contract Documents:

1. Dayton Superior Corporation, Chemical Operations, Oregon, IL (815/732-3136 or 800/745-3707; local office, Santa Fe Springs, CA, 310/946-5504 or 800/745-3701).
2. Euclid Chemical Co., Cleveland, OH (216/531-9222 or 800/321-7628).
3. L&M Construction Chemicals, Inc., Omaha, NE (402/453-6600 or 800/362-3331).
4. Master Builders Technology, Inc., Cleveland, OH, (216/831-5500; local representative, Rancho Cucamonga, CA, 909/466-6267).
5. W.R. Meadows, Inc., Elgin, IL (700/683-4500; local representative Walnut, CA, 909/469-2606 or 800/342-5976).
6. The Rawl Plug, Inc., New Rochelle, NY (914/235-6300).
7. Sika Corporation, Lyndhurst, NJ (201/933-8800; local representative, Santa Fe Springs, CA, 310/941-0231).
8. Sonneborn Building Products, Division of ChemRex, Inc., Minneapolis, MN (612/835-3434 or 800/433-9517).

B. Acceptable Manufacturers: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified Section 01 6000 - Product Requirements.

1. The Burke Co., Buffalo, NY (716/832-5959; local representative, Fountain Valley, CA, 714/556-4510).
2. Larsen Products Corp., Rockville, MD (301/770-5200 or 800/633-6668).
3. Tamms Industries Co. (A.C. Horn), Mentor, OH (216/974-2399 or 800/218-2667; local representative, Los Angeles, CA, 213/269-1846).
4. Thoro System Products, Miami, FL (800/327-1570).
5. Stonhard, Inc., USA, Maple Shade, NJ (800/736-9300).
6. Symons Corporation, Des Plaines, IL (708/298-3200; local representative, Industry, CA, 818/330-6855).

C. Metallic Shrinkage-Resistant Grout: For filling under equipment and interior miscellaneous metal fabrications (not for structural steel construction); pre-mixed factory-packaged compound,

metallic aggregate, minimum 5000 psi 28-day compressive strength. Confirm product selection with manufacturer's recommendations for intended use.

1. Firmix by Euclid Chemical Co.
2. Ferrogrout by L&M Construction Chemicals, Inc.
3. Embeco 636 or Embeco 885 by Master Builders Technology, Inc.
4. Kemox G by Sika Corporation.
5. Ferrolith G by Sonneborn.

D. Non-Metallic Shrinkage-Resistant Grout: For filling under baseplates and around anchors for exterior miscellaneous metal fabrications; pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with CE-CRD-C621, minimum 5000 psi 28-day compressive strength.

1. Sure Grip Grout by Dayton Superior.
2. Euco N.S. by Euclid Chemical Co.
3. Crystex by L&M Construction Chemicals, Inc.
4. Masterflow 713 or Masterflow 928 by Master Builders Technology, Inc.
5. Sealtight 588 Grout by W.R. Meadows.

E. Shrinkage-Resistant Setting Grout: For setting railing posts and similar components in sleeves or blockouts in concrete; pre-mixed, natural aggregate, minimum 5000 psi 28-day compressive strength, Master Builders Technology, Inc., Set Grout.

F. Non-Shrink Polymer (Epoxy) Grout: For setting anchor bolts in concrete.

1. For anchor bolts for structural members: As noted on Structural Drawings.
2. For anchor bolts for non-structural components: Polymer (epoxy) grout, Brutem MP or AB by Master Builders Technology, Inc., or approved equal, as recommended by manufacturer for intended use.

PART 2 - EXECUTION

2.01 PREPARATION

A. Preparation for Cutting and Fitting: Obtain Architect's review prior to site cutting or making adjustments not indicated.

B. Welding Preparation: Clean and strip site primed steel items to bare metal where site welding is indicated.

C. Blocking and Bracing: Make provision for erection loads with temporary bracing. Keep work in alignment.

D. Coordination with Cast in Place Concrete: Furnish setting templates and place items required to be cast into concrete, as specified in Section 03200 - Reinforcing Steel.

2.02 INSTALLATION, TYPICAL

A. Installation, General: Install items plumb and level, accurately fitted, free from distortion or defects.

B. Field Welding: Perform field welding in accordance with AWS D1.1.

2.03 BASES AND BEARING PLATES

A. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. After bearing plates have been installed and leveled, fill space between bottom of plate and concrete using flowable non-shrink grout to completely fill space to form solid bearing for base plate. Build forms to hold grout 1-inch minimum past edges of baseplates.
4. For proprietary grout materials, comply with manufacturer's instructions.

2.04 FIELD CONNECTIONS

A. Field Connections, General:

1. Conceal connections where possible. Otherwise, make countersinks for concealment after fabrication, except where noted.
2. Provide lugs, clips, anchors and miscellaneous fastenings necessary for complete assembly and installation.
3. Fit or miter to hairline tolerances.
4. Component parts of built-up members shall be well-pinned with closely-fitted contact.

B. Coordination: Make provisions to connect metal fabrications with or to receive Work specified in other Sections.

C. Joints Exposed to Weather or Water: Fabricate and secure joints to keep water out, or provide adequate drainage of water that penetrates.

D. Installation and Testing of Expansion Anchors: Comply with anchor manufacturer's installation instructions and conditions of approval of Authority Having Jurisdiction (AHJ), including applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report.

2.05 ANCHORING POSTS AND RAILINGS

A. Post Anchors Grouted in Concrete: Anchor posts by forming or core-drilling holes not less than 6 inches (125 mm) deep and 3/4 inch (20 mm) greater than outside diameter of post.

1. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with non-shrink grout, mixed and placed to comply with grout manufacturer's instructions and recommendations.
2. Unless otherwise indicated, leave joint at post base exposed, wipe off surplus grout material and leave 1/8-inch (3-mm) build-up, sloped away from post.

B. Posts and Railings Bolted to Substrate: Use fasteners as indicated or, if not indicated, sized to suit dead and live loads. Coordinate framing and backing installation at steel and wood framing to provide suitable supports.

1. Where indicated, make connections to concrete and masonry substrates by bolting with expansion anchors.
2. Where indicated, make connections to steel shapes by through-bolting.
3. Where indicated, make connections to cold-formed steel stud or joist framing or sheet backing by screwing with sheet metal screws.
4. Where indicated, make connections wood substrates using lag bolts into wood framing or blocking.
5. Where indicated, install removable railing and fence sections in slip-fit metal sockets embedded into concrete. Accurately locate sockets to match post spacing.
6. Toggle bolts will not be acceptable.

2.06 FIELD WELDING

A. Field Welding: Weld joints, corners and seams continuously in compliance with AWS D1.1 and 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 that no roughness shows after finishing and contour of welded surface matches those adjacent.
5. Re-weld to fill holes. Putties and fillers will not be accepted.
6. Do not field weld galvanized components to remain unfinished. Grind welds smooth and flush with base material.
7. Provide continuous special inspections as noted on Structural Drawings.

B. Welding Inspection and Testing: Inspect and test welds during installation of load-carrying components as follows:

1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record Work required and performed to correct deficiencies.
2. Perform visual inspection of all welds.
3. Perform ultrasonic inspections or partial- and full-penetration groove welds in compliance with ASTM E 164.

2.07 TOUCH-UP AND PREPARATION FOR FINISHING

A. Cleaning: Perform initial cleaning immediately after completion of installation. Prepare surfaces for finish painting as specified in Section 09900 - Field Painting, for interior locations, and Section 09873 - Urethane Coating Systems for Metals, for exterior locations.

B. Galvanizing Touch-Up: Touch up galvanizing immediately after installation, including after galvanizing is damaged due to field welding. Prepare surface and apply cold galvanizing compound in compliance with the manufacturer's instructions and recommendations.

C. Primer Paint Touch-Up: Immediately after erection or installation, touch up shop paint. Use products as specified in Section 09900 - Field Painting, for interior locations, and as specified in Section 09873 - Urethane Coating Systems for Metals, for exterior locations.

1. Clean field welds, bolted joints, and areas where primer is damaged.
2. Clean and primer paint welds and surrounding areas affected by welding.
3. Paint with material used for shop painting, minimum 3 mils dry film thickness.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide structural steel and related items complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Structural steel framing.
2. Structural steel trusses in the gymnasium.
3. Steel pipe and tube framing.
4. Shop priming and field touch-up. See Section 09920 - Coating Systems for Exterior Metals, specifically Section 2.03.

B. Related Work Not In This Section:

1. Setting of anchor bolts and inserts in concrete.
2. Reinforcing steel.
3. Section 09900 -Field Painting (except as specified herein).
4. Miscellaneous metal fabrications.

1.02 QUALITY ASSURANCE:

A. Reference Standards:

1. AISC Standards. Code of Standard Practice for Steel Buildings and Bridges; Specification for the Design, Fabrication and Erection of Structural Steel for Buildings; and Steel Construction Manual.
2. AWS Standards. AWS D1.1, Structural Welding Code.
3. Structural Joint Reference Specification. The Specifications for Structural Joints Using ASTM A325 or ASTM A490 Bolts established by the Research Council On Riveted and Bolted Structural Joints of the Engineering Foundation, hereinafter referred to as Ref Spec.

B. Qualifications of Fabricator: Fabricate structural steel in shops that are certified fabricators. The City of Ontario accepts any fabricators approved by the City of Los Angeles.

C. Requirements of Regulatory Agency: Work of this Section shall conform to Code and Title 8, CCR.

D. Source Quality Control: Refer to Section 01400.

1. Identified Structural Steel. Tests are waived for steel identified by heat number, accompanied by mill analyses and mill test reports, and properly tagged with Identification Certificate so as to be readily identified for conformance with applicable ASTM.
2. Unidentified Steel. If structural steel cannot be identified, it shall not be used for the project.

E. **Erection and Bracing Plan and Procedure**: Refer to Section 1710, Title 8, CCR, and Building Code.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. **Shop Drawings**: Submit for Work of this Section, including welding, accessories, and fastenings. Fully detail minor connections and fastenings not indicated or specified to meet the required conditions. Include a detailed sequence plan for shop and field welding that minimizes locked-in stresses and distortion. Submit drawings in a sequential manner; typical details, anchor bolt layout, plan sheets, and member details. Individual members shall be cross-referenced to gridlines and elevations for purposes of location.

B. **Charpy-V-Notch (CVN) Impact Tests**: Submit certified copies of Charpy-V-Notch (CVN) Impact Tests by manufacturer for applicable steel members and components.

1. Charpy-V-Notch (CVN) Impact Test For Base Metal: All shapes and plates for truss members and braced frame and rigid frame column members which have a thickness dimension of 1-1/2" or greater shall be subjected to Charpy-V-Notch (CVN) impact tests per ASTM E23 and ASTM A673.

   Exception: Rolled shapes listed under Groups 4 and 5 of Table 2, pages 1-8 of the 9th edition of the AISC Manual of Steel Construction shall have the Charpy-V-Notch test as specified above, performed on flange material at the juncture of the web and flange.

2. Charpy-V-Notch tests shall be performed by the manufacturer employing Test Frequency (P) per ASTM A673 and utilizing standard specimen sizes shown in Figure 6 of ASTM E23. The absorbed energy in a CVN impact test shall not be less than indicated by the formula:

   CVN = Fy (t+0.25)/5.45 = x ft-lb - CVN minimum average value shall be 20 ft-lb.

Where: Fy	=	Specified Yield Stress (ksi)
t	=	Material Thickness
CVN	=	foot-pounds of absorbed energy when tested at a temperature of 70 degrees Fahrenheit. Components requiring mandatory toughness requirements shall be designated on the Contract Drawings and on the steel shop drawings.

C. **All welds used for connections of structural members** shall conform to AISC standards and to AWS D1.1 and be made with weld filler metal with a Charpy V-Notch toughness of 20 foot-pounds at minus 20 degrees Fahrenheit.

D. **All welds used for connections of the seismic force resisting system and for splices and bases of columns in gravity resisting systems** shall conform to AISC standards and to AWS D1.8 and be made with weld filler metal with a Charpy V-Notch toughness of 20 foot-pounds at 0 degrees Fahrenheit.

E. **All Demand Critical welds used for connections of the seismic force resisting system** shall conform to AISC standards and to AWS D1.8 and be made with weld filler metal with a Charpy V-Notch toughness of 40 foot-pounds at 70 degrees Fahrenheit.

F. **Weld Procedures**: Submit weld procedures, indicating joint details and tolerances, preheat and interpass temperature, postheat treatment, single or multiple pass, electrode type and size, welding current, polarity and amperes and root treatment. Welding Procedure Specifications shall be reviewed and approved by the Testing Laboratory.

1.04 PRODUCT DELIVERY AND HANDLING:

A. **Protect Materials** from damage during shipping, handling and storage on the site. Steel showing dents, creases, deformations, weathering, or other defects is not acceptable.

B. **Welding Electrodes**: Deliver to site in unbroken packages bearing manufacturer's name and label identifying the contents.

1.05 JOB CONDITIONS:

A. **Site Measurements**: Take such field measurements as may be required. Report any major discrepancy between Drawings and field dimensions to the Architect.

B. **Protection of Floors**: Exercise caution to protect floors and adjacent Work from damage. Do not overload floors. Use rubber tired equipment to handle and move steel. Do not place steel members directly on floor; use pads of timber or like material for cushioning.

C. **Temporary Flooring**: Provide the necessary temporary planking, scaffolding, and flooring in connection with erection of structural steel or support of erection machinery. Conform use of temporary floors to Code.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS: Furnish materials conforming to the following:

Wide Flange Shapes, WT's:	ASTM A992.
Plates, Angles, Channels	ASTM A36 unless noted otherwise in details
Hollow Structural Sections, "HSS" Square and Rectangular	ASTM A500, Grade B, Fy = 46 ksi
Hollow Structural Sections, "HSS" Round	ASTM A500, Grade B, Fy = 42 ksi
Structural Pipes	ASTM A53, Grade B, Fy = 35 ksi. Pipes are standard weight unless indicated otherwise.
Bolts and Nuts:	ASTM A307.
High-strength Bolts, Nuts, and Washers:	ASTM A325
Electrodes:	AWS D5.1, E70XX Series as required for intended use.
Primer:	Red Oxide Primer or equal.
Non-shrink Grout:	Master Builders "Embeco", or equal, non-gas-forming type, free of oxidizing catalysts and in organic accelerators, performance characteristics when

mixed to fluid consistency meeting CRD-C-79 and CRD-C-588, non-staining type in exposed areas.

2.02 GENERAL FABRICATION REQUIREMENTS: Conform to the approved submittals, Reference Standards as applicable to the Work, and the requirements herein. Fabricate and form the Work to meet actual installation conditions as verified at the site.

A. **Cleaning and Straightening**: Thoroughly wire brush material, clean of loose mill scale and rust, and straighten by methods that will not injure the steel prior to fabrication. Remove twists or bends after punching or working the component parts of a member before the parts are assembled. Produce finished members free from twists, bends, and open joints when erected.

B. **Contact**: Pin components parts of built-up members and rigidly maintain in close contact using clamps or temporary bolting during welding operations. Accurately mill compression bearing surfaces of joints depending on contact bearings or saw cut square to axis, or as detailed. Cut other joints straight and true.

C. **Joining**: Provide members of sizes, weights, shapes, and arrangements indicated, closely fitted and finished true to line and in precise position as necessary to allow proper joining of parts in the field. Drifting to enlarge unfair holes is not allowed without prior approval.

D. **Drilling, Punching, and Reaming**: Hole burning to make or enlarge previous holes is not allowed. Prepare required holes in structural steel members for attachment or passage of Work of other trades. Precisely locate finished holes to ensure passage of all bolts through steel assemblies without drifting. Enlarge holes only by reaming. Poor matching of holes is cause for rejection.

E. **Holes For Anchor Bolts**: Punch and drill or ream the holes in base and bearing plates. Do not make or enlarge the holes by burning.

F. **Base Plates**: Press or mill column base plates 4" thick or under for a straight contact bearing between plate and column.

2.02 CONNECTIONS:

A. **Common Bolts**: Make connections with common bolts only where indicated.

B. **High-Strength Steel Bolting**: For joints connected by high-strength steel bolts, hardened washers, and nuts tightened to a high tension, the materials, methods of installation and tension control, type of wrenches, and inspection shall conform to the Reference Specification and the following requirements:

1. High-strength bolts shall have a suitable identifying mark placed on top of the head before leaving the factory.
2. Tightening of nuts shall be done with properly calibrated wrenches or by the turn-of-the-nut method. Minimum bolt tension for the size of bolt used shall conform to tables listed in Reference Specification.
3. Calibrated wrenches shall be checked individually for accuracy at least once daily for actual conditions of application.
4. Fully tightened bolts shall be marked with identifying symbol.
5. Hardened washers shall be installed as per AISC Standards.
6. Clean all contact surfaces of bolted parts and threads free of scale, slag,

burrs, and pits, or dirt, paint, or other foreign material or defects which would prevent solid seating of parts.

7. Bolt lengths shall be the grip plus 1-1/4".

C. **Load Indicator Washers** as manufactured and licensed by either Cooper and Turner or Bethlehem Steel may be used for the field installation of the high-strength bolts. Load indicator washers may not be substituted for any required washer, but may be used in conjunction with the required washers. Conform tightening to Paragraph 5e of the Ref Spec. After sufficient bolts in a joint are snugged to bring the members into close contact, tightening shall progress from the most rigid part to the free edges until the load indicators on all bolts are closed to the required gap of 0.015” under bolts heads or 0.010" under the nuts. Do not completely close the gap to prevent overtightening and damage to the bolts.

D. **Tension Set or Load Indicator Bolts, Nuts, and Washers** as manufactured by Cold Form Specialties or Bethlehem Steel may also be used for field installation of the high-strength bolts. In multi-bolt joints, the nuts shall be tightened in stages (a little at a time) without breaking the spline in any of them until the final stage, to minimize slackening of the installed bolts.

2.03 WELDING: Conform to AWS D1.1, as modified by referenced AISC Standards, and as indicated or noted on the Drawings. Employ certified welding operators who are thoroughly trained and experienced in arc welding and produce uniformly reliable groove and fillet welds in flat, vertical, and overhead positions, and make neat and consistent welds. Weld structural steel joints by the shielded electric-arc method unless otherwise shown or specified. Provide inspection and testing of welds as required under Article "Field Quality Control" hereinafter.

A. **Weld Finishing**: Grind exposed welds subject to contact to smooth surfaces free of holes, slag, or other defects, flush with the adjoining surfaces. No finish treatment is required for permanently concealed welds and other exposed welds.

B. **Storage and Care of Electrodes**: Coatings of low-hydrogen type electrodes shall be thoroughly dry when used. Use electrodes as taken from hermetically sealed packages within 4 hours of the time the package is opened. Electrodes not used within this 4 hour period, and electrodes that have been exposed more than one hour to air having a relative humidity of 75% or greater, shall be dried for at least two hours at a temperature of 200 to 250oF before they are used, or shall be reconditioned according to the manufacturer’s recommendations. Electrodes so dried or reconditioned not used within 4 hours after drying is completed shall be redried before use. Electrodes of any class that have been wet shall not be used under any conditions.

C. **Preparation**: Clean surfaces to be welded of paint, grease, oil, mill scale, and all foreign matter. Clean weld each time the electrode is changed. Chip entire surface of hand guided and controlled flame cut edges before welding. Surfaces prepared with automatic or mechanically guided and controlled equipment need not be ground or chipped before welding.

D. **Lamination Checking**: Prior to welding, ultrasonically test column materials greater than 1-1/2" in thickness for lamination within 12" (6" on each side) of a direct groove weld from column splices and girder flange connections. Conform to the ultrasonic testing procedures specified under "Field Quality Control" hereinafter.

E. **Procedures**: During assembling and welding, hold components of a built-up member with adequate clamps or other means to keep parts straight and in close contact. Do no welding in wind until adequate protective screening has been set up. Cut out defective welds or parts of welds with a chisel or air arc and replace.

F. **Characteristics of Welds**: Completed welds shall be wire brushed and shall show uniform section, smoothness of welded metal, feather edges without undercuts or overlays, and freedom from porosity and inclusions. Visual inspection at edges and ends of fillet welds shall show good fusion and penetration into base metal.

1. After welding moment frame joints, the backing bar shal be removed from the bottom flange and the run-off tabs shall be removed from the top and bottom flanges. The weld root shall be inspected and tested per A.W.S. Requirements given in Section 8. If rejectable indications are found, remove by backgouging to sound metal. The backgouged area shall be welded, and the weld shall be reinforced with a fillet weld. Unless noted otherwise, the size of the reinforcing fillet weld shall be equal to 1/4 of the beam flange thickness, but not less than 1/4", but need not exceed 3/8".
2. For the weld of the bottom beam flange of moment frame beams to the column flange, follow the following steps: 1) The root pass should not exceed a 1/4" in layer thickness. 2) The first half-length root should be made with one of the following techniques, at the option of the Contractor: a) The root may be initiated near the center of the joint. If this approach is used, the welder should extend the electrode through the opposite side of the girder web. This is to allow adequate access for clearing and inspection of the initiation point of the weld before the second half-length of the root pass is applied. It is not desirable to initiate the arc in the exact center of the girder width since this will limit access to the start of the weld during post-weld operations. After the arc is initiated, travel should progress toward the end of the joint (outboard beam flange edge), and the weld should be terminated on a weld tab/run-off tab. Tabs shall extend the joint, no end dams. b) The weld may be initiated on the weld tab, with travel progressing toward the center of the girder flange width. When this approach is used, the welder should stop weld approximately 1” before the beam web. It is not advisable to leave the weld crater directly in the center of the beam flange width since this will hinder post-weld operations. 3) The half length root pass should be thoroughly slagged and cleaned. 4) The end of the half length root pass that is near the center of the beam flange should be visually inspected to ensure fusion, soundness, freedom from slag inclusions and excessive porosity. The resulting bead profile should be suitable for obtaining fusion by the subsequent pass to be initiated on the opposite side of the girder web. If the profile is not conducive to good fusion, the start of the first root pass should be ground gouged, chipped or otherwise prepared to ensure adequate fusion. 5) The second half of the weld joint should have the root pass applied before any other weld passes are performed. The arc should be initiated at the end of the half length root pass that is near the center of the beam flange, and travel should progress to the outboard end of the joint, terminating on the web tab. 6) Each weld layer should be completed on both sides of the joint before a new layer is deposited.

7) Weld tabs should be removed and ground flush to the beam flange.

2.04 SHOP PRIMING: Clean all exterior exposed steel in accordance with SSPC-SP6 Commercial Blast Clean with a 1.5 mil minimum angular anchor profile.. Apply Tnemec 90-97 Tneme-Zinc (or approved equal) to all exterior exposed surfaces at 2.5 to 3.5 mils DFT. 90-97 meets AISC slip coefficient requirements as a Class B rating. Clean all interior steel in accordance with SSPC-SP2 Hand Tool Clean and /or SSPC-SP3 Power Tool Clean. Apply Tnemec 115 Uni-Bond Primer (or approved equal) to all interior steel surfaces at 2.0 to 3.5 mils DFT. Do not prime the following:

1. Steel surfaces to be welded or embedded in concrete or masonry.
2. Permanently concealed structural steel surfaces.
3. Contact surfaces of high-strength bolted connections, bearing surfaces, or surfaces in contact with metal decking.
4. Members to be covered with fireproofing.
5. Members to be galvanized or to receive other coatings as shown on the architectural drawings.

PART 3 - EXECUTION

3.01 ERECTION OF STRUCTURAL STEEL: Brace and secure structural steel until permanent connections are completed. Provide accessories and fasteners to secure steel in place as indicated and required. Conform to Code, AISC Standards, and erection and bracing plan and procedure.

A. **General**: Employ qualified riggers and plan erection to require minimum cutting. Erect members plumb, true to line and level, and in precise positions. Provide temporary bracing and guying to resist loads and stresses to which the structure may be subjected, including those due to erection equipment and its operation.

B. **Damaged Members**: During erection, straighten or replace members who are bent, twisted, or damaged as directed. If heating is required, perform the heating by methods that ensure a uniform temperature throughout the entire member. When directed, remove the members that are damaged to an extent impairing appearance, strength, or serviceability and replace with new members at no extra cost to the Owner.

C. **Anchor Rods**: Furnish and deliver with setting drawings and templates. Verify position of bolts prior to delivery of steel; report all errors or deviation for correction.

D. **Columns**: Set column bases in exact position for alignment, plumb and straight, supported on adjustable bolt supports or shims until grout has set. Set center of base true to column center within 1/16" and adjust height exactly. Maintain bases at exact position and level during grouting. Fill grout space solid with flowable non-shrink grout.

E. **Connections**: Maintain steel in correct position during welding and bolting, and provide for dead loads, wind, and all erection stresses. Do no welding or final bolting until members have been aligned and plumbed.

2. Common Bolts. Tighten and upset bolt threads to preclude loosening, or use approved self-locking nuts.

3. High-Strength Bolting. Conform to requirements under Part 2 of this Section.

F. **Tolerances**: Erect members to tolerances conforming to referenced AISC Standards and Code.

G. **Plumb Displacement**: Conform to referenced AISC Standards and Code.

3.02 FIELD TOUCH-UP PAINTING: After erection and connections are approved, clean all connections to be painted and damage to shop painted surfaces, and apply a field touch-up coat of same metal primer used for shop coat.

3.03 QUALITY CONTROL: Refer to Section 01400.

A. **Inspection**: According to Reference Standards. The Inspector shall visually inspect welds, shall be present to inspect and approve all groove, multi-pass, and penetration welding, all field welding, and shall inspect high-strength bolting performed in the fabricator's shop or at the site, and shall inspect all erection including the grouting under base plates.

B. **Tests of Welding and Bolting**: The Testing Laboratory shall inspect all shop and field welding and high-strength bolting, conform to requirements of Code and the Building Department, and certify in writing, after completion of the Work, that all welding and high-strength bolting have been performed in accordance with the Drawings, Specifications, and Code.

C. **Inspection of High-Strength Bolts**: The Testing Laboratory shall check the bolt tightness on a minimum 10% of bolts, selected at random, for each high-strength bolted joint. Inspection procedure shall conform to the Ref Spec.

D. **Inspection of Groove Welds**: Testing Laboratory shall inspect all groove welded connections of column to column, column to girder, girder to girder, and like connections by ultrasonic or other approved non-destructive tests. Conform to Building Department Requirements for reinspection of welds after installation.

1. Ultrasonic Testing shall be performed by a specially trained and qualified technician who shall operate the equipment, examine welds, and maintain a record of welds examined, defects found, and disposition of each defect. All defective welds shall be repaired and costs for retesting defective welds shall be paid by the Contractor.
2. Rate of Testing. All welds requiring ultrasonic testing shall be tested at a 100% rate.
3. Backing Strips. Contractor shall remove backing strips whenever ultrasonic indications arising from weld roots can be interpreted as either a weld defect or the backing strip and, if no root defect is visible, weld shall be retested. If no defect is indicated on this retest, and no significant amount of the base and weld metal have been removed, the joint needs no further repair or welding. If a defect is indicated, it shall be repaired. Contractor shall bear the cost of removals.

4. Questionable Root Indications that prove not to be defective welds shall not count against the welder to increase the test rate.
5. Ultrasonic Instrumentation shall be calibrated by technician to evaluate the quality of the welds in accordance with AWS D1.1, Sections 5 and 6.

END OF SECTION

SECTION 05310

STEEL DECKING

PART 1 - GENERAL

0.1 SECTION INCLUDES

A. Steel roof decking.

B. Acoustical roof/ceiling decking.

C. Related sheet steel shapes, fasteners and accessories.

D. Wedge anchor fastening system for support of items hung from acoustical roof/ceiling decking.

0.2 RELATED SECTIONS

A. Section 05081 - Galvanized Finishes on Steel: Galvanizing repair products and procedures applicable to steel decking.

B. Section 05090 - Anchors and Fasteners: General requirements for anchors, fasteners and welding.

C. Section 05120 - Structural Steel: Supporting structure of steel shapes at steel decking.

D. Section 05500 - Miscellaneous Metal Fabrications: Clips and angles to support decking and reinforce openings in decking.

E. Section 07270 - Firestopping and Smoke Seals: Mineral fiber fire safing insulation for installation at decking closures above fire-resistive walls and partitions.

F. Section 07620 - Roofing Accessories: Pre-fabricated sheet metal curbs; roof access hatch.

G. Section 09900 - Field Painting: Priming and finish coating of interior, exposed steel decking.

H. Section 09920 - Coatings for Exterior Steel: Priming and finish coating of exterior steel decking.

0.3 REFERENCES

A. American Iron and Steel Institute (AISI): AISI - Specification for the Design of Cold-Formed Steel Structural Members.

B. ASTM International (ASTM):

1. ASTM A 446 - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

2. ASTM A 525 - Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process.

C. American Welding Society (AWS):

1. AWS D1.1 - Structural Welding Code - Steel.

2. AWS D1.3 - Structural Welding Code - Sheet Steel.

D. Steel Decking Institute (SDI): SDI - Design Manual for Composite Decks, Form Decks, and Roof Decks.

0.4 SYSTEM DESCRIPTION

A. Steel Deck Structural Design: Design is based upon continuous span conditions, with minimum length for two span configuration.

B. Diaphragm Action: See Structural Drawings for connection to supporting members and for seam attachments.

0.5 SUBMITTALS

A. Shop Drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

B. Product Data:

1. Manufacturer's specifications and installation instructions for steel decking, accessories and manufacturer's load tables. Indicate by transmittal form that a copy of each instruction has been distributed to installer.

2. Submit complete manufacturer's descriptive literature and specifications, including acoustical properties, for acoustical decking.

C. Sustainable Design Submittal: For compliance with California Green Building Standards Code (CALGreen).

1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

2. Include statement indicating costs for each product having recycled content.

D. Design Calculations: Where decking size, gage or layout vary from Drawings or specified product, submit design calculation, prepared by a Structural Engineer registered to practice in the State of California, hired at no change in Contract Time and Contract Sum, for all loading and span conditions, demonstrating adequacy of proposed decking units and demonstrating compliance to SDI Design Manual for Floor Decks and Roof Decks. Costs of services of Engineer shall be included in Contract Sum.

E. Manufacturer's Certificates of Conformance: Submit the following.

1. A statement that decking manufacturer is not responsible for design intent of structural system shown on Contract Drawings.

2. Certification for carbon steel.

3. Certification for zinc-coated steel.

4. Certification that decking complies with SDI Specifications.

F. Test Reports: Submit current ICC Evaluation Service, Inc. (ICC ES) Evaluation Report acceptable to Authority Having Jurisdiction (AHJ). State the horizontal shear value allowed, based on test results. Minimum safety factor shall be 3.0 against ultimate load.

G. Welder Certifications:

1. Submit test certifications for each welder.

2. Submit certification prior to welding operations.

3. Certification shall attest that welders to be employed for Work have satisfactorily passed AWS qualification tests.

0.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall be regularly engaged and specializing, for the preceding 5 years, in producing specified products. Manufacturer shall be a member firm of Steel Deck Institute (SDI) in accordance with Quality Control provision specified in PART 1, herein.

B. Codes and Standards: Comply with applicable provisions of following codes and standards.

1. AISI Specifications for the Design of Light Gauge Cold-Formed Steel Structural Members.

2. AWS D1.1 Structural Welding Code.

3. AWS D1.3 Code for Welding Sheet Steel in Structures.

4. SDI Design Manual for Floor Decks and Roof Decks.

C. Coordination: Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Section 07540 - Thermoplastic Membrane Roofing to ensure protection of insulation strips against damage from effects of weather and other causes.

D. Welder's Qualifications:

1. All welding shall be done only by welders qualified to weld lightgage metal.

2. Qualifications of welders, and duration of qualification period, shall be in accordance with applicable requirements of AWS D1.3.

3. Welders producing unsatisfactory welding, even though having passed qualification tests, shall immediately be re-certified or replaced by qualified welders.

4. Retest all welders whose certification is 12 months or older.

5. If recertification of welders is required, retesting shall be done at no change in Contract Time or Sum.

0.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Protect steel decking to avoid corrosion, deformation and other damage.

B. Storage: Store decking and related materials to avoid contact with ground and properly supported in a sloped position for drainage. Keep decking covered and dry, using covers which do not allow condensation entrapment. Remove damaged materials from Project site immediately.

0.8 WARRANTY

A. Extended Warranty, Roof Decking: Manufacturer's 10 year warranty, covering structural performance of decking and suitability as roofing substrate.

PART 1 - PRODUCTS

1.1 MATERIALS

A. Steel for Galvanized Metal Deck Units: ASTM A 653, minimum yield of 38 ksi, galvanized according to ASTM A 924, G60 coating designation.

B. Miscellaneous Steel Shapes: ASTM A 36. Refer also to Section 05120 - Structural Steel and Section 05505 - Miscellaneous Metal Fabrications.

C. Welding Rods: As required by AWS D1.1 and AWS D1.3.

D. Galvanizing Repair: As specified in Section 05081 - Galvanized Finishes on Steel.

1.2 NON-ACOUSTICAL STEEL ROOF DECKING

A. Specified Manufacturer: EPIC Metals Corporation, Rankin, PA (877-696-3742).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Non-acoustical steel roof decking shall integrate with perforated, acoustical steel roof decking.

C. Steel Roof Decking for Concealed and Exterior Exposed Conditions: Epicore ER3.5 Steel Deck Panels, manufactured by EPIC Metals Corporation, complying with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report ESR-2047. Physical properties:

1. Metal: As indicated on Structural Drawings.

2. Panel depth: 3-1/2 inches.

3. Panel width: 24-inches.

4. Rib spacing: 6-inches o.c.

5. Minimum structural section properties: As indicated on Structural Drawings.

D. Metal Finish: Hot-dipped galvanized.

E. Finish Coating: For exposed steel decking, field-applied, as specified in Section 09970 - Coatings for Exterior Steel.

1.3 ACOUSTICAL STEEL ROOF/CEILING DECKING

A. Specified Manufacturer: EPIC Metals Corporation, Rankin, PA (412/351-3913 or 877/890-3742).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

C. Acoustical Steel Roof/Ceiling Decking: For exposed interior locations indicated on the Drawings, Epicore ER3.5A Roof Deck Ceiling Systems, manufactured by EPIC Metals Corporation, with perforated bottom flat areas and acoustical batt insulation, complying with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report ESR-2047. Physical properties:

1. Metal: As indicated on Structural Drawings.

2. Panel depth: 3-1/2 inches.

3. Panel width: 24-inches.

4. Rib spacing: 6-inches o.c.

5. Minimum structural section properties: As indicated on Structural Drawings.

6. Acoustical Properties: Minimum NRC .95.

D. Acoustical Roof/Ceiling Decking Fabrication:

1. Acoustical roof deck shall be cold-formed from steel coils conforming to ASTM A 653, structural quality, with minimum yield strength of 40 ksi, with hot-dip protective coating of zinc conforming to ASTM A 924, Class G90, as defined in ASTM A 653. Decking shall be formed with continuous dovetail shaped ribs.

2. Acoustical roof deck shall have full depth positive registering sidelaps that can be fastened by screws or powder-activated fasteners.

3. Acoustical roof deck shall be fabricated with perforations.

   a. Perforated areas shall be located in the bottom flat areas between the dovetail shaped ribs.
   b. Minimum NRC value of .95 shall be provided. This value shall be established by sound absorption tests without use of fiberglass insulation above the panels.

E. Finish on Acoustical Roof/Ceiling Decking:

1. Pretreatment: Before fabrication of panel, all surfaces of galvanized sheet steel shall be processed through continuous coil coating line, designed to degrease and clean metal, followed by chemical conversion coating to etch surface for proper bond characteristics.

2. Primer: Before fabrication of panel, all surfaces of galvanized steel shall receive primer coating compatible with finish coat specified below. Primer shall be applied immediately after pretreatment chemical conversion process.

3. Finish coating: Field-applied paint, as specified in Section 09900 - Field Painting.

F. Acoustical Roof Decking Accessories:

1. Sheet metal accessories: As specified below under Article titled, "STEEL DECKING ACCESSORIES."

2. Acoustical insulation: Encapsulated in polyethylene bags, provided for installation above perforations in bottom flat area between dovetail-shaped ribs of decking. To facilitate field painting of the perforated surfaces, bagged acoustical insulation shall be supported on corrosion-resistant mesh spacers.

1.4 STEEL DECKING ACCESSORIES

A. Steel Decking Accessories, General: Provide decking manufacturer's standard type accessories for purposes indicated and for finished installation.

1. Accessories shall be same material and gage as decking units but not lighter than 20 gage, unless otherwise indicated.

2. Provide cant strips, ridge and valley plates and various types of plates and closures as indicated or as necessary to complete work.

B. Steel Roof Decking Accessories: Provide accessories as indicated or as necessary to complete Work shall include cant strips, ridge and valley plates and various types of plates and closures. Provide sheet metal accessories of same material, gage, and finish as deck, unless otherwise shown on Drawings or specified. Sheet metal accessories include but are not necessarily limited to:

1. Ridge plates.

2. Valley plates.

3. Steel cant strips.

4. Eave plates.

5. Closure plates at edge of decking.

C. Adjusting Plates: As practicable, use adjusting plates of same gage and configuration as decking units. Plates of predetermined size shall be factory-cut.

D. Metal Closure Strips: Provide galvanized sheet steel closures fabricated by decking manufacturer, of not less than 0.045-inch minimum (18 gage) sheet steel, to close openings between decking and other construction. Form metal to provide tight-fitting closures at open ends of cells or flutes and sides of decking.

1. End Closures: To close open ends of decking units.

2. Closures Above Walls and Partitions: To close space above all partitions abutting decking where fire and smoke seals are required. Provide firestopping and smokestopping as specified in Section 07840 - Firestopping and Smoke Seals, to fill between closures to maintain fire resistance rating of walls and partitions.

E. Flexible Closures: For decking closures other at all partitions abutting decking where fire and smoke seals are not required, compressible foam closures, as standard with decking manufacturer, to fill large and small cells, complying with ICC Evaluation Service, Inc. (ICC ES) ESR-2255.

F. Cover Plates: Provide cover plates or under-lapping sleeves for end-butted floor deck units to cover gaps not otherwise covered by deck units and to cover welding access holes.

1. Fabricate cover plates of sheet steel of same type and not less than same thickness as decking.

2. Form cover plates approximately 6-inches wide and match contour of deck units.

3. Polyethylene-coated self-adhesive, 2-inch wide joint tape may be provided, instead of cover plates, on flat-surfaced decking.

G. Sump Pans: Provide sump pans of minimum 14 gage galvanized sheet steel at drains, as indicated on the Drawings.

1. Provide level bottoms and sloping sides to direct water flow to drain.

2. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3-inches wide.

3. Recess pans not less than 1-1/2 inches below roof deck surface unless otherwise shown or required by deck configuration.

4. Cut holes for drains in the field.

1.5 WEDGE ANCHOR FASTENING SYSTEM

A. Specified Manufacturer: EPIC Metals Corporation, Rankin, PA (412/351-3913 or 877/890-3742).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Wedge anchors shall be products produced by metal roof decking manufacturer.

C. Wedge Anchor Fastening System: ANK38 Ankor nut system manufactured by EPIC Metals Corporation, consisting of threaded Ankore wedge nut, coupling nut and all-thread hanger rod.

1. Wedge anchor components shall be manufactured of steel in the manufacturer's approved quality documentation.

2. Wedge anchor fastening system shall comply with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report No. ESR-2255.

3. Provide quantity of wedge anchor fastening assemblies to suit selected locations plus 10 percent spares. Deliver spares to City as directed by Construction Manager.

PART 2 - EXECUTION

2.1 PREPARATION

A. Supporting Structure Verification: Check alignment and levels of support framing. Do not proceed with metal deck installation until improper conditions have been corrected. Installation of decking shall constitute acceptance of supporting and surrounding construction.

2.2 DECKING INSTALLATION, GENERAL

A. Steel Decking Installation, General: Install steel deck and accessories in accordance with SDI Design Manual for Composite Decks, Form Decks and Roof Decks and accessories in accordance with manufacturer's instructions and recommendations, reviewed shop drawings and requirements specified herein.

B. Decking Placement: Do not start placement of deck units before supporting members are installed. Place deck units on supporting steel framework and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks. Unless otherwise indicated, provide 2-inch minimum bearing at supports.

C. Decking Alignment: Place deck units on supporting structure, in straight alignment of cells of abutting units for entire length of run.

1. Adjust decking units and align at right angles to supports before permanently welding into place.

2. Correct inaccuracies in alignment or leveling of supports before welding deck units into place.

D. Laps: Lap decking units unless as required by manufacturer and as indicated on Structural Drawings.

E. Securing of Decking: Secure steel decking to supporting structure flat and square, without warp or excessive deflection, as specified following under Article titled "WELDING OF STEEL DECKING".

F. Cutting and Fitting: Cut and neatly fit deck units and accessories around other Work projecting through or adjacent to decking. Decking splice and joint locations shall be compatible with roof ridges and valleys. Decking shall not be partially cut nor shall decking be field altered except as shown on Structural Drawings and reviewed shop drawings.

G. Loading of Decking: Do not use deck units for storage or working platforms until permanently secured. Do not exceed design live load as indicated on the Drawings.

2.3 WELDING OF STEEL DECKING

A. Decking Unit Welding: Install decking units flat and square, secured to adjacent framing without warp or excessive deflection.

1. Weld steel decking in accordance with AWS D1.1 and D1.3 and as indicated on Structural Drawings.

2. Weld through one thickness of sheet steel only.

3. All welding at locations scheduled to remain exposed shall be neat, regular and even, ready for finish painting. Repair galvanized finish with cold galvanizing compound neatly applied over minimum area necessary to restore corrosion resistance. Comply with requirements specified in Section 05081 - Galvanized Finishes on Steel.

4. Welding other than resistance-welding, shall be in accordance with applicable provisions of AWS D1.3.

5. Welding corrections: Comply with AWS requirements and procedures.

B. Welding Inspection: Testing Laboratory will provide special inspection as required by California Building Code (CBC) and as indicated on the Drawings.

2.4 OPENINGS

A. Reinforcement of Openings: Reinforce decking or frame as necessary for rigidity and load-carrying capacity at all openings.

B. Cutting and Drilling: Neatly cut or drill holes and other opening necessary for Work specified in other Sections. Obtain review and acceptance by Architect (Structural

Engineer) of holes or openings larger than 6-inches in diameter or diagonal, before drilling or cutting.

C. Openings: Openings shall not interfere with seismic members such as chords or drag-struts.

1. Reinforce decking or frame as indicated on the Drawings and as necessary for rigidity and support of other Work.

2. Provide additional metal reinforcement and closure pieces as necessary for strength and continuity of decking.

2.5 DECKING ACCESSORIES

A. Adjusting Plates: Provide in locations too narrow to accommodate full-size deck units, and install as recommended by decking manufacturer and as reviewed by Architect (Structural Engineer).

B. End Closures: Provide galvanized sheet metal closures to close open ends of cells at columns, walls, and openings in deck.

C. Closures Strips: Provide metal closure strips at open uncovered ends and edges of roof decking and in voids between decking and other construction. Weld sheet metal closures into position to provide a complete decking installation.

1. Provide sheet metal closures at both sides of all fire-rated partitions abutting decking.

2. At fire-rated partitions, pack space between closures full with fire safing insulation as closures are installed.

3. At non-fire rated partitions, pack space between closures full with unfaced acoustical batt insulation as closures are installed.

4. Provide metal closure strips at open uncovered ends and edges of decking and in voids between decking and other construction.

5. Provide flexible closure strips instead of metal closures, at Contractor's option, at tops of interior walls and partitions not of fire-resistive construction. Install flexible closures with adhesive in accordance with manufacturer's instructions.

D. Bracing: Brace continuous metal edge and end closure pieces with minimum 20-gage steel strap at 72-inches on center maximum.

E. Wedge Anchor Fastening System Installation: Comply with manufacturer's installation instructions and recommendations and applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report.

1. Locate wedge anchor fastening assemblies at locations as directed by Architect through Construction Manager.

2.6 CLEANING AND PROTECTION

A. Cleaning: Broom clean decking serving as roofing substrate and make ready for installation of roofing.

B. Galvanizing Touch-Up: At all field welds to remain exposed, scratches and other defects in galvanized surfaces of steel decking, wire brush surface to expose clean bare metal and immediately apply galvanizing repair paint.

1. Comply with requirements specified in Section 05081 - Galvanized Finishes on Steel.

2. Restore factory-applied pretreatment, primer and intermediate coat, making surface ready to receive finish coating specified in Section 09905 - Field Painting, for exposed interior conditions, and Section 09970 - Coatings for Exterior Steel, for exposed exterior conditions.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide miscellaneous metal fabrications complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Steel ladders.
2. Above-ceiling supports.
3. Steel angle guards.
4. Expansion control.
5. Non-standard connectors for wood framing.
6. All other miscellaneous metal fabrications required to complete the Work.

B. Related Work Not In This Section:

1. Finish painting. Section 09900 Field Painting and Section 09920 Coating System for Exterior Metals.
2. Setting of anchor bolts and inserts in concrete.
3. Steel backing plates on stud walls.

1.02 QUALITY ASSURANCE:

A. Reference Standards: Conform to the following as applicable:

1. AISC Standards: Code of Standard Practice for Steel Buildings and Bridges; Specification for the Design, Fabrication and Erection of Structural Steel for Buildings; and Steel Construction Manual.
2. AWS Standards: AWS D1.1, Structural Welding Code.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit Shop Drawings fully detailing all Work of this Section, including accessories, fastenings, and welding. Include minor connections and fastenings not indicated or specified to meet required conditions; indicate in detail on Shop Drawings.

B. Samples: Submit if requested by Architect.

1.04 PRODUCT DELIVERY AND HANDLING: Protect materials from damage during shipping, handling and storage. Work showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver welding electrodes to site in unbroken packages bearing manufacturer's name and contents identification.

1.05 JOB CONDITIONS: Verify conditions according to Section 01400. Verify all field measurements as required. Report any major discrepancy between the Drawings and field dimensions to Architect before fabrication of Work. Exercise caution to protect concrete floor surfaces and adjacent Work from damage.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS: Furnish materials conforming to the following:

Steel shapes:	ASTM A36.
Steel tubing:	ASTM A500, ASTM A501, or ASTM A36.
Steel pipe:	ASTM A120 standard weight for general use; ASTM A53 Grade B where used for structural purposes.
Stainless Steel:	Type 304, Finish as selected by Architect.
Bolts and nuts:	ASTM A307.
Electrodes:	AWS D1.1, E70XX Series as required for intended use.
Primer:	Red Oxide Primer or equal.
Non-shrink grout:	Master Builders "Embeco", W. R. Grace "Vibro-foil", or equal.
Galvanizing:	ASTM A123, hot dip, 2.0 ounce psf on actual surface with minimum 1.8 ounce on any specimen.
Galvanizing repair material:	All States Galvanizing Powder, Drygalv by American Solder and Flux, or equal hot applied material, or anodic zinc-rich galvanizing repair paint conforming to MIL-P-21035.

2.02 GENERAL FABRICATION REQUIREMENTS: Conform to the approved submittals, reference standards as applicable to the Work, and the requirements herein. Fabricate and form the Work to meet actual installation conditions as verified at the site. Obtain necessary templates and information and provide all holes and drilling indicated or required for securing Work of other trades to metal fabrications.

A. **Welding**: Conform to AWS D1.1, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Unless otherwise indicated or specified, weld joints by shielded electric-arc method. Grind exposed welds subject to contact to smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finishing treatment is required for permanently concealed welds and other exposed welds except as specified herein. Cut out defective welding with chisel or air arc and replace. Weld seams and corners continuously in compliance with AWS Requirements.

B. **Shop Priming**: Clean all exterior exposed steel in accordance with SSPC-SP6 Commercial Blast Clean with a 1.5 mil minimum angular anchor profile. Apply Tnemec 90-97 Tneme-Zinc (or approved equal) to all exterior exposed surfaces @ 2.5 to 3.5 mils DFT. 90-97 meets AISC slip coefficient requirements as Class B rating. Clean all interior steel in accordance with SSPC-SP2 Hand Tool Clean and /or SSPC-SP3 Power Tool Clean. Apply Tnemec 115 Uni-Bond Primer (or approve equal) @ 2.0 to 3.5 mils DFT. Do not prime galvanized items or items embedded in concrete or masonry.

C. **Galvanizing**: Galvanize specified items after fabrication is completed. Produce coating free of roughness, whiskers, unsightly spangles, icicles, barbs, sags, and other surface blemishes.

D. **Miscellaneous Items**: Fabricate items not specifically mentioned according to the Drawings, approved Shop Drawings, and as required to complete the entire Work. Galvanize exterior items and shop prime interior items unless otherwise shown or specified.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS:

A. **Grouting**: Provide grouting for Work of this Section as shown, specified, and required. Use non-shrink grout and conform to manufacturer's directions.

B. **Galvanizing Repair**: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified hot-applied galvanizing repair compound where surfaces remain exposed and unpainted.

C. **Shop Prime Coat Repair**: Do not apply metal primer in wet weather unless steel is protected from dampness and is dry. Clean field welds, field bolts, and all damaged shop primer after erection and apply a spot coat of the same primer used for the shop coat.

D. **Fasteners**: Provide fasteners and connectors of approved types as required for the installations, whether or not indicated. Provide galvanized fasteners for galvanized items and for exterior use.

3.02 SPECIFIC ITEMS: List of items hereinafter is not necessarily complete. Check all Drawings, other Sections of the Specifications, and with other trades, and provide miscellaneous metal fabrications as required to complete the entire Work.

A. **Steel Ladders**: Continuously weld joints and grind smooth and flush. Fixed ladders shall conform to the requirements of CCR Title 8, Section 3277 - Fixed Ladders. Materials to be 1" diameter rods at 12" on center for rungs and flat bar 2-1/2” by 3/8” thick for stringers. Fabricate and install in accordance with approved shop drawings. Fixed ladders shall be secured/locked requiring a key to access ladder. Ladders in open areas shall have side barriers between the wall and ladder to deny access behind ladder.

B. **Above-Ceiling Supports**: Provide steel hangers, supports, attachments, and other framing for support of ceiling-hung items in apartments and garage areas. Conform to approved Shop Drawings of related trades.

C. **Non-Standard Connectors for Wood Framing**: Fabricate as detailed or required for each item. Deliver to carpentry trade for installation.

D. **Expansion Control:** Fabricate expansion covers as detailed on the drawings.

END OF SECTION

ORNAMENTAL METALS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide all ornamental metal items, complete as indicated, specified and required.

A. Work In This Section: Principal items include:

1. Decorative Gates.
2. Decorative Railings, all types.
3. Decorative Trash Enclosure Gates.
4. Ornamental items as indicated on drawings or required to complete any and all ornamental metal items complete.

B. Related Work Not In This Section:

1. Metal fabrications.
2. Structural supports to receive architectural metal items.
3. Sheet metal as specified in Section 07600.
4. Section 09900 Field Painting and Section 09920 Coating System for Exterior Metals.
5. Finish carpentry.

1.02 QUALITY ASSURANCE:

A. Qualification of Fabricator: All Work of this Section shall be fabricated and installed by a specialist architectural metals fabricator, whose qualifications and experience are subject to Owner's review.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Showing complete details for all Work of this Section. For panel siding, showing details of girts for anchorage and attachments not indicated all provisions for expansion and contraction control, preparation for Work of other trades, architectural metal installations conform to Code.

B. Samples: Submit minimum 24" square Samples, connections and fasteners, plates including a connecting joint, finished as specified, and joint finished with sealant, and submit such other Samples Architect may request.

PART 2 - PRODUCTS

2.01 STEEL SHAPES, TUBING AND CLADDING PLATES: Conforming to ASTM A36, A500 and A501, metalized 20 gage minimum unless otherwise specified and as required to meet building code requirements, temper best suited for the purpose. Finish as scheduled on drawings or as selected by Architect. Size and shape as indicated, thickness as required and approved by Architect.

A. **Provide railing insets** as indicated on drawings. Fabricate as detailed on drawings. Provide shop drawings for Architects approval prior to fabricate. Finish as indicated on drawings or as selected by Architect. Provide all hardware and accessories required for proper installation.

2.02 ALUMINUM STEEL, TUBING, SHAPES, CLADDING PLATES: Provide Type 6063-T52 and 6063-T832 aluminum alloy, finish as scheduled on drawings or as selected by Architect, temper best suited for the purpose, minimum 3/16" thickness unless otherwise indicated on drawings.

2.03 STAINLESS STEEL, TUBING, SHAPES, CABLE, CLADDING PLATES: Provide Type 304, 20 gage, stainless steel, finish as scheduled on drawings or as selected by Architect, temper best suited for the purpose, minimum 3/16" thickness unless otherwise indicated on drawings.

2.04 GATES: Provide reinforced gates of galvanized steel or Grip-Loc if selected by Architect, structural shapes with welded joints to form rigid structures. Equip gates with three heavy-duty stainless steel barrel hinges as follows:

A. **Hinges** – heavy weight stainless steel concealed ball bearing type. Manufactured and supplied by Stanley, (860) 827-5828.

B. **Locks** – extra heavy duty satin stainless steel cylindrical keyed lever set. Manufactured and supplied by Schlage, San Francisco, CA, (415) 330-5600. Coordinate Keys with Building and Room Keys.

C. **Closer** – heavy duty satin stainless spring powered barrier free. Manufactured and supplied by Stanley, (860) 827-5828.

2.05 CUSTOM FABRICATED ITEMS (SPUN ALUMINUM DOMES): Fabricate in accordance with details on drawings and SMACNA requirements for each item. Provide to Architect shop drawings for approval prior to fabrication. Fabricate from materials using the proper alloy, oz. and thickness to prevent oil canning or telegraphing of any concealed fastener. Finish shall be as scheduled on drawings. Install in accordance with approved shop drawings.

2.06 FASTENERS: Where in connection with Steel, heat-treated aluminum or Type 316 non-magnetic stainless steel. Finish exposed fasteners to match the adjoining painting surfaces. Provide screw type fasteners. Do not place fasteners on exposed surfaces unless indicated on the Drawings or on approved Shop Drawings. Design connections to use concealed fasteners wherever feasible.

2.07 WELDING: Conform to AWS D1.1, as modified by referenced AISC Standards, and as indicated or noted on Drawings. Unless otherwise indicated or specified, weld joints by shielded electric-arc method. Grind exposed welds subject to contact smooth surfaces free of holes, slag, or other defects, flush with adjoining surfaces. No finishing treatment is required for permanently concealed welds and other exposed welds except as specified herein. Cut out defective welding with chisel or air arc and replace.

A. **Galvanizing Repair**: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified hot-applied galvanizing repair

compound where surfaces remain exposed and unpainted.

2.08 SHOP PRIMING: Clean all exterior exposed steel in accordance with SSPC-SP6 Commercial Blast Clean with a 1.5 minimum angular anchor profile. Apply Tnemec 90-97 Tnemec-Zinc (or approved equal) to all exterior exposed surfaces @ 2.5 to 3.5 mils DFT. 90-97 meets AISC slip coefficient requirements as a Class B rating. Clean all interior steel in accordance with SSPC-SP2 Hand Tool Clean and /or SSPC-SP3 Power Tool Clean. Apply Tnemec 115 Uni-Bond Primer (or approved equal) to all interior steel surfaces @ 2.0 to 3.5 mils DFT.

2.09 PAINT FINISH: Refer to either Section 05900 or Section 09900 for application procedures. All items shall either be painted in the field or factory applied as selected by Architect. Refer to Section 09900 for application procedures or below.

A. Powdercoating/Factory Applied Coatings:

1. Preparation
   a. Remove all loose mill scale, rust oil film and dirt.
   a. Clean all surfaces equivalent to SS PC-SP-6.
   b. Recoat all damaged and marred galvanized surfaces. Apply rich compound in accordance with manufacturer's instructions.
2. Powdercoating
   a. Do not powdercoat surfaces which will be embedded in concrete. Steel surfaces to be embedded in or bonded to concrete shall be primed only.

PART 3 - EXECUTION

3.01 INSPECTION: Article "Verification of Conditions", and report to Architect in writing those conditions that prevent or interfere with correct installation of Work of this Section.

3.02 INSTALLATION: Install and connect materials according to drawings and approved submittals. Carefully erect materials and check for correct alignment before completing permanent connections. Tighten fasteners to firm pressure without over-stressing oil canning or distorting connected materials. After installing, caulk all exposed joints in accordance with Section 07900 using sealant of color matching finish color. Remove defaced or damaged items and provide sound proper replacements as directed and approved, at no extra cost to Owner.

3.03 ISOLATION: Isolate all dissimilar metals and materials other than non-magnetic stainless steel. Conceal all isolation in finished Work.

3.04 CLEANING: Upon completion, clean and polish all surfaces and leave ready for service.

END OF SECTION

SECTION 05900

METAL FINISHES

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. This Section covers technical requirements for shop-applied fluorocarbon paint finish and forms a part of all other Sections which require materials to be finished according to this Section.

1.02 QUALITY ASSURANCE: Use products of one manufacturer to produce uniform quality, color, and finished appearance. Applicator(s) of paint finish shall be licensed by manufacturer. The Architect will return two pieces from each approved set of Master Samples to Contractor for production quality control.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. **Color**: Architect will inform Contractor of the exact paint color required prior to submission of the Master Samples. Manufacturer's to provide custom color as noted on the drawings.

B. **Master Samples**: Submit two sets of four identical Samples of paint finish, one set on minimum 12" squares of flat metal, one set on tubular sections at least 18" long. Submit as many sets of Samples as are required for approval.

C. **Samples Under Other Sections**: Samples of the paint finish required for the Work under other Sections shall demonstrate exact match with approved Master Sample sin all characteristics.

D. **Other Samples**: Submit such Samples as Architect may request.

E. **Product Data**: Submit approved paint manufacturer's Product Data covering paint materials, surface preparation, pretreatment or priming, application, handling, and repair and touch-up instructions.

F. **Certificates**: Submit certificate that paint system applicator(s) are currently licensed by the paint manufacturer. For each delivery of painted products to site, submit applicator's certificate that delivered products have been painted in accordance with this Section.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING: At all times, ship, store, and handle painted products by methods that prevent deterioration or damage. Conform to protection and packing requirements herein.

1.05 WARRANTY: Refer to Section 01740. Furnish to the Owner a written warranty for 10 years covering the fluorocarbon paint finish against defects in material or application, including chalking, loosening, peeling, or color changes exceeding 5 NBS units during the warranty period.

PART 2 - PRODUCTS

2.01 PVDF RESIN-BASED COATING

A. Specified Manufacturer: Coatings & Resins Division, PPG Industries, Inc. (Duranar brand), (412/274-7900 or 800/258-6398).

B. Acceptable Manufacturers: Products complying with specified requirements, produced by manufacturers listed below, will be acceptable. Products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Product Requirements.

1. Akzo Nobel Coatings, Inc. (Trinar brand), (614/294-3361 or 800/294-3361).
2. The Valspar Corporation (Fluropon brand), (972/485-7173 or 866/351-6900).
3. BASF Corporation (Fluoroceram brand), (248/948-2442).

C. Acceptable Resin Manufacturers: Provide coating based on PVDF resin produced by one of the following:

1. Kynar 500®, by Arkema, Inc., (800/225-7788).
2. Hylar 5000™, by Solvay Solexis, Inc., (856/853-8119).

D. PVDF Resin-Based Coating System: PPG Duranar series thermoplastic organic coating system containing minimum 70 percent Kynar 500 or Hylar 5000 polyvinylidine fluoride (PVDF) resin combined with proprietary ceramic/inorganic pigments for factory-application to aluminum extrusions. Coating system shall comply with the following:

1. American Architectural Manufacturers Association (AAMA) standard AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
2. Architectural Spray Coaters Association (ASCA) standard ASCA 96 - Voluntary Specification for Superior Performance of Organic Coatings.

E. Touch-Up Paint: For minor field repairs to finish, air-drying coating as produced and recommended by finish coating manufacturer's specifications.

F. Finish Color: UC51568XL Champagne Gold or unless otherwise selected by Architect.

G. Primer: Baking type epoxy primer manufactured for the approved paint system and furnished by the approved fluorocarbon paint manufacturer.

H. Touch-Up Paint: Air-dry exterior quality acrylic enamel, or equal, furnished by the finish paint manufacturer, color and gloss to exactly match paint finish.

2.02 PREPARATION FOR PAINTING: Clean, degrease, and prepare all surfaces according to paint manufacturer's instructions, using methods that do not damage materials or

leave deleterious residues. Comply with Aluminum Association Spec AA-C12 for aluminum, when applicable. Buff and polish exposed metal surfaces to remove all extrusion or fabrication marks which may show through completed paint finish.

A. **Pretreatment**: After buffing is completed, aluminum surfaces may be given a fine matte caustic etch pretreatment and rinse if standard with product manufacturer.

B. **Preparation of Other Metals**: Sandblast uncoated ferrous metal to white surface free of mill scale, slag, or paint primer. Clean zinc or cadmium coated metal surfaces of grease, oil, and other deleterious substances.

2.03 PAINT APPLICATION: Apply complete paint system under dust-free temperature and humidity controlled paint booth conditions and thermally bake each coat at the temperature and for the duration directed by paint manufacturer. Electrostatic spray application is preferred. Use methods that minimize handling both during and after application.

A. **Priming**: Apply epoxy primer on exposed and concealed surfaces, except interior of tubular members. Exposed surfaces include interior parts of channel-shaped glazing stops, glazing rebates, and like accessible or visible surfaces. Apply primer to a minimum 0.0002 (0.005 mm) dry film thickness.

B. **Finish Paint**: Apply on exposed surfaces and extend over concealed surfaces for a distance sufficient to assure complete continuity of coatings without visible skips, holidays, or thin edges, and so edges of finish paint are fully concealed by calking sealant, glass setting materials, abutting finish materials or finish items, and like items. Fully coat surfaces visible through glass edges. Paint thickness on corners and edges shall equal that on flat surfaces. Apply finish paint to a minimum 0.0008 inch (0.020 mm) dry film thickness.

C. **Heat Sensitive Materials**: Apply an especially formulated low baking temperature and slow hardening exterior quality siliconized polyester paint exactly matching the finish paint and furnished or recommended by fluorocarbon paint manufacturer on plastic-cored aluminum panels and other materials that are damaged by normal high baking temperatures. Carefully control heat during paint baking operations to prevent damaging or distorting heat sensitive materials.

2.04 PACKING AND SHIPPING PROTECTION: Do not handle the painted products until paint finish is fully cured and hardened.

A. **Primary Protection**: Cover finish painted surfaces with a compatible stripable pressure-sensitive covering material of type that does not leave adhesive on the surface when removed, or enclose items with a polyethylene film wrapping secured with tape bands.

B. **Packing**: Secure bundled items with resilient separators, pads, and strong bands or tape, non-staining types that prevent chafing, gouging, excessive pressure at any point, or other damage. Ship the items in water-resistant sealed containers labeled as to contents and locations unless installed immediately.

PART 3 - EXECUTION

3.01 PREPARATION FOR PAINTING: Clean, degrease, and prepare all surfaces according to paint manufacturer's instructions, using methods that do not damage materials or leave deleterious residues. Comply with Aluminum Association Spec AA-C12 for aluminum, when applicable. Buff and polish exposed metal surfaces to remove all extrusion or fabrication marks which may show through completed paint finish.

A. **Pretreatment**: After buffing is completed, aluminum surfaces may be given a fine matte caustic etch pretreatment and rinse if standard with product manufacturer.

B. **Preparation of Other Metals**: Sandblast uncoated ferrous metal to white surface free of mill scale, slag, or paint primer. Clean zinc or cadmium coated metal surfaces of grease, oil, and other deleterious substances.

3.02 PAINT APPLICATION: Apply complete paint system under dust-free temperature and humidity controlled paint booth conditions and thermally bake each coat at the temperature and for the duration directed by paint manufacturer. Electrostatic spray application is preferred. Use methods that minimize handling both during and after application.

A. **Priming**: Apply epoxy primer on exposed and concealed surfaces, except interior of tubular members. Exposed surfaces include interior parts of channel-shaped glazing stops, glazing rebates, and like accessible or visible surfaces. Apply primer to a minimum 0.0002 (0.005 mm) dry film thickness.

B. **Finish Paint**: Apply on exposed surfaces and extend over concealed surfaces for a distance sufficient to assure complete continuity of coatings without visible skips, holidays, or thin edges, and so edges of finish paint are fully concealed by calking sealant, glass setting materials, abutting finish materials or finish items, and like items. Fully coat surfaces visible through glass edges. Paint thickness on corners and edges shall equal that on flat surfaces. Apply finish paint to a minimum 0.0008 inch (0.020 mm) dry film thickness.

C. **Heat Sensitive Materials**: Apply an especially formulated low baking temperature and slow hardening exterior quality siliconized polyester paint exactly matching the finish paint and furnished or recommended by fluorocarbon paint manufacturer on plastic-cored aluminum panels and other materials that are damaged by normal high baking temperatures. Carefully control heat during paint baking operations to prevent damaging or distorting heat sensitive materials.

3.03 PACKING AND SHIPPING PROTECTION: Do not handle the painted products until paint finish is fully cured and hardened.

A. **Primary Protection**: Cover finish painted surfaces with a compatible stripable pressure-sensitive covering material of type that does not leave adhesive on the surface when removed, or enclose items with a polyethylene film wrapping secured with tape bands.

B. **Packing**: Secure bundled items with resilient separators, pads, and strong bands or tape, non-staining types that prevent chafing, gouging, excessive pressure at any point, or other damage. Ship the items in water-resistant sealed containers labeled as to contents and locations unless installed immediately.

3.04 INSTALLATION OF PAINTED PRODUCTS: Where possible, leave the primary protection in place until just prior to final cleaning, removing only those parts required for connections. Where painted products are jambs or heads of openings used for passage of materials or debris, install temporary boarding or flashing necessary to protect the painted surfaces. Immediately remove damaged Work that cannot be satisfactorily repaired and provide acceptable Work at no extra cost to Owner.

3.05 TOUCH-UP AND REPAIR: Subject to Architect's prior approval in each case, minor scratches and blemishes in paint finish may be repaired with specified touch-up paint. Smooth edges of defects and use air-brush and hot-air-gun technique, or equal. Produce virtually non-apparent repairs. If repairs are not acceptable, remove and replace involved Work as directed and as specified above for damaged Work.

3.06 FINAL CLEANING: Just prior to final inspection, remove protection and clean the painted surfaces. Use non-abrasive cleaning agents that are satisfactory to the paint manufacturer.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide rough carpentry complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Rough construction wood and plywood framing.
2. Wood blocking, grounds, backing, stripping, cants, and nailers as indicated, specified, or required for securing other Work, except for those items specified to be furnished by other trades.
3. Provide rough hardware incidental to Work of this Section and install steel non-standard framing connectors furnished under Division 5.
4. Wood preservative treatment.

B. Related Work Not In This Section:

1. Concrete forms.
2. Finish carpentry and millwork.
3. Casework and cabinet work.
4. Insulation.
5. Furnishing of steel non-standard wood framing connectors.

1.02 QUALITY ASSURANCE:

A. Requirements of Regulatory Agencies: Conform to CBC Code Chapter 23 for construction, nailing, and connections except as exceeded by requirements on Drawings or specified.

B. Supervision: Perform rough carpentry under the direction of capable experienced foreman.

1.03 PRODUCT DELIVERY AND STORAGE: Store lumber materials, plywood, and metal items off the ground, protected from rain and dampness.

1.04 JOB CONDITIONS: Coordinate with related trades and plan the framing and furring to accommodate structural members, finish materials, piping, conduits, ductwork, mechanical and electrical equipment, accessories, and fixtures.

PART 2 - PRODUCTS

2.01 LUMBER: Douglas fir and Larch, all S4S unless otherwise indicated or specified, manufactured, graded, and bearing grade mark of WCLIB Standard Grading Rules 16 or WWPA Grading Rules, moisture content at time of installation not over 19% or less than 7%.

A. Grades: Use grades and species as noted on Structural drawings.

B. **Lumber Pressure Preservative Treatment**: Pressure treat all lumber for blocking, screeds, cants, nailers, grounds, stripping, rough bucks, plates, sills, and the like resting on or against steel, masonry, or concrete, or connected to roofing, in accordance with AWPA Standard C1 and AWPI Standard LP-2, each piece of lumber bearing the mark of an approved testing agency. Deliver to the site at maximum 14% moisture content. When necessary to cut, notch, tap, bore, splice, or frame treated lumber, thoroughly paint newly cut surfaces with same preservative used in treatment of lumber.

C. **Sheathing**: Douglas fir plywood or OSB conforming to PS-1 or PS-2, Group I, "Exterior" type, grade marked by recognized grading agency (APA or TECO), grades as noted on Architect/Structural Drawings. Use sheathing grades indicated on structural drawings for structural application (diaphragms and shearwalls).

D. **Fire-Retardant Treatment**: Provide as indicated on drawings and where required by the Building Code. Pressure treat to flame spread rating of 25 or less and fuel contribution of 30 or less when tested in accordance with ASTM E84, each piece bearing the UL label of conformance. Re-dry to maximum 14% moisture content.

2.02 ROUGH HARDWARE: Provide rough hardware required to complete the Work shown and specified. The term "rough hardware" includes bolts, nuts, nails, washers, lag screws, washers, plates, post and beam anchors, joist hangers, framing hangers, wood connectors, and similar items used for construction of rough wood framing. Non-standard steel framing connectors are specified in Division 5 and installed under this Section.

A. **Nails**: Provide common wire nails, sizes as indicated. Provide ring-shank nails for plywood on floors.

B. **Adhesive (Glue)**: Elastomeric adhesive conforming to American Plywood Assn. Specification AFG-01 for "APA Glued Floor System".

C. **Bolts and Nuts**: ASTM A307, galvanized for exterior or exposed use.

D. **Washers**: As required by intended use, galvanized for exterior or exposed use.

E. **Stock Framing Connectors**: By "Simpson" or approved equal, types indicated or required, galvanized, with nails furnished by manufacturer of anchors used. Fully drive nails in all holes in anchors. If other than Simpson connectors are proposed for use, submit Code approval catalog data with proposed substitutions circled.

PART 3 - EXECUTION

3.01 GENERAL: Fabricate, install, connect and fasten, bore, notch, and cut wood and plywood framing with joints true, tight, and well-nailed, screwed, or bolted as required, all members with solid bearing without being shimmed. Set horizontal members subject to bending with crown up. Install framing plumb, square, true, and cut for full bearing. Splices are not permitted between bearings. Use full lengths except as detailed. The

notching, drilling, splicing, or cutting of any structural member is not permitted without prior approval. Reinforce or replace wood framing members damaged by erroneous cutting as directed. Perform cutting for other trades under their direction. Wherever necessary to avoid splitting, sub-drill for nails and screws with diameter of hole smaller than that of nails or screws.

3.02 NAILING: Use nails or spikes of such lengths that penetration into second piece of wood is not less than one-half the nail or spike length, except 16d nails shall be used to connect pieces of 2" nominal thickness. Set nails no closer together than one-half nail length, nor closer to wood edges than one-fourth nail length. Sub-drill holes where necessary to prevent splitting. Use of power driven nails is subject to approval by the Engineer. Demonstrate satisfactory installation of machine nailing at the site and obtain approval by Structural Engineer before using machine-applied nails; such approval is subject to continued satisfactory performance.

A. Nails and Spikes:

1. Furnish only common wire nails or spikes whenever indicated, specified or required.
2. Whenever necessary to prevent splitting, holes shall be pre-drilled for nails and spikes.
3. Nails in sheathing shall not be overdriven.
4. Machine Applied Nailing: Use of machine nailing is subject to a satisfactory Project site demonstration for each Project and review by the Engineer. Installation is subject to continued satisfactory performance. Machine nailing is not permitted for 5/16” plywood. Do not permit nail heads to penetrate outer ply. Maintain minimum allowable edge distances when installing nails.
    a. Powder Driven Fasteners:
        1. Loads shall not exceed 75 pounds unless indicated on the Drawings or when reviewed by the Architect.
        2. The operator, tool, and fastener shall perform the following as observed by the Engineer.
            a. Observe installation of first 10 fasteners.
            b. Test the first 10 fasteners by performing a pullout test. Load shall be at least twice the design load, or 150 pounds, whichever is greater.
            c. Random testing:
        3. Load less than 75 lb. - approximately 1 in 10 pins.
        4. Load 75 lb. or greater - 1/2 of the pins.
        5. Failure of any test will result in testing of all installed pins.
        6. Nail heads shall not break the outer skin of sheathing.
        7. Non-compliant pins shall be replaced.

3.03 LAG SCREWS. Place by screwing; do not hammer drive into place. Install screws with anchorage embedment in piece lagged of not less than 60% of screw length or 8 diameters. Provide standard malleable iron or steel plate washer under heads. Bore a hole of same diameter and depth as shank. For threaded portion of screw, bore the hole with a bit not larger than base of thread.

A. Lag Screws:

1. When installing lag screws in a wood member, pre-drill hole as recommended by CBC.
2. Lag screws, which bear on wood, shall be fitted with standard steel plate washers under head. Lag screws shall be screwed and not driven into place.

3.04 BOLTS: Clamp members together and bore holes true to line and 1/32" to 1/16" larger than bolt diameter. Provide standard malleable iron or steel washers under heads and nuts when bearing on wood. Draw nuts up tight as installed and again just prior to being enclosed with other materials or at completion.

A. Bolts:

1. Lumber and timber to be fastened together with bolts shall be clamped together with holes for bolts bored true to line.
2. Bolts shall be fitted with steel plates or standard cut washers under heads and nuts. Bolts shall be tightened when installed and again before completion of the Work of this section.

3.05 WOOD SCREWS: When installing wood screws, pre-drill holes as recommended by CBC.

3.06 FRAMING ANCHORS: Framing anchors, joist hangers, ties, and other mechanical fastenings shall be galvanized or furnished with a rust inhibitive coating. Nails and fastenings shall be of the type recommended by manufacturer.

3.07 SILLS ON CONCRETE OR MASONRY: Anchor as indicated or required by Code. Tighten with washers and nuts to level bearing. Use pressure treated lumber or approved redwood.

3.08 STUD WALLS, PARTITIONS AND FURRING:

A. Wood stud walls, partitions and vertical furring shall be constructed of members of size and spacing indicated. Provide single plate at bottom and double plate at top unless otherwise indicated, installed to provide overlapping at corners and at intersections with other wall and partitions or by metal ties as detailed. Interior, nonbearing non-shear partitions may be framed with a single top plate

B. Walls and partitions shall be provided with horizontal staggered blocking at least 2" nominal thickness and same width as studs, fitted snugly, and nailed into studs. Blocking shall be installed at mid-height of partition or not more than 7 feet on center vertically. Install wood backing on top of top plate wherever necessary for nailing of lath or gypsum board.

C. Walls, partitions and furred spaces shall be provided with 2" nominal thickness wood firestops, same width as space to be firestopped, at ceiling line, mid-height of partition and at floor line. Firestops at floor line are not required when floor is concrete. If width of opening is such that more than one piece of lumber is necessary, provide 2 thicknesses of one inch nominal material installed with staggered joints.

D. **Firestops shall be** installed in stud walls and partitions, including furred spaces, so the maximum dimension of any concealed space is not over 10 feet.

E. **Corners, and where** wood stud walls and wood vertical furring meet, shall be constructed of triple studs. Openings in stud walls and partitions shall be provided with headers as indicated and a minimum of 2 studs at jambs, one stud of which may be cut to support header in bearing.

F. **Where wood and masonry** or concrete walls intersect, end stud shall be fastened at top, bottom and mid-height with one 1/2” diameter bolt through stud and embedded in masonry or concrete a minimum of 4”. Bolts shall be provided with washers under nuts.

G. **Sills under bearing walls,** exterior walls, and shearwalls shall be bolted to concrete as indicated on structural drawings. There shall be an anchor bolt within 9” of each end of each piece of sill plate. Sills shall be installed and leveled with shims, washers, with nuts tightened to level bearing. Space between sill and concrete shall be dry packed with cement grout.

3.09 FLOOR FRAMING: Provide joists as indicated, laid with crowning edge up and with minimum 3-1/2" end bearing unless otherwise shown. Conform floor framing to the following requirements unless otherwise indicated.

A. **Bridging and Blocking**: Provide nominal 2" thick solid blocking of same depth as joists, cut in between joists at walls and partitions. Use I-joist blocking for framed areas of I-joists. Provide nominal 2" thick solid or cross bridging between the joists where spans are over 8-feet, interval between rows of bridging not over 10-feet.

B. **Spacing**: Space joists as indicated and provide proper clearance for plumbing, heating, or other piping where partitions occur above joists. Where a partition containing such piping runs parallel to joists, provide double joists under the partition, space to pass the piping, and install 1-1/2" solid bridging between these joists at maximum 4-foot centers.

C. **Header, Tail, and Trimmer Joists**: Provide doubled header joists and single tail joists installed with joist hangers, and doubled trimmer joists where supporting header joists.

D. **Floor Sheathing**: Sheathing of thickness and adhesive/nailing shown on drawings. Install with the face grain across supports, end joints staggered and centered over supports. Provide solid blocking under plywood edges. Plywood sheets for floor shall be secured in place with elastomeric adhesive which shall be applied at all beams, joists and perimeter supports and at all panel edges, in addition to nailing.

1. Subflooring: Floor sheathing: Plywood of thickness and nailing indicated. Install with the face grain across supports, end joints staggered and centered over supports. Provide solid blocking under plywood edges where indicated. In addition to nailing, sheets of plywood flooring shall be

secured in place with adhesive, installed at beams, joints, perimeter supports and panel edges.

3.10 ROOF/FLOOR AND CEILING FRAMING: Provide joists as shown, placed with crowning edge up. Conform to the following requirements unless otherwise indicated.

A. Floor Joists, Roof and Ceiling Framing:

1. Wood joists shall be of the size and spacing indicated, installed with crown edge up, and shall have at least 3-1/2" bearing at supports. Provide 1-1/2" solid blocking, cut in between joists, same depth as joists, at ends and bearings, unless otherwise indicated.
2. Floor joists of more than 12" in depth and roof joists of more than 8" in depth shall be provided with bridging. Floor joists shall be bridged every 8 feet with solid blocking or metal cross bridging. Roof joists shall be bridged every 10 feet.
3. Joists under and parallel to bearing partitions shall be doubled and nailed or bolted together as detailed. Whenever a partition containing piping runs parallel to floor joists, joists underneath shall be doubled and spaced to permit passage of pipes and blocked with solid blocking spaced at not more than 4 feet intervals.
4. Trimmer and header joists shall be doubled, when span of header exceeds 4 feet. Ends of header joists more than 6 feet long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition, or wall. Tail joists over 12 feet long shall be supported at header by framing anchors or on ledger strips at least 2 x 4.
5. Provide solid blocking between rafters and ceiling joists over partitions and at end supports where indicated.

B. Beams, Girders and Joists:

1. Ends of wood beams, girders and joists which are 2 feet or less above finished outside grade and which abut, but do not enter concrete or masonry walls, as well as wood blocking used in connection with ends of those members shall be treated with wood preservative.
2. Where wood beams, girders and joists enter masonry or concrete walls 2 feet or less above outside wall, metal wall boxes or equivalent moisture barriers shall be provided between wood and masonry or concrete.

C. Bridging: Provide 1-1/2" solid wood blocking, cut in between joists for same depth as joist, as indicated. Metal cross-bridging may be used in lieu of wood cross bridging, spacing same as wood bridging.

D. Roof Sheathing: Provide roof sheathing of thickness and nailing shown on drawings. Block all edges. Thickness of Sheathing and crickets shall be the greater of that shown on the drawings or as required by the roofing material manufacturer. Install panels with close joints and nail at each support as indicated. Provide pressure-treated cant strips and saddles where shown or necessary to pitch water to drain outlets.

1. Roof sheathing shall be Exposure-1, grade and thickness as indicated.

2. Where exposed roof sheathing is indicated, area shall be sheathed solid with dressed and center matched, V-jointed boards of sizes indicated. Boards shall be installed perpendicular to supports.
3. Soffits of overhanging eaves, where indicated, shall be boxed-in using Group I, Exterior Type, grade as selected by Architect, plywood, thickness as indicated.
4. Sheathing for shearwalls shall have grade and thickness as indicated. Install with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports. Shearwall construction, nailing, and top and bottom anchorage shall be as indicated.
5. Provide and install blocking for built-up roofing areas, block all edges.

3.11 NAILING STRIPS AND PLATES: Provide wood nailing strips, plates, and blocking as shown or required, securely nailed or screw fastened in place. Bolt wood strips and plates to metal. Use treated lumber for members on concrete or masonry.

3.12 WOOD BACKING: Provide wood backing to receive mechanical or electrical fixtures and equipment, bases, cabinets, door stops, wall plates, toilet accessories and partitions, and other fixed equipment or other fixed items, as indicated or required, securely nailed or screw fastened to framework. Coordinate locations with related trades.

3.13 ERECTION OF WOOD JOISTS: Lift joists only at designed lift points. Distortion or loads which cause member stresses exceeding design limits are not allowed. Provide erection bracing in addition to permanent bridging to keep the joists straight and plumb as required to assure adequate lateral support for the individual joists and the entire system until sheathing is applied. Give notice prior to enclosing joists to allow inspection of the installation.

END OF SECTION

SECTION 06192

METAL-WEB WOOD JOISTS

PART 1 - GENERAL

1.01 DESCRIPTION: This Section covers Contractor's survey work and engineering responsibilities where required under this Project.

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Open web, wood chord, metal joists.

B. Related bridging, bracing and anchors.

1.2 RELATED SECTIONS

A. Section 05120 - Structural Steel: Fabricated steel supports.

B. Section 05505 - Miscellaneous Metal Fabrications: Fabricated steel connectors.

C. Section 06112 - Wood Framing and Sheathing: Surrounding and supporting wood frame structure.

D. Section 06174 - Wood I-Joists: Factory fabricated I-shaped wood framing members with plywood webs.

1.3 SYSTEM DESCRIPTION

A. Design Criteria:

1. Design Live Load: As indicated on the Drawings.

2. Wood chord metal joists shall be sized and detailed to fit the dimensions and loads indicated on Drawings.

3. Designs shall be in accordance with allowable values and section properties assigned and approved by the building code.

1.4 SUBMITTALS

A. Shop Drawings: Indicate all critical dimensions for determining fit and placement in the building as well as loads the members are designed to support. Indicate framing system, sizes and spacing of joists, loads and joist cambers, bearing and anchoring details, bridging and bracing and framed openings. Review of shop drawings shall be completed prior to fabrication.

B. Calculations: Submit structural calculations certified by Registered Civil or Structural Engineer licensed in State of California.

C. Installation Instructions: Submit manufacturer's installation instructions and recommendations for Project conditions.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Conform to California Building Code (CBC), Chapters 16 and 23 for loads, seismic zoning, classification of building, and other loading criteria and fire-resistance requirements of floor-ceiling assembly and roof-ceiling assembly, as applicable.

2. In addition to conforming with all applicable Codes and regulations, manufacture wood chord metal joists in a plant acceptable to Authority Having Jurisdiction (AHJ), with inspection by an independent inspection and testing agency.

B. Fabricator's Qualifications: Company specializing in fabrication of wood chord metal trusses with minimum of 5 years verifiable experience. Design joists under direct supervision of Registered Civil or Structural Engineer experienced in wood chord metal joist design and licensed in State of California.

1.6 DELIVERY, STORAGE AND HANDLING

A. Packaging: Piece-mark and wrap wood chord metal joists in packages before arrival at jobsite.

B. Protection: Members shall be protected from weather and damage during transportation, erection, and construction.

C. Storage: Store material at site off the ground in a vertical position.

1.7 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate and fit metal chord wood joists with carpentry Work and other related Work. Scribe and cope as required for accurate fit. Locate joists and related furring, nailers, blocking, grounds and similar supports to allow proper attachment of other Work.

PART 2 - PRODUCTS

2.1 WOOD CHORD METAL JOISTS

A. Specified Manufacturer: Red Built, LLC; Chino, CA (909) 465-1208

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements, provided products meet or exceed the section modulus of elasticity and moment of inertia (EI) of the specified products, and are acceptable to the Authority Having Jurisdiction (AHJ). Depths of wood chord metal joists shall not exceed those the product indicated on the Drawings, unless approved by Architect.

C. Wood Chord Metal Joists: Sloped top chord, level bottom chord, double top and bottom chords, complying with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report ESR-1774 Red Built series and sizes of joists as indicated on Drawings.

D. Structural Wood Chord Members: Red Built - MSR Lumber, manufactured in accordance with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report ESR-1774.

1. Moisture content shall be between 6 and 7 percent.

2. Laminated veneer lumber shall have modulus of elasticity (E) of not less than 2.0×10^6.

E. Steel Web Members: Accurately die-stamped, electrically-welded, cold-rolled steel tubing, 45,000 psi minimum yield strength, electro-galvanized.

F. Connecting Pins and Bearing Accessories: Structural carbon steel, size as required for member design, electrogalvanized in compliance with ASTM A 307 or ASTM A 449.

G. Joist Bridging: Type, size and spacing as recommended by joist manufacturer, or as indicated on the Drawings.

H. Adhesives: Waterproof types, as standard with joist manufacturer.

I. Fabrication: Shop fabricate all joists in accordance with Reference Standards and for use in accordance with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report ESR-1774

2.2 ACCESSORIES

A. Wood Blocking, Support Members and Framing for Openings: In accordance with Section 06112 - Wood Framing and Sheathing and Section 06114 - Wood Backing, Blocking and Curbing.

B. Framing Anchors and Fasteners: Comply with requirements specified in Section 06112 - Wood Framing and Sheathing, except provide framing anchors and fasteners as required and recommended by joist manufacturer, as applicable. Fasteners shall be galvanized steel.

C. Bearing Plates: Electrogalvanized steel, as indicated on Drawings or, if not indicated, as recommended by manufacturer.

2.3 WOOD CHORD METAL JOISTS FABRICATION

A. Wood Chord Metal Joists Fabrication: Shop fabricate joists in accordance with applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report, including conditions of acceptance by the Authority Having Jurisdiction (AHJ).

1. Fabricate wood chord metal joists in accordance with notes on Drawings.

2. Provide continuous chords without joints.

3. For spans greater than 20'-0", manufacture wood chord metal joists with camber based on radius of 2250'-0", unless otherwise indicated on the Drawings.

2.4 SOURCE QUALITY CONTROL

A. Source Quality Control:

1. Provide continuous inspection of fabrication by a compliance assurance or inspection agency listed by the National Evaluation Service Committee as part of manufacturer's standard in-plant inspection policies and procedures.

    a. Inspector shall be subject to approval for that purpose by Authority Having Jurisdiction (AHJ).
    2. To be eligible for approval, the fabrication inspector shall be examined as to his knowledge and experience in glued construction.

3. After fabrication and inspection, stamp each joist with an identifying mark, noting name and plant number of manufacturer, grade, applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report number, and identification of quality control agency.

B. Structural Wood Chord Members:

1. The fabrication inspector shall make a verified report identifying the members by mark and including pertinent data such as grade and specie of lumber, the type of glue, the extremes of moisture content and such other information as may be required.

2. The fabrication inspector's verified report shall show, of his own personal knowledge, the Work covered by the report has been performed and materials used and installed in every product in accordance with, and in conformity to, the duly approved plans, shop drawings and specifications.

3. The verified report, together with an identified copy of the lumber grade certificate shall be mailed to Authority Having Jurisdiction (AHJ).

C. Steel Web Members: Round tubular steel web members shall be certified as to conformance to ASTM A500, Grade B, by mill certificate.

1. Members shall be identified by heat or melt number.

2. One tension and on bend test shall be made for each heat.

3. The tests shall be made by an independent laboratory on samples selected by the fabrication inspector, who will be in overall charge of fabrication inspection.

4. One copy of test report shall be forwarded to the Authority Having Jurisdiction (AHJ) for each project.

D. Welding: All welding operations shall be inspected by a qualified welding inspector who will furnish a written report to the Authority Having Jurisdiction (AHJ) verifying that the welding has been performed in accordance with the plans and specifications.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination: Coordinate placement and installation of support items.

B. Scheduling: Coordinate and sequence wood chord metal joist installation and details with Work specified in other Sections, to ensure proper interface of joists with adjoining components, to minimize cutting and penetration of joists and to limit erected joists to the shortest possible exposure to the elements before closing-in of building envelope.

3.2 INSTALLATION

A. Installation: Erect and secure joists as indicated on Drawings, the reviewed shop drawings and manufacturer's installation instructions and recommendations.

1. Space, adjust and align joists in proper locations before permanently fastening. Align joists between supports and hold in place with temporary bracing until sheathing is secured in place.

2. Immediately fasten joists to supporting construction after setting in proper location, with joists plumb, square and true to line. Use fasteners as indicated on the Drawings and in accordance with applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report, including conditions of acceptance by the Authority Having Jurisdiction (AHJ).

3. Make connections and install all blocking, stiffeners and bridging as erection progresses and before construction loads are imposed on joists.

4. Do not permit temporary construction loads which cause member stresses beyond design limits.

B. Openings: Frame openings between joists with lumber as specified in Section 06112 - Wood Framing and Sheathing and as indicated on Drawings. Place headers and supports at wall openings as required.

C. Blocking and Stiffeners: Install blocking and stiffeners as required and shown for lateral support of members, to provide nailing surface for sheathing and finish materials and to fireblock cavities in accordance with California Building Code (CBC), Chapter 23.

D. Erection Bracing: Provide erection bracing in addition to specified bridging to keep joists straight and plumb and to assure adequate lateral support until sheathing material has been applied.

E. Construction Loads: Do not permit temporary construction loads which cause member stresses beyond design limits.

F. Tolerances: 1/2-inch maximum from true position.

G. Field Cutting and Modifications: Do not alter joists in field except as permitted for penetrating elements such as piping and conduit.

1. Comply with details shown on the Drawings and according to applicable ICC Evaluation Service, Inc. (ICC ES) Evaluation Report, including conditions of acceptance by the Authority Having Jurisdiction (AHJ).

2. Do not repair damaged or defective joists. Joists which are damaged or found to not conform to specified requirements shall be rejected and immediately removed from the Project site. Provide new joists at no change in Contract Time and Contract Sum.

END OF SECTION

SECTION 06181

GLUE LAMINATED STRUCTURAL UNITS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Prefabricated, glue laminated wood** units equivalent to sawn lumber framing ("minilams").

B. **Related steel framing** hardware and attachment brackets.

1.02 RELATED SECTIONS

A. **Section 01400 - Quality Control**: Tests and inspections for glue-laminated structural units.

B. **Section 05500 - Metal Fabrications**: Custom fabricated metal framing anchors for glue laminated wood units. Custom fabricated metal framing anchors.

C. **Section 03200 - Reinforcing Steel**: Embedding anchors and brackets for glue laminated wood members into concrete.

D. **Section 06100 – Rough Carpentry**: General requirements applicable also to glue laminated wood members. Heavy timber construction is Sawn wood members for field-fabricated, heavy-timber trusses; heavy-timber decorative beams, corbels and trellis framing; and solid wood decking, used as roof deck at exposed roof overhangs.

E. **Section 06181 – Glued Laminated Structural Units**: Pre-engineered and factory-manufactured lumber.

F. **Section 06192 – Composite Wood Web Joists**: Manufactured wood framing members.

E. **Section 09900 - Painting**: Field finishing of exposed glue laminated structural units with stain and varnish.

1.03 SUBMITTALS

A. **Shop Drawings**: Indicate pertinent dimensions, camber, grades, species, shop applied finishes, cuts and drilled holes, fasteners, erection details and connection materials and finishes.

B. **Sustainable Design Submittals**:

1. Product data: For laminating adhesive used for structural glued-laminated timber, indicating that product contains no urea formaldehyde.

2. Certificates: Chain-of-custody certificates certifying that lumber used in manufacture of structural glue-laminated timbers are from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body. Include statement indicating costs for each certified wood product.

C. Certificates:

1. Certificates of Compliance: Certify compliance with AITC 110-83, PS 56, ANSI/AITC Standard A190.1 and ASTM D 3737.
2. FSC Chain-of-Custody Certificate: As specified above.

1.04 QUALITY ASSURANCE

A. Manufacturer: Certified by American Institute of Timber Construction (AITC).

B. Industry Standard: Comply with ANSI/AITC A 190.1 - Structural Glued Laminated Timber.

C. Regulatory Requirements: Conform to requirements of California Building Code (CBC) for loads, seismic zoning, classification of building, and other loading criteria and fire-resistance requirements of floor-ceiling and roof-ceiling assemblies, as applicable. Members shall be fabricated and inspected in accordance with the requirements of ANSI/AITC A 190.1 - Structural Glued Laminated Timber.

D. Industry Standards: Fabrication shall comply with the following standards.

1. ANSI/AITC A190.1 - Structural Glued Laminated Timber.
2. ASTM D3737 - Structural Glu-Laminated Timbers, Softwood and Hardwood Species.

E. Manufacturer Qualification: Provide factory-glued structural units, produced by an AITC-licensed firm qualified to apply the AITC Quality Inspected mark.

F. Product Identification: Factory-mark each piece of glued laminated structural units with AITC Quality Inspected mark. Place AITC mark on timber surfaces which will not be exposed in completed Work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protection: Protect members in accordance with AITC requirements. Piece-mark and wrap structural units before shipping to jobsite. Maintain wrapping until units are in place and ready to receive adjoining framing members.

1. For members to be exposed to view, individually wrap members.
2. For members to be concealed, bundle wrap or load wrap members.

B. Storage: Comply with AITC requirements. Protect members from weather and damage during transportation, storage, erection, and construction.

1. Schedule the delivery and the erection of glued laminated timber to avoid extended on-site storage, and to avoid delaying subsequent work.
2. Store units on sleepers above ground.
3. If individually wrapped, slit bottom of wrappings intermittently to allow moisture to escape.

PART 2 - PRODUCTS

2.01 LUMBER-SIZE GLUE LAMINATED WOOD STRUCTURAL UNITS

A. **Specified Manufacturer**: None identified.

B. **Acceptable Manufacturers**: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 – Material and Equipment, subject to acceptability of member sizes and structural performance equivalence.

C. **Lumber-Size Glue Laminated Wood Structural Units**: Type and size as indicated on the Drawings.

1. Members not exposed to view and not exposed to weather: Douglas fir, Industrial appearance grade, Combination Symbol as indicated on the Structural Drawings.
2. Members exposed to view or exposed to weather: Alaskan Yellow Cedar, Architectural appearance grade, Combination Symbol as indicated on the Structural Drawings with 95% heartwood.

D. **Camber:** As indicated on Drawings.

E. **Adhesive**: ANSI/AITC A190.1, wet-use type. Adhesive shall be formaldehyde-free. Adhesive color for Alaskan Yellow Cedar shall closely match the color of the wood.

F. **End Sealer**: Manufacturer's standard, transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.

G. **Penetrating Sealer**: Manufacturer's standard, translucent, penetrating wood sealer that will not interfere with application of wood stain and transparent finish, or paint finish.

2.02 GLUE LAMINATED WOOD STRUCTURAL UNITS FABRICATION

A. **Glue Laminated Wood Structural Units Fabrication, General**: Fabricate members in compliance with ANSI/AITC A190.1, ASTM D3737, and AITC 117, using laminating stock and adhesives of type to suit specified Combination Symbol and exposure.

1. Field verify dimensions and Project conditions before fabrication.
2. Each lamination shall be graded on the basis of the requirements of the nominal size of the individual lamination. When lumber is resawn, regrade

members on basis of new net size, at no change in Contract Time and Contract Sum. Comply with AITC 200, referenced in ANSI/AITC A190.1.

3. Provide pre-glued, plain scarf end joints in laminations.
   a. Portions of scarfs in adjacent laminations shall be separated by a minimum of 6-inches.
   b. Strength reducing defects such as wane will not be acceptable in or near an end joint.
   c. Sum of knots, which appear in the beveled surface of a scarf, shall not exceed one-fourth the nominal width of lamination when lamination is 1-5/8 inch or less in thickness.
4. Provide pre-glued edge joints.
   a. For lumber stock glued edge-wise and used in top or bottom lamination of glue laminated units for exterior use or when direction of load is parallel to wide face of the lamination.
   b. For lumber stock used in other laminations, laminations may consist of two or more pieces placed side-by-side, provided longitudinal edge joints in adjacent laminations are staggered at least 2-inches laterally.
5. Cut and fit members accurately to length to achieve tight joint fit.
6. Fabricate members with camber built in. Provide camber as indicated on Drawings.
7. Do not splice or join members in locations other than those indicated, without approval of Architect (Structural Engineer).

B. **Appearance Grade**: Provide grades as follows, complying with AITC 110.

1. Locations concealed from view: Industrial appearance grade.
2. Locations exposed to view: Architectural appearance grade.

C. **Sealing**: After end trimming, seal exposed members and members exposed to wet or damp conditions, in accordance with AITC requirements.

2.03 CONNECTORS, ANCHORS, AND ACCESSORIES

A. **Connectors, Anchors, and Accessories**: Provide stock- and custom-fabricated connectors of structural steel (ASTM A36 (ASTM A36 M)) shapes, plates and bars, welded into assemblies of types and sizes indicated, with steel bolts (ASTM A 307), lag bolts, and other fasteners, as indicated and as necessary.

1. At dry conditions, finish each assembly and fastener prior to use with rust-inhibitive primer, 2 mils (0.05 mm) dry film thickness. Coordinate primer with requirements specified in Section 09900 - Painting.
2. At damp and wet conditions, finish each assembly and fastener unit with hot-dip zinc coating (ASTM A153). Coordinate with primer requirements specified in Section 09920 Coatings Systems for Exterior Metals.

B. **Fabrication**: Fabricate connectors and use hardware so joints are neatly fitted, welded and, at exposed locations, ground smooth. Comply with general requirements for steel fabrications specified in Section 05505 - Miscellaneous Metal Fabrications.

C. Painted Finish at Connectors:

1. Interior conditions: As specified in Section 09900 - Field Painting.
2. Exterior conditions: As specified in Section 09920 - Coatings for Exterior Steel.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordination and Sequencing: Coordinate and sequence glue laminated units installation and installation details with Work specified in other Sections.

1. Do not install glue laminated members until supporting construction is in place and is braced and secured.
2. Ensure proper interface of glue laminated members with adjoining components, to minimize cutting and penetration of glue laminated members and to limit erected glue laminated members to the shortest possible exposure to the elements before closing-in of building envelope.

B. Coordinate routing of pipes, ducts and conduits to avoid penetrations through glue laminated structural units.

3.02 ERECTION

A. Erection: Erect and secure glue laminated units as indicated on Drawings, the reviewed shop drawings and manufacturer's installation instructions and recommendations.

1. Space, adjust and align glue laminated members in proper locations before permanently fastening. Align glue laminated members between supports and hold in place with temporary bracing until sheathing is secured in place.
2. Set members level and plumb, or to indicated slope, in correct positions.
3. Provide temporary bracing and anchorage to hold members in place until permanently secured.
4. Fit members together accurately without trimming, cutting, or any other unauthorized modification.
5. Immediately fasten glue laminated members to supporting construction after setting in proper location. Make connections as erection progresses and before construction loads are imposed on glue laminated members. Use fasteners as indicated on the Drawings.
6. Do not permit temporary construction loads which cause member stresses beyond design limits.

B. Erection Bracing: Provide erection bracing as necessary to keep glue laminated members straight and plumb and to assure adequate lateral support until other framing and sheathing materials have been applied.

C. Field Cutting and Modifications:

1. Do not alter glue laminated members in field except as approved by Architect for penetrating elements such as piping and conduit.
2. Do not repair damaged or defective glue laminated members. Glue laminated members which are damaged or found to not conform to specified requirements shall be rejected and immediately removed from the Project site. Provide new glue laminated members at no change in Contract Time and Contract Sum.

D. Weather Protection

1. Protect installed glue laminated members from exposure to weather and potential discoloration from sun and rain before finishing.

3.03 TOLERANCES

A. Framing Members: 1/4-inch maximum from true position.

END OF SECTION

SECTION 06192

COMPOSITE WOOD WEB JOISTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Composite wood web joists.
2. Bracing and bridging.
3. Rough hardware and fasteners.

B. Related work:

1. Division 6 for rough carpentry.

1.02 SYSTEM DESCRIPTION

A. General:

1. Wood I-joists shall be designed and manufactured by a manufacturer licensed to do so and accepted by the Authority Having Jurisdiction. I-joists shall have a valid ICC or IAPMO evaluation report for the applications shown on the drawings. Structural capacities and design provisions shall be established and monitored in accordance with ASTM D5055.
2. Certain assemblies are not fully detailed on the Drawings, which are diagrammatic and show basic dimensions, alignment and profiles of members and their relationship to other building components.

B. Design requirements:

1. Engineer, fabricate, assemble, and install joists to meet or exceed the criteria indicated and specified, to conform to the profiles indicated and to other requirements of the Contract Documents, to satisfy the requirements of the authorities having jurisdiction, and to provide a watertight, structurally sound, self-draining assembly.
2. Prepare and submit shop drawings, specifications, calculations and any other supporting data required for review and approval, and pay fees incurred, prior to beginning installation.
3. Engineering calculations for these assemblies shall bear the signature and seal of a California-licensed professional engineer.

C. Performance requirements:

1. Dead and live loads:
   a) Provide assemblies, including anchorage, that accommodate the supporting structure deflection from uniformly distributed and concentrated loads indicated without failure of materials or permanent deformation.

b) Limit deflection to span ratios as indicated in the structural drawings. Section properties of the I-joist only shall be used for deflection calculations.

2. Seismic loads: Provide assemblies, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction.

1.03 SUBMITTALS

A. Data:

1. Product data: Submit manufacturer's product data, specifications, typical installation details and other data for lumber, adhesives, fabrication process, preservative treatment and accessories as necessary to demonstrate compliance with the specified requirements.
2. Design data: Submit engineering calculations, signed and stamped by a California-licensed professional engineer, demonstrating compliance with the requirements of the authorities having jurisdiction for manufacturer-engineered assemblies.
   a) Calculations shall be legible and shall incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
   b) Test reports are not an acceptable substitute for calculations.
   c) Calculations shall include:
      1) Analysis of joist framing members.
      2) Analysis of anchors, including anchors embedded in concrete.
      3) Section property computations for framing members.
      4) Designation of hangers at ends of members.
      5) Seal and signature of design engineer.

B. Shop drawings:

1. Submit large scale, dimensioned drawings showing, member profiles, materials, member sizes, dimensions and hardware.
2. Include complete joist plan layout with each joist cross-referenced to the structural calculations. Indicate design loading of joists and allowable stress increases, camber and permanent bracing/bridging
3. Show connections to adjacent construction. Furnish isometric drawings for conditions too difficult to illustrate in 2 dimensions.
4. Coordinate the shop drawings with the work of other trades that are part of, or will be incorporated into, the work of this section. Indicate work to be performed by other trades, including adjacent and abutting materials to which this work is to be secured.

1.04 QUALITY ASSURANCE

A. Uniformity: Obtain all joists used for the Project from the same manufacturer.

B. Manufacturer's qualifications:

1. Firm with minimum of 5 years experience in the production of specified products.
2. Obtain joists only from a manufacturer who will send a qualified technical representative to the Project site before covering the work of this section to review installation.

C. Installer's qualifications: Firm and individuals with a minimum of 5 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

D. Regulatory requirements: Joists requiring fire-resistive assemblies shall be constructed to requirements of, and bear the required label from Underwriter's Laboratories (UL) or other agency approved by the authorities having jurisdiction.

E. Certifications: Factory-mark all joists delivered to the Project site with stamp indicating product type and grade, NER, ICBO ES or CCMC evaluation report number, manufacturer's name, plant number and the APA - Engineered Wood Association (APA EWS) Performance Rated I-Joist (PRI) trademark.

1.05 HANDLING

A. Delivery: Deliver materials to project site in original protective wrappings, clearly labeled with manufacturer's identification labels intact and legible, indicating manufacturer's name, brand, type, source of product, date of manufacture, and grade.

B. Storage: Store joists as shipped, in original wrappers, upright and off the ground on support blocks as recommended by the manufacturer, protected from sun and water.

1. Repair damaged or torn wrap with manufacturer's recommended repair tape.
2. Store away from direct sunlight, combustible materials and sources of heat.
3. Do not subject materials to abnormal heat, extreme dryness, humid conditions or sudden changes in temperature.

C. Handling:

1. Handle products to avoid damage.
2. To minimize checking, seal ends of joists after trimming or cutting and before storing.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of design is for prefabricated wood joists by Red Built, LLC.

2.02 MATERIALS

A. Joists:

1. Webs: Structural grade plywood, oriented strand board (OSB) or other approved web material
2. Flanges: Douglas-Fir laminated veneer lumber (LVL) or machine stress-graded lumber.
3. Adhesive: Manufacturer's standard exterior exposure "wet-use" type adhesive complying with one of the following:
   a) ASTM D 2559.

B. Accessories:

1. Builder's rough hardware: As specified in Section 06100.
2. Metal framing accessories:
   a) Basis of design is for galvanized or cadmium-plated steel joist hangers, framing anchors, fasteners and other such connection devices shall be of standard manufacture, of the types indicated, by Simpson Co. Other acceptable manufacturers include the following:
      1) Harlen Metal Products, Inc.
      2) USP Structural Connectors.
      3) Or equal.
   b) Nails used with the framing accessories shall be those furnished by the manufacturer with the framing accessories.

C. End sealer: Manufacturer's standard transparent, colorless wood sealer, effective in retarding transmission of moisture at cross-grain cuts.

2.03 FABRICATION

A. Shop-fabricate joists to the dimensions and profiles indicated, or required, in continuous lengths with all flange veneer grains and web strands oriented parallel to the member length, and in accordance with the reference standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.02 INSTALLATION

A. **Install in accordance with** the Contract Drawings, the lumber manufacturer's recommendations, the requirements of the authorities having jurisdiction and the following.

1. Erect plumb, true, securely anchored, accurately aligned, with all required fastenings, accessories, etc.
2. During erection, exercise care to keep horizontal bending of the joists to a minimum.
3. Install joists camber up with lateral bracing as indicated.
   a) Provide erection bracing to hold joists true, plumb and in safe condition until permanent bracing and bridging is in place to form a structurally sound framing system.
   b) Erection and permanent bracing shall be installed, and components permanently and securely fastened, before the application of any loads to the joists.

B. **Lifting:** Hoist members into position with proper bracing and secured at designated lift points. Keep out-of-plane bending to a minimum.

C. **Joints:** Accurately cut and solidly fit to provide strong, rigid joints with full bearing for members. Shimming is not permitted.

D. **Connectors:** Check for tightness. Re-tighten as necessary.

E. **Cutting:** Do not cut or notch joists, except as indicated or directed by the Architect.

1. Cut webs as shown on the Drawings, or accepted on shop drawings. Obtain Architect's approval to perform cutting not indicated.
2. Reinforcing: Unless otherwise detailed or required by the authorities having jurisdiction, reinforce locations where cutting is performed with 1/8-inch by 3-inch by 18-inch galvanized steel straps punched for 10d nails at 6-inch o.c.

F. **Site Tolerances:**

1. Joists shall be installed within 1/4-inch of true position.
2. Align joists to receive finished surfaces so the difference in plane between adjacent members is 1/8-inch or less at any point.

3.03 FIELD QUALITY CONTROL

A. **Temporary construction loads** that cause member deflections or stresses beyond design limits are not permitted.

B. **Manufacturer shall conduct** periodic on-site inspections of installation operations to verify the joist manufacturer's recommended procedures are being followed.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide and perform finish carpentry complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Plastic laminated cabinets, casework and countertops.
2. Natural finished cabinets and casework.
3. Custom-fabricated casework and countertops.
4. Back priming to extent specified.
5. Telephone and electrical backboards.
6. Installation of steel doors and frames.
7. Installation of wood doors.
8. Installation of finish hardware except as otherwise specified.

B. Related Work Not In This Section:

1. Finish painting.
2. Furnishing steel doors and frames.
3. Furnishing wood doors.
4. Furnishing finish hardware for doors.
5. Solid surfacing countertops.

1.02 QUALITY ASSURANCE: Work of this Section shall conform to the Manual of Millwork of the Woodwork Institute (WI), Current Edition, or Architectural Woodwork Institute, (AWI), Current Edition, and grades as specified herein or indicated. Prior to delivery to site, submit WI Certified Compliance Certificates indicating each millwork product for the Work and that all products will fully conform to the WI grades and other requirements shown and specified.

A. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates as noted on the drawings:
   a. Wilson Art.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit for following items, bearing the WI Certified Compliance Grade Stamp.

1. Show locations of steel backing plate or wood blocking required for the anchoring of cabinets, casework, and other Work of this Section. This work to be done by others.
2. Natural and paint finished cabinets and casework, each typical type.

B. Samples and Product Data: Submit the following for selection and approval:

1. Provide VOC compliant materials. Adhesives, adhesive primers, sealant, sealant primers and all coatings shall be VOC compliant products for all on site, applied products which are applied inside of building including building weatherproofing elements. Refer to Section 01350 LEED Requirements for VOC information.
2. Catalog data for each proposed cabinet hardware item.

1.04 QUALITY ASSURANCE

A. Mock-Ups: Construct mock-ups in accordance with directions of Architect. If approved by Architect, first unit of each casework type may be mock-up, subject to review and modification as directed. If acceptable, mock-up may be incorporated into completed construction. Provide mock-ups of the following:

1. Base cabinet with doors and interior shelf.
2. Base cabinet with drawers.
3. Upper cabinet with doors and interior shelving.
4. Plastic laminate countertop.

PART 2 - PRODUCTS

2.01 LUMBER MATERIALS

A. Softwood Lumber: Graded in accordance with AWI Architectural Woodwork Standards (AWS), maximum moisture content of 6 percent, any species and grade as allowed for Grade specified for woodwork product, unless otherwise indicated.

B. Hardwood Lumber: For concealed locations in plastic laminate casework, species according to AWI Architectural Woodwork Standards (AWS) for grade specified.

2.02 PANEL MATERIALS

A. Plywood Base for Plastic Laminate: Close-grained hardwood plywood, ANSI/AHA A135.4, all hardwood plies, non-telegraphing faces, low formaldehyde-emitting and complying with requirements of AWI Architectural Woodwork Standards (AWS) for specified grade.

1. Provide minimum thickness according to AWI Architectural Woodwork Standards, as detailed on Drawings and as specified herein.
2. Provide exterior grade product with waterproof glue (marine grade plywood) at countertop locations with plumbing fixtures.

B. Plywood for Drawer Construction: Birch or maple plywood, all hardwood plies.

C. **Wood Fiber Board:** Medium density fiberboard (MDF). Provide minimum thickness according to AWI Architectural Woodwork Standards (AWS) and details indicated on the Drawings.

D. **Wood Fiber Board:** Medium density fiberboard (MDF), ANSI A208.2, Grade 130, composed of 100 percent recovered and recycled wood fibers, containing no urea-formaldehyde resin binders, thickness according to Architectural Woodwork Standards (AWS) and details indicated on the Drawings, minimum 3/4-inch thick.

1. Specified Manufacturer: Sierra Pine Limited, (916/772-3422 OR 800/676-3339).
2. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
3. Casework panels and countertop substrate without plumbing fixtures: Medex or Medite II, manufactured by Sierra Pine Limited, medium density fiberboard (MDF), nominal 48 pcf for 3/4-inch and less thickness, and nominal 46 pcf for 13/16-inch and greater thickness.
   a) Wood fiber: 100 percent post-industrial recycled wood fiber.
   b) Binder: Formaldehyde-free adhesive system.
   c) Conformance: ANSI A208.2 industrial grade MDF.
   d) Moisture-resistance: Pass ASTM D 1037, 6-cycle accelerated aging test.
4. Countertop substrate with plumbing fixtures: Do not use wood fiber board. Provide exterior grade plywood with waterproof glue (marine grade plywood) with no added formaldehyde.

E. **Wood Fiber Board, Fire-Retardant:** Where indicated, provide panels complying with the following requirements that have fire-retardant chemicals bonded to softwood particles at time of panel manufacture to achieve products identical to those tested for flame spread of 20 or less and for smoke developed of 25 or less per ASTM E 84 by UL or other testing and inspecting organization acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1. Specified Manufacturer: Sierra Pine Limited, Roseville, CA (916/772-3422 or 800/676-3339).
2. Acceptable Manufacturers: Equivalent products of other manufacturers, including Duraflake Division, Willamette Industries, Inc., will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
3. Fire-retardant casework panels: Sierra Pine Medite-FR, medium density fiberboard (MDF), nominal 48 pcf for 3/4-inch and less thickness, and nominal 46 pcf for 13/16-inch and greater thickness. MDF shall be produced using no added formaldehyde.
   a) Wood fiber: 100 percent post-industrial recycled wood fiber.
   b) Binder: Formaldehyde-free adhesive system.
   c) Conformance: ANSI A208.2 industrial grade MDF.
   d) Moisture-resistance: Pass ASTM D 1037, 6-cycle accelerated aging test.

4. Listing: Fire-retardant particleboard shall be tested and certified by Guardian Fire Testing Laboratories, Inc., and certified for Class 1 (A).
   a) Flame spread: 20.
   b) Smoke developed: 100.

F. Particleboard: Not permitted.

G. Hardboard: ANSI/AHA A135.4, interfelted lignocellulosic fibers consolidated under heat and pressure, tempered treated, smooth one side. Provide thickness indicated or, if not indicated, 1/8-inch thick when used as a laminate and 1/4-inch thick (minimum) when used as drawer bottom, cabinet back or dust panel.

2.03 PLASTIC LAMINATE MATERIALS

A. Specified Manufacturer: As indicated on the Drawings. If not indicated, laminate shall be as selected by Architect from full selections of solid colors and matte textures of the following manufacturers:

B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements, subject to color(s) acceptably matching specified color(s), as determined by Architect.

1. Formica: Formica Corporation, (513/786-3400 or 800/367-6422).
2. Nevamar: Nevamar Corporation, (410/551-0341).
3. Pionite: Pioneer Plastics Corp., (207/784-9111 or 800/777-8113).
4. WilsonArt: WilsonArt International, (817/778-2711 or 800/433-3222).

C. Plastic Laminate Finish, Typical: NEMA LD 3 and ANSI A161.2.

1. Horizontal applications at countertops, not post-formed: NEMA Type GP50 (0.050-inch nominal thickness).
2. Horizontal applications at countertops, post-formed: NEMA Type PF42 (0.039-inch nominal thickness) horizontal post-forming grade.
3. Horizontal applications, other than countertops, and mill option for vertical applications: NEMA Type PF42 (0.039-inch nominal thickness).
4. Vertical applications: NEMA Type GP28 (0.028-inch nominal thickness) or NEMA Type PF42 (0.039-inch nominal thickness).
5. Colors and patterns: White Maple Veneer or as indicated on Drawings. If not indicated, then as selected by Architect.

D. Cabinet Liner: High-pressure cabinet liner laminate (HPL), 0.020-inch thick. Provide white color, unless otherwise directed.

E. Plastic Laminate Backing: NEMA LD-3, BK 20, high pressure paper base laminate without a decorative finish; Style ND, Type IV, 0.020-inch thick, smooth surface finish, for backing at countertops and other concealed locations.

F. Panel Edging:

1. For doors and drawers, polyvinyl chloride (PVC) T-molding, as manufactured by Edgebanding Services, Inc., San Dimas, CA (800/470-5831) or equal. Provide color as indicated on the Drawings or, if not indicated, as selected by Architect.
2. For cabinet body: High-pressure plastic laminate to match exposed face of panel.

2.04 ANCHORS, FASTENERS AND ACCESSORIES

G. Anchor Type, Sizing and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate. Refer to special seismic anchoring requirements noted on Drawings.

H. Anchors and Fasteners: Select material, type, size, and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Refer to general anchor requirements specified in Section 05090 - Anchors and Fasteners for anchoring into building substrates.

3. Screws: For use at wood or metal stud walls, minimum #14 x 3", Phillips truss head, type 17 hard, zinc plated, self-tapping, full head screws. Select material, type, size, and finish required for each use. Comply with applicable requirements of FS FF-S-111. For attachment to metal framing supports, provide screws as indicated on Drawings.
4. Countertop segment anchors: Tite Joint Fasteners.

I. Exposed Anchors and Fasteners: Same material, color and finish as the metal to which applied, except use only stainless steel at aluminum materials and use cadmium plated at interior pre-painted steel products.

J. Contact Adhesives: Formaldehyde-free, Type II Water-Resistant typically and Type I Fully Waterproof at damp locations and countertops.

K. Wall Adhesive: Solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

L. Countertop Segment Adhesive: Rigid (urea, resorcinol) adhesive, complying with requirements for Type II Water-Resistant adhesive.

2.05 HARDWARE

A. **Manufacturers:** Specified manufacturers shall be as listed and specified indicated below. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Where manufacturer is not specified, provide hardware complying with ANSI A156.9 and ANSI A156.11, as selected by Contractor as suitable for Project conditions, subject to review and acceptance by Facilities and Construction Manager and Architect. Provide non-ferrous (aluminum or stainless steel) at phenolic core casework.

1. Accuride: Accuride International, Inc., (562/903-0200).
2. Blum: Julius Blum, Inc., (704/827-1345).
3. EPCO: EPCO, Inc., (561/585-5545).
4. ERGO: ERGO Systems, Inc., 860/282-9767.
5. Häfele: Häfele America Co., (336/889-2322 or 800/334-1873).
6. Humanscale: Humanscale, Inc., (800/400-0625 or 714/430-6850).
7. Ives: H.B. Ives, (203/294-4837).
8. K&V: Knape & Vogt Manufacturing Co., (616/459-3311 or 800/253-1561).
9. MilesTek: MilesTek Corp., (940/484-9400 or 800/524-7444).
10. Mockett: Doug Mockett & Company, Inc., (310/318-2491).
11. Olympus: Olympus Lock (206/525-5338 or 800/525-0954).
12. Pro-Dec Products, Inc., (281/240-8050).
13. Stanley: The Stanley Works, (203/225-5111 or 800/337-4393).

B. **Finish Hardware for Casework:** Provide hardware as indicated on Drawings and as follows. If not indicated, provide hardware conforming to ANSI/BHMA A156.9, Grade 1 unless otherwise noted, as selected by Contractor and subject to acceptance by Facilities and Construction Manager and Architect.

1. Screw caps: For covering casework mounting screws visible at exposed and semi-exposed locations in casework, Snap-Cap®, manufactured by Pro-Dec Products, Inc., two-piece decorative plastic washer and cap, color to match surrounding casework panel finish or as selected by Architect. Verify color with Architect prior to ordering.
2. Shelf standards: Hettich International, catalog no. 1005-767, Sekura 1 or approved equivalent, 0.5 mm hole diameter with seismic (earthquake) pin, 50 lbs per clip working load rating.
3. Door hinges: Grade 1, concealed ("European") style hinges, to provide minimum of 165-degrees opening, Häfele Aximat-SM, unless other hinges are selected by the Architect.
4. Drawer slides: No substitutions.
    a) Typical drawers, full extension, 90-100 lb. capacity: Accuride 3832.
    b) Heavy drawers, overtravel design, 150 lb. capacity: Accuride 4034 Series.
    c) Shallow drawers, full extension, low profile, 65 lb. capacity: Accuride 2632.
    d) File drawers, 1-inch overtravel, 200 lb. capacity, three-section slide, 0.89-inch slide space: Accuride 3640.

5. Retracting door hardware: Accuride 1332 Anti-Rak Flipper Door Slides with Anti-Rak cable, vertical retracting slide with hinge carrier strip and extra hinge; one hinge per foot of door height.
6. Door and drawer pulls: Atlas IT Pulls (5-1/16”), satin chrome plated steel or brushed stainless steel, or approved equivalent.
7. Drawer stops: Provide stops to prevent drawer fronts from hitting face of cabinet body.
8. Computer CPU mount: CPU 300 manufactured by Humanscale, or equal, with the following attributes:
    a) Adjustable to fit CPUs 3.25-inches to 9-inches wide and 10.5-inches to 18-inches tall.
    b) Fabricated from cold-rolled steel with black powder-coated finish.
    c) Designed to support CPUs weighing up to 40 lbs.
    d) CPU slides smoothly on nylon glides in 16-inch track.
    e) CPU mount rotates full 360 degrees for complete access to cables and ports.
    f) Includes handle for pulling and pushing CPU out and in.
    g) CPU shall be secured in place using proprietary security screws and nuts which can be removed only with special tools.
    h) Installed Dimensions: CPU width +1.5-inches by CPU height +3-inches.
9. Keyboard supports: Synchronicity by ERGO, Little Twist series, retracting keyboard support surface with attached twist-out mouse platform.
10. Keyboard drawer: Accuride CB ERGO-Tray, 30-inches wide, suitable for mouse at left or right side, with gel-filled wrist rests.
11. Sliding door slides: KV2412.
12. Sliding door pulls: Grant 428.
13. File folder supports: As suitable for Pendaflex file folders, chrome plated.
14. Cabinet drawer/door locks: Olympus 500DR door locks and Olympus 600DW drawer locks, re-keyable and capable of being masterkeyed. Exposed lock nose shall match metal and finish of other exposed hardware on casework.
    a) Provide locks at all drawers, single doors and on active leaf of paired doors.
    b) Provide 3 keys for each keyed-alike lock in each room.
    c) Coordinate locks and latches specified below. At pairs of doors, active leaf shall have lock and inactive leaf shall have elbow catch.
    d) Assist Owner with developing a key schedule for drawer locks when shop drawings are reviewed. Integrate cabinet drawer and door locks with existing campus masterkey system. Coordinate with casework locks specified in Section 12345 - Wood Laboratory Casework.
    e) Provide stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:
        1) 2 for each keyed different lock.
        2) 3 for each group keyed alike locks.
        3) 2 for master keys for each system.
15. Elbow catches: Ives IV2AM, aluminum. Coordinate locks and latches specified below. At pairs of doors, active leaf shall have lock and inactive leaf shall have elbow catch.

16. Magnetic catches: Provide magnetic catches at all doors with locks and all doors without elbow catches, Amerock (National) No. 61-570, Stanley No. 41 or approved equivalent.
17. Closet poles: 1-1/16 inch diameter chrome plated steel, 14 gage minimum, with chrome plated steel pole sockets.
18. Grommets: Mockett MM Series, cap and liner, solid brass, matte black finish, size as indicated on Drawings or, if not indicated, provide nominal 3-inch grommet cap size.
19. Cable Management Wire Ducts: MilesTek, square shape wire duct, with factory-applied double-sided adhesive tape.
    a) Model: Catalog no. 70-50287.
    b) Color: Black.

C. Casework Hardware Finishes: ANSI/BHMA A156.18.

1. Exposed hardware, plastic laminate covered casework: Chrome plated or stainless steel, brushed finish, as follows:
    a) Chrome, satin brushed finish, plated on steel: BHMA 652 (US26D).
    b) Chrome, satin brushed finish, plated on brass or bronze: BHMA 626 (US26D).
    c) Stainless steel, brushed: BHMA 630 (US32D).
2. Exposed hardware, phenolic core casework: Stainless steel, brushed finish, BHMA 630 (US32D).
3. Concealed hardware: Polished or satin chrome, brushed stainless steel or satin anodized aluminum. At phenolic casework, provide brushed stainless steel or satin anodized aluminum, only.

2.06 CASEWORK FABRICATION, GENERAL

A. Casework Fabrication, General: Shop fabricate casework in compliance with AWI Architectural Woodwork Standards (AWS) for grade specified. Shop fabricate casework for delivery to site in units easily handled and to permit passage through building openings. See Drawings for special casework fabrication details and notes.

2.07 PLASTIC LAMINATE-COVERED CASEWORK FABRICATION

A. Plastic Laminate-Covered Casework Fabrication: Provide high-pressure plastic laminate covered casework complying with AWI Architectural Woodwork Standards (AWS) for specified Grade and as follows. See Drawings for special casework fabrication details and notes.

1. Grade: Custom.
2. Construction Style: Style A, frameless.
3. Construction Type: Type I, (multiple self-supporting units fastened together to form a larger unit).
4. Door and Drawer Front Style: Flush Overlay.

B. Construction Details: Comply with AWI Architectural Woodwork Standards (AWS) standard details for Grade specified, with details and notes indicated on the Drawings, including seismic details, and the following:

1. Cabinet cases: 3/4-inch thick medium-density fiberboard core panels with faces and edges as follows. Hinges shall be routed into cabinet panel. Exposed, semi-exposed and concealed portions shall be as defined in AWI Architectural Woodwork Standards (AWS), except interior of open cabinets (cabinets without doors) shall be considered the same as "Exposed."
   a) Exposed faces: High-pressure plastic laminate.
   b) Semi-exposed faces, cabinets with doors: High-pressure cabinet liner laminate (HPL).
   c) Semi-exposed faces, cabinets without doors: High-pressure plastic laminate.
   d) Panel edges: High-pressure plastic laminate.
2. Doors: 3/4-inch thick medium-density fiberboard core panels with faces and edges as follows. Hinges shall be routed into door panel. Doors over 40-inches in height shall have 3 hinges.
   a) Exposed faces: High-pressure plastic laminate.
   b) Semi-exposed faces: Either high-pressure decorative plastic laminate or high-pressure cabinet liner laminate (HPL).
   c) Panel edges: PVC edge banding at all edges. Edge banding shall be eased, to eliminate sharp edges. Locate joint in edge banding at bottom center of door at base cabinets and top center of door at wall cabinets.
3. Drawer fronts: 3/4-inch thick medium-density fiberboard core panels with faces and edges as follows:
   a) Exposed faces: High-pressure plastic laminate.
   b) Semi-exposed faces: High-pressure decorative plastic laminate or high-pressure cabinet liner laminate (HPL).
   c) Panel edges: PVC edge banding. Edge banding shall be eased, to eliminate sharp edges. Locate joint in edge banding at bottom center of drawer front.
4. Drawer sides, backs and sub-fronts: 1/2-inch thick birch veneer plywood with clear lacquer finish on all surfaces. At file drawers, provide 3/4-inch thick birch veneer plywood, routed to receive file folder rails. Round-over top edges of drawer box.
5. Drawer bottoms: Ploughed into drawer sides, backs and sub-fronts, with clear lacquer finish both sides.
   a) Provide 1/4-inch thick hardwood plywood at drawers less than 30-inches wide.
   b) Provide 3/8-inch thick hardwood plywood at drawers 30-inches and wider.
6. Shelves: Medium-density fiberboard or plywood, as suitable for shelf size. Particleboard will not be acceptable. Provide core thickness for 50 psf shelf loading.
   a) Shelves at cabinets with doors: High-pressure decorative plastic laminate or high-pressure cabinet liner laminate, with PVC edge banding at front and back edges.

b) Shelves at cabinets without doors: High-pressure decorative plastic laminate to match casework interior, with PVC edge banding at front and back edges.

7. Adjustable Shelves: Supported by metal shelf rests in vertical rows of cleanly bored holes in cabinet sides, 1-inch on center.
   a) Locate rows between 1-1/2 and 2-inches from front and back faces of cabinet body.
   b) Row size, spacing and location shall be identical throughout Project.
8. Dust panels: 1/4-inch thick plywood or hardboard, above compartments and drawers except where located directly under tops, to vertically secure spaces at locked cabinets.
9. Closures: Minimum 1-inch and maximum 3-inches wide, scribed to wall. Close all gaps at face, bottom and top of cabinets. Provide closure at all cabinet sides abutting walls, to ensure clearance for door to swing open fully.
10. Edge Banding: PVC edge banding shall be provided on edges of doors, drawer fronts and shelves. Install edge banding as follows:
    a) Provide edge banding in longest practicable lengths.
    b) Locate joints at base and full-height cabinet doors at bottom center of panel.
    c) Locate joints at wall cabinet doors at top center of door.
    d) Locate joints at drawer fronts at bottom center of panel.
    e) Accurately fit edge banding. Where edge band joins plastic surfaces there shall be no open spaces, voids or chipping of plastic laminate surface.
    f) Machine or trim protruding edges of banding to provide flat, smooth corner at intersection of banding and adjoining surfaces.
    g) Ease edges of edge banding to eliminate sharp edges. Plastic laminate edge banding shall be used on all tops, webs, bottoms, ends and inside partitions.
11. Lumber components: As follows except if otherwise indicated on the Drawings.
    a) Backing cleats: 3/4-inch by nominal 4-inches.
    b) Web rails: 3/4-inch by nominal 4-inches.
    c) Base and sleepers: 3/4-inch by net 4-inches.
12. Closures: Minimum 1-inch and maximum 3-inches wide, scribed to wall. Close all gaps at face, bottom and top of cabinets. Provide closure at all cabinet sides abutting walls, to ensure clearance for door to swing open fully.

C. Laminate Cladding: Comply with manufacturer's instructions and recommendations. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Make corners and joints hairline. Slightly bevel edges.

D. Back Priming: All unfinished materials used for backs, bases, self-edge backing, stripping and other concealed portions shall be sealed with water-repellent sealer.

E. Field Cutting and Fitting Provisions: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Base or Full-Height Cabinets Fabrication: Comply with AWI Architectural Woodwork Standards (AWS) for specified Grade and as follows.

1. Mounting strips: Minimum 1/2-inch by 2-1/2 inch, at top and bottom of case. Provide intermediate mounting strip at middle of casework 60-inches and taller, including book cases.
2. Back: 1/4-inch thick tempered hardboard, dadoed into top rail, sides and bottom of cabinet.
3. Base cabinet depth: 24-inches, excluding door and drawer front thicknesses, unless otherwise indicated on the Drawings.
4. Base cabinet height: 34-inches to top of countertop work surface, unless otherwise indicated on the Drawings.
5. Full-height cabinet depth: As indicated on the Drawings, excluding door and drawer front thicknesses.
6. Full-height cabinet height: As indicated on the Drawings.
7. Cabinet width: Align wall cabinet end panels with base cabinet end panels and not countertop edge.
8. Toe kicks: Separate from or integral with base unit casework, 4-inches high by 2-inches deep at front and 4-inches high by 3/4-inch deep at exposed ends.
9. Drawer construction: Dovetailed joints at drawer box, with drawer bottom ploughed into drawer sides, backs and subfronts. Provide 3/8-inch thick bottoms at drawers 30-inches and wider.
   a) Surfaces other than drawer sides: At Contractor's option, provide plywood with natural hardwood of similar species and color to approximate composite hardwood veneer, except rotary sliced grain pattern.
   b) Drawer sides: Solid hardwood lumber, similar species and color to approximate composite hardwood veneer.
   c) Hot-melt glue drawer bottom in place.
   d) Glue all drawer box joints.
   e) File drawers shall be fabricated to receive standard, letter-size Pendaflex hanging file folders; provide steel rails for hanging files.
10. Door and drawer pulls:
   a) At base cabinets, install door pulls oriented as indicated on the Drawings or, if not indicated, as directed by Architect. Locate mounting hole centered 1-1/2 inches down from top edge of base cabinet door and centered 1-1/2 inches from strike (non-hinge) edge of door.
   b) At wall and full-height cabinets, install door pulls oriented as indicated on the Drawings or, if not indicated, as directed by Architect. At wall cabinets, locate mounting hole centered 1-1/2 inches up from bottom edge of wall cabinet door and centered 1-1/2 inches from strike (non-hinge) edge of door.
   c) Install drawer pulls horizontally, centered horizontally on drawer faces and 1-1/2 inches down from top edge of drawer front, unless otherwise indicated on the Drawings. Do not install pulls on false drawer fronts or sink base panels. Do not install pulls on drawers located directly above knee spaces, such as pencil drawers, or on keyboard trays.

11. Door catches at doors without locks: Install typically on all doors except as specified below for double doors with locks. Install spring-loaded latch body to inside face of door, with the catch installed on the bottom face of cabinet bottom panel. Center catches 1-1/2 inches from strike (non-hinge) edge of door.
12. Door catches at double doors with locks: Installed on door leaf without lock. Install spring-loaded latch body to inside face of door, with the catch installed on the top face of cabinet bottom panel. Center catches 1-1/2 inches from strike (non-hinge) edge of door.
13. Shelves:
    a) Shelves, base cabinets: Unless otherwise indicated, provide one adjustable shelf.
    b) Shelves, full-height cabinets: Provide quantity as indicated on the Drawings or, if not indicated, one shelf for each 12-inches of clear open height in cabinet.
    c) Minimum thickness, shelves less than 36-inches long: 3/4-inch.
    d) Minimum thickness, shelves 36-inches and longer: 1-inch.

G. Wall Cabinets Fabrication:

1. Mounting strips: Minimum 1/2-inch by 2-1/2 inch, at top and bottom of case. Provide intermediate mounting strip at middle of casework 60-inches and taller.
2. Back: 1/4-inch thick tempered hardboard, dadoed into top rail, sides and bottom of cabinet.
3. Wall cabinet depth: 15-inches, unless otherwise indicated on the Drawings, excluding door and drawer front thicknesses.
4. Wall cabinet height: 36-inches, unless otherwise indicated on the Drawings. Provide closure to ceiling or soffit, typically.
5. Shelves: Unless otherwise indicated, all wall cabinets shall have two adjustable shelves.
6. Door catches at doors without locks: Install typically on all doors except as specified below for double doors with locks. Install spring-loaded latch body to inside face of door, with the catch installed on the bottom face of cabinet bottom panel. Center catches 1-1/2 inches from strike (non-hinge) edge of door.
7. Door catches at double doors with locks: Installed on door leaf without lock. Install spring-loaded latch body to inside face of door, with the catch installed on the top face of cabinet bottom panel. Center catches 1-1/2 inches from strike (non-hinge) edge of door.

H. Field Cutting and Fitting Provisions: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.08 PLASTIC LAMINATE COUNTERTOPS FABRICATION

A. Plastic Laminate Countertop Core Material:

1. Countertops without sinks: Medium density fiberboard (MDF) or close-grained hardwood plywood, 3/4-inch minimum thickness, except 1-inch thickness for mobile units.

2. Countertops with sinks: Marine grade plywood, 3/4-inch thick.

B. Plastic Laminate Countertops Fabrication, General: AWI Architectural Woodwork Standards (AWS) for Premium Grade at locations with sinks and for Custom Grade at all other locations. Fabricate countertops for delivery to site in units easily handled and to permit passage through building openings.

1. Locate counter butt joints minimum 2-feet from sink cut-outs.
2. Countertops shall be flush with faces of doors and drawer fronts along the front face of base cabinets and flush at the exposed ends of base cabinets (those ends not abutting walls).
3. Unless otherwise indicated, all back and side splashes shall be 4-inches high.
4. Provide support from below countertop, either by base cabinets or welded steel angle supports as indicated on the Drawings, spaced so that unsupported length does not exceed 36-inches. Comply with requirements specified in Section 05505 - Miscellaneous Metal Fabrications.
5. At each knee space and other locations to have communications or electrical receptacles installed below countertop, provide one 2-inch ID plastic grommet, black or color to match countertop/work surface, installed directly over the outlet, centered 1-1/2 inches from the back wall (if no back splash) or 1-3/4 inches from face of back splash.

C. Plastic Laminate Countertop Edges: As indicated on the Drawings. If not indicated, fabricate countertops with edges as follows:

1. Front edge, countertops without sinks: Waterfall edge (post-formed).
2. Front edge, countertops with sinks: Waterfall No Drip edge (post-formed).
3. Backsplash, countertops without sinks: Butt joint, side or back mount at mill option.
4. Backsplash, countertops with sinks: Integral coved (post-formed).
5. Backsplash top edge: Square.
6. Side splash top edges: Square.
7. Exposed corners: Where end of cabinet is exposed and corner is subject to impact, bevel cut corner at 45-degree angle with minimum 1-1/2 inch face, to avoid sharp corner.

D. Plastic Laminate Surfacing: High-pressure plastic laminate surfacing with minimum 0.020-inch backing sheet, in compliance with specified for grade specified.

2.09 FIRE CHARACTERISTICS OF PLASTIC LAMINATE-CLAD CASEWORK AND COUNTERTOPS

A. Fire Characteristics of Plastic Laminate-Clad Casework: Comply with California Building Code (CBC), Table 8-B, Class III, Flame Spread 200 or less and Smoke Density not exceeding 450, when tested in accordance with ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.

1. Provide support from below countertop, either by base cabinets or welded steel angle supports as indicated on the Drawings, spaced so that

unsupported length does not exceed 36-inches. Comply with requirements specified in Section 05505 - Miscellaneous Metal Fabrications.

2.10 NATURAL FINISHED WOOD CABINETS AND CASEWORK

A. **Natural Finished Wood Cabinets and Casework**: WI Section 14, "Premium" grade, with Type 1 or 2 doors faced both sides with hardwood veneer. Set veneer grain vertical, with veneer from the same flitches in order to match and be continuous where drawers and doors are aligned vertically. Finish exposed and semi-exposed surfaces with Select White Maple with light cherry stain finish.

PART 3 - EXECUTION

3.01 INSTALLATION OF CABINETS AND CASEWORK: Perform by manufacturer's skilled and experienced mechanics according to the approved submittals, scribed to walls and adjoining surfaces, using first class workmanship throughout. All installation shall conform to Section 26 of the WI Manual of Millwork.

A. **Fixed Cabinets**: Set base and wall cabinets level and straight. Securely fasten to walls or floors with fasteners and anchors as required and approved. Conform anchorages to Code.

B. **Cabinet Hardware**: Fit and install cabinet hardware at the shop. After cabinets are in place, readjust each item and leave in correct working condition.

3.02 INSTALLATION OF FINISH CARPENTRY:

A. **General**: Conform to Drawings, approved submittals, and Section 26 of the WI Manual. Repair all damage as approved.

B. **Telephone and Electrical Backboards**: Install Grade B-B Exterior plywood panels, 3/4" thick by 8-feet high. Secure to walls with stripes of contact adhesive and molly-bolts at 24" centers around perimeter of each panel. Run backboards from top of wall base.

C. **Wood Work**: Provide woodwork in single lengths where possible. Make allowance for scribing by cutting on job. Cope or miter corners. Use waterproof glue for all gluing. Species as shown.

3.03 WOOD TIMBER ITEMS: Fabricate wood items as indicated on drawings and specified herein, using skilled craftsmen capable of producing first quality work. Wood shall be not more than 19% moisture content at time of fabrication.

3.04 INSTALLATION OF STEEL DOORS AND FRAMES WORK: Conform installation to submittals approved under Section 08110 and manufacturer's instructions. Install all frames plumb, straight, in true alignment, rigidly connected to walls and building structure. Erect in proper sequence with other trades to prevent delays. Erect within the tolerances specified or shown in the approved submittals.

3.05 INSTALLATION OF WOOD DOORS: Install door according to NWWDA and WI requirements except as modified herein. Field trimming of prefit doors is not permitted. Fit doors square and plumb with frames with allowance for possible swelling and

shrinking, maximum 1/8" clearance at top, edges, and meeting stiles, with 3/8" clearance at sill unless otherwise indicated or required by floor or threshold finish. Round arises to 1/16" radius. Bevel lock stiles for lock and latch hardware.

3.06 INSTALLATION OF FINISH HARDWARE: Install hardware supplied under Section 08710, excluding only hardware specified to be installed at the factory or under other Sections. Drill pilot holes for screws and screw home; hammer driving of screws is not allowed. After installation and fitting, remove finish hardware items on surfaces to be painted, except prime coat items, repack in original containers, and perform final installation, testing, and adjustment after finish painting is completed. Adjust hinges to swing smoothly but not loosely, without sticking or hinge-bound conditions. Adjust other hardware for correct operation.

3.07 WOOD BACKING: Provide wood backing to receive mechanical or electrical fixtures and equipment, bases, custom and standard cabinets, door stops, wall plates, toilet accessories and partitions, and other fixed equipment or other fixed items, as indicated or required, securely nailed or screw fastened to framework. Coordinate locations with related trades.

END OF SECTION

SECTION 06655

SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Countertops fabricated** from solid surfacing sheet material.

1.02 RELATED SECTIONS

A. **Section 05090 - Anchors and Fasteners:** General requirements for anchors and fasteners to building substrates.

B. **Section 05500 - Miscellaneous Metal Fabrications:** Countertop supports fabricated from steel.

C. **Division 15 - Mechanical:** Plumbing components integrated into countertops.

D. **Division 16 - Electrical:** Electrical power, lighting and signal components integrated into countertops.

1.03 REFERENCES

A. **Architectural Woodwork Institute (AWI):** AWI Woodwork Quality Standards.

1.04 SUBMITTALS

A. **Product Data:** If other than specified products of specified manufacturer, submit complete product data, including fire performance data.

B. **Shop Drawings:** Comply with AWI Architectural Woodwork Standards (AWS) requirements for shop drawings preparation.

C. **Samples:** If colors are not indicated on the Drawings, submit samples consisting of one full chain for preliminary selection and 6 samples of each selected color, pattern and finish.

D. **Certificates of Compliance:** Submit certificate of compliance from fabricator that all products conform to specified requirements.

E. **Maintenance Data:** Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions and maintenance video. Provide maintenance kit suitable for finishes on solid surfacing fabrications.

1.05 QUALITY ASSURANCE

A. **Industry Standards:** Construction and installation shall meet or exceed requirements of Woodwork Institute - Manual of Millwork, except as otherwise specified herein.

1. Countertops construction and installation shall comply with solid surfacing manufacturer's standard details except as indicated on the Drawings.
2. Should neither manufacturer's standard details nor details indicated on the Drawings describe condition, construct and install solid surfacing fabrication in accordance with appropriate typical details in AWI Architectural Woodwork Standards (AWS).

B. **Regulatory Requirements:** California Building Code (CBC) for flammability and smoke regulations.

C. **Field Measurements:** Field verify dimensions for shop fabricated items before production.

D. **Coordination:** Coordinate rough-in for items installed through or in millwork and trim. Locate rough-ins for proper alignment with edges, faces and reveals.

1.06 PROJECT CONDITIONS

A. **Project Conditions:** Do not install countertops until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.

B. **Environmental Requirements:** Condition countertops to building environment before installation. Maintain temperature and humidity at completed Work in accordance with requirements for storage.

1.07 WARRANTY

A. **Extended Warranty**: Provide manufacturer’s Limited Commercial 10-Year Warranty against all product defects when fabricated and installed by a CaesarStone certified fabricator, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for replacement or repair of material and labor for the warranty period from date established by Notice of Completion. For fabrications with installed warranty coverage, affix manufacturer's fabrication/installation source plate.

PART 2 - PRODUCTS

2.01 SOLID SURFACING SHEET MATERIAL

A. **Specified Manufacturer:** Caesarstone Quartz: As indicated on drawings.

B. **Solid Surfacing Material:** Caesarstone Quartz Surfacing as indicated in interior design drawings, filled acrylic, not coated, laminated or of composite construction, complying with ANSI Z124.3 and ANSI Z124.6, Type Six, and AWI Architectural Woodwork Standards (AWS). Refer to Caesarstone Surfaces Performance Technical Data for all required tests and methods:

1. Flexural Strength: 6,500 psi (44.8 MPa) minimum, per ASTM C 880.
2. Water Absorption: <0.05% per ASTM C 97.
3. Thermal Expansion: 1.3-1.9 x 10^5 cm/cm/C degree) maximum, per ASTM D 696.
4. Color Stability: No change, 100 hours minimum, per NEMA LD3-3.10.
5. Wear and Cleanability: Passes ANSI Z124.6.
6. Boiling Water Surface Resistance: Passes, per NEMA LD3-3.05.
7. High Temperature Resistance: Passes, per NEMA LD3-3.06.
8. Stain Resistance: Passes ANSI Z124.6.
9. Water Absorption by Weight: Maximum percent, per ASTM D 570.
   a) 24 hours, 1/4-inch (6 mm): 0.05.
10. Flammability: flame spread and smoke developed, Class 1 and Class A, per ASTM E 84.
11. All other tests and results required by Caesarstone.

B. **Thicknesses:** As indicated on Drawings or, if not indicated, typically 1/2-inch. Minimum thickness shall be not less than that recommended by manufacturer intended usage.

1. For countertops, solid surfacing material shall be fabricated by adhesively joining panels with inconspicuous seams.
2. Edge details shall be as indicated on the Drawings, fabricated by building up edges with bonded strips and finishing achieve inconspicuous lamination joints.

C. **Color and Pattern:** As indicated on the Drawings. If not indicated, then as selected by Architect from manufacturer's full selection of standard production colors and patterns.

D. **Joint Adhesive:** Manufacturer's standard two-part adhesive kit to create inconspicuous, non-porous joints with chemical bond.

E. **Adhesive:** Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1, UL listed.

2.02 ANCHORS, FASTENERS AND ACCESSORIES

A. Anchor Type, Sizing and Spacing: Unless otherwise indicated, provide fasteners of type, grade and class required for intended use and sized and spaced as required for loads and substrate. Refer to anchoring requirements indicated on the Drawings.

B. Exposed Anchors and Fasteners: Not acceptable. All fasteners shall be concealed.

C. Fabrication Adhesive: For bonding solid surfacing to itself, epoxy or polyester adhesive of type and manufacturer as recommended by solid surfacing material manufacturer.

1. Acceptable manufacturers: Products of the manufacturers listed below and of other manufacturers in accordance with the "or equal" provision specified in Section 01600 - Product Requirements will be acceptable.
   a) Akemi North America.
   b) Bonstne Material Corporation.
   c) Tenax USA.
2. Adhesive color: To suit pattern and color of solid surfacing material.

D. Installation Adhesive: For bonding solid surfacing fabrications to substrates, structural-grade silicone or epoxy adhesive of type and manufacturer as recommended by solid surfacing material manufacturer.

1. Acceptable silicone adhesive manufacturers: Products of the manufacturers listed below and of other manufacturers in accordance with the "or equal" provision specified in Section 01600 - Product Requirements will be acceptable.
   a) Dow Corning.
   b) GE Sealants and Adhesives.
2. Acceptable epoxy adhesive manufacturers: Products of the manufacturers listed below and of other manufacturers in accordance with the "or equal" provision specified in Section 01600 - Product Requirements will be acceptable.
   a) Akemi North America.
   b) Bonstone Material Corporation.
   c) Tenax USA.

E. Joint Sealer: Silicone sanitary sealant, clear or white as selected by Architect, as specified in Section 07900 - Joint Sealers.

F. Sink/Lavatory Mounting Hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.

2.03 SOLID SURFACING COUNTERTOPS FABRICATION

A. Solid Surfacing Countertops Fabrication:

1. Comply with manufacturer's instructions and recommendations and AWI Architectural Woodwork Standards (AWS), for Premium Grade.
2. Fabricate countertops with set-on slash and square front edge applications, as indicated on the Drawings. Comply with solid surfacing sheet manufacturer's instructions and recommendations for adhesives, sealers, fabrication, and finishing.
3. Conform to profiles and dimensions indicated on the Drawings and reviewed shop drawings. Thicknesses shall not be less than minimum recommended by solid surfacing sheet manufacturer and specified herein.
4. Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids. Attach 2-inch (50 mm) wide reinforcing strip of solid surfacing sheet under each joint.
5. Make cutouts and holes for plumbing and other fixtures and fittings, as indicated on the Drawings and to suit fixtures and equipment being furnished under separate contract by Owner.
6. Rout and finish all edges to smooth, uniform finish. Sand all edges smooth.
7. Finish all surfaces uniformly to gloss as noted or directed.
   a) Matte: Gloss rating of 5-20.
   b) Semigloss: Gloss rating of 25-50.
   c) Polished: Gloss rating of 55-80.
8. Repair or replace defective and inaccurate Work.

B. Countertop Side and Back Splashes, General: Comply with manufacturer's fabrication instructions and recommendations.

1. Provide side and back splashes of height as indicated on the Drawings.
2. Unless otherwise indicated on the Drawings, fabricate countertops with sinks and countertops subject to liquid spills, with 1/2-inch radius cove at intersection of countertop and backsplash and with no-drip (Marine) front edge.
3. Form backsplash using 1/2-inch (13 mm) thick material.

C. Cut-Outs: Sized to suit plumbing fixtures and other penetrating components. Provide 3/8-inch (10 mm) minimum inside radius at corners.

1. Reinforce corners according to solid surfacing manufacturer's instructions and recommendations.
2. If remaining material outside of cut-out is less than 3-inches (76 mm) wide, reinforce remaining material by laminating underside of countertop with additional strip of solid surfacing material, according to solid surfacing material manufacturer's instructions and recommendations.
3. Where edges of cut-outs will be visible, polish edges to match countertop.

D. Edges: Configuration and sizes as indicated on the Drawings. Polish edges to match countertop.

E. **Finishing:** Finish all surfaces uniformly. Provide finish as indicated on the Drawings or, if not indicated, provide finish as directed by Architect. For pricing, assume polished surface with gloss greater than or equal to 35 percent at 50 degrees.

F. **Allowable Tolerances:**

1. Variation in component size: ±1/8-inch.
2. Location of openings: ±1/8-inch from indicated location.
3. Vertical surfaces:
4. Horizontal surfaces: 1/2-inch (13 mm) thick solid surfacing material, adhesively joined with inconspicuous seams, having edge details as indicated on the Drawings, color as indicated on the Drawings.

G. **Accent Strips:** 1/4-inch (6 mm) thick solid surfacing material, color as indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSPECTION

A. **Substrate Verification:** Verify adequacy of backing and support framing. Inspect subsurfaces to assure that backing is suitable for plumb, true and level installation.

B. **Solid Surfacing Fabrications Inspection:** Inspect fabrications for damage before installation. Verify that fabrications will fit in intended locations.

3.02 SOLID SURFACING COUNTERTOPS INSTALLATION

A. **Solid Surfacing Countertops Installation:** Comply with solid surfacing manufacturer's instructions and recommendations.

1. Make and finish field joints to be inconspicuous in appearance and without voids. Sand and polish joints to match factory finish.
2. Attach countertops to substrate with screws or other approved mechanical fasteners only. Do not glue. Finish edges at sink cut-outs with one coat of oil-based wood primer.

B. **Plumbing Fixtures Installation in Countertops Applications:** Comply with instructions and recommendations of solid surfacing sheet material manufacturer.

1. Install undermount/submount/bevel mount lavatories and sinks, as applicable, using manufacturer's recommended adhesive and mounting hardware.
2. Adhere topmount sinks/bowls to countertops using manufacturer's recommended adhesives and color-matched silicone sealant.

3.03 CLEANING AND PROTECTION

A. **Cleaning:** Clean countertops and Wall Trim for Completion review, using cleaning agents and procedures as recommended by solid surfacing sheet manufacturer. Use non-abrasive cleaners only.

B. **Instructions to Owner:** Fabricator/Installer shall provide a commercial care and maintenance video, review maintenance procedures and warranty details with Construction Manager and Owner representatives prior to Completion review.

C. **Protection:** Provide temporary covers to protect surfaces from soiling, marring scratching and other damage. Remove temporary covers and perform final cleaning in preparation for Completion review.

END OF SECTION

SECTION 07110

SELF-ADHERED UNDERLAYMENT & FLASHINGS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide self-adhered underlayment and flashing membrane complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Self-adhered membrane on building walls, doors and window flashings and where indicated on drawings.
2. Flexible flashing panels to weatherproof penetrations complete in exterior walls and where indicated on drawings.

B. Related Work Not In This Section:

1. Masonry, lath and plaster, doors and windows.
2. Concrete or plywood substrates.
3. Roofing systems.

1.02 QUALITY ASSURANCE:

A. Qualifications of Applicator: Employ skilled and experienced applicator for all Work of this Section.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: Submit manufacturer's specifications and installation directions, with typed specification sheet prepared specifically for conditions in the Work not covered by manufacturer's standard specifications.

B. Samples: Submit such Samples as Architect may request.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING: Deliver materials to site in original unbroken packages bearing manufacturer's label showing brand and weight. Store materials at site under cover and maintain in dry condition until ready for use. Store materials in accordance with manufacturer’s recommendations.

1.05 JOB CONDITIONS: Apply pressure-sensitive masking tape to prevent staining of surfaces to remain exposed wherever membrane materials abut or lap on to other finish surfaces. Provide additional covering as necessary to supplement tape.

1.06 WARRANTY: Conform to Section 01740. The contractor and the waterproofing manufacturer shall furnish to Owner a joint and separately written warranties against defects in materials or workmanship for up to 10 years, all systems are installed including waterproofing specified in another Section by the same manufacturer, covering the waterproofing performance of the installed waterproofing systems for the fully warranty period. Defects covered under the warranty shall include, without limitation, loosening, softening, blistering, loss of either adhesion or cohesion, delamination, and penetration of moisture.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. **Manufacturers**: Vycor V-40, Vycor Ultra as manufactured by Grace Construction Products or Fortiflash or Protecto Wrap or approved equal.

B. **Door, Window and Wall Waterproof Flashing/Underlayment Membrane**: Vycor V-40, Vycor Ultra Fortiflash or Protecto Wrap or approved equal:

1. Prestrip: Moistop E-Z Seal.
2. Corners: Moistop corner Shield.
3. Self Adhering Membrane Flashing: Fortiflash.
4. Sealant: Moistop Sealant.

C. **High Heat Conditions**: (SAMF-HH) Provide Grace “Vycor Ultra” or Carlisle WIP 300 HT under sheet metal flashings with slip sheet as recommended by manufacturer.

D. **Surface Primer**: Provide where required for proper installation, refer to manufacturer for recommendations.

E. **Mastic**: EM - A rubberized asphalt-based mastic or Schnee-Morehead SM 7108 Permathane (moisture-cured polturethane).

2.02 FLASHING PANELS

A. **Quickflash** Weatherproofing Products, Inc., (702) 614-6100 or approved equal. www.quickflashproducts.com.

B. **Flashing Panels**: Quickflash Weatherproofing Flashing Panels to fit each required condition completely.

C. **Plumbing Flashing Panels**: Quickflash Plumbing Flashing Panels to fit each required condition completely.

D. **Electrical Flashing Panels**: Quickflash Electrical Flashing Panels to fit each required condition completely.

PART 3 - EXECUTION

3.01 APPLICATION: Install per manufacturer's recommendations/specifications for all systems and the following requirements.

A. **Preparation**: Membrane must be placed directly on the solid backing and substrate over insulation. Suitable substrates include plywood, wood composition, wood planks or gypsum.

B. Wall, Window or Door Preparation:

1. Membrane must be placed directly on the structural material, apply in accordance with manufacturers specifications.
2. Refer to details on drawings for each type of application, if a discrepancy occurs, bring it to the Architects attention for resolution.

C. Install flexible flashing panels in accordance with manufacturer's instructions.

3.02 CLEANING: Clean all waterproofing materials from surfaces to remain exposed and restore the finish as required. If exposed surfaces are stained and cleaning is not acceptable, remove affected Work and provide new conforming Work as directed and approved, at no extra cost to Owner.

END OF SECTION

SECTION 07113

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide membrane waterproofing complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Membrane waterproofing on building, planter and site walls retaining earth.
2. Drainage composition matting.

B. Related Sections:

1. Cast-In-Place Concrete.
2. Sheet Metal.
3. Caulking and Sealants.

1.02 REFERENCES:

A. **ASTM D 3767** Standard Practice for Rubber—Measurement of Dimensions.

B. **ASTM D 412** Standard Test Method for Rubber Properties in Tension.

C. **ASTM D 882** Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

D. **ASTM E 96** Standard Test Methods for Water Vapor Transmission of Materials.

E. **ASTM D 1970** Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

F. **ASTM C 836** Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

G. **ASTM D 903** Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

H. **ASTM D 1876** Standard Test Method for Peel Release of Adhesives (T-Peel).

I. **ASTM E 154** Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

J. **ASTM D 570** Standard Test Method for Water Absorption of Plastics.

K. **ASTM D 5385** Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.

L. **GSA-PBS** 07121 Test for Decay from Soil Burial.

M. **UL 790** Tests for Fire Resistance of Roof Covering Materials.

1.03 SYSTEM DESCRIPTION:

A. **Product provided by this** Section is a self-adhesive membrane of not less than 60 mils thickness, consisting of 56 mils of rubberized asphalt membrane laminated to a 4 mil cross-laminated polyethylene film.

1.04 SUBMITTALS:

A. **General:** Submit in accordance with Section 01300.

B. **Product Data:** Submit manufacturer's product literature and installation instructions.

C. **Subcontractor's approval by Manufacturer:** Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.

D. **Warranty:** Submit a sample warranty identifying the terms and conditions stated in this Section.

1.05 QUALITY ASSURANCE:

A. **Applicator Qualifications:** Applicator shall have 5 years of experience in applying the same or similar materials and shall be specifically approved in writing by the membrane manufacturer.

B. **Regulatory Requirements:** Comply with applicable codes, regulations, ordinances, and laws regarding use and application of products that contain volatile organic compounds (VOC).

C. **Pre-Application Conference:** Prior to beginning work, convene a conference to review conditions, installation procedures, schedules and coordination with other work.

1.06 WARRANTY:

A. **Upon completion and acceptance** of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials installed by an approved applicator for a period of 5 years.

1.07 DELIVERY, STORAGE AND HANDLING:

A. **Deliver materials to project** site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.

1. Name of material.
2. Manufacturer's stock number and date of manufacture.

3. Material safety data sheet.

B. **Store materials in protected** and well-ventilated area. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with local applicable regulations.

1.08 PROJECT CONDITIONS:

A. **Do not apply membrane** when surface temperature is below or inclement weather conditions conflict with manufacturer's published requirements. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the installation. Warn personnel against breathing of vapors and contact of material with skin or eyes. Wear applicable protective clothing and respiratory protection gear. Keep flammable products away from spark or flame. Do not allow the use of spark producing equipment during application and until all vapors have dissipated. Post "NO SMOKING" signs. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. **Provide CCW MiraDRI 860/861** Sheet Membrane Waterproofing as manufactured by Carlisle Coatings and Waterproofing Incorporated, Phone: (800) 527-7092 Fax: (972) 442-0076.

2.02 PRODUCTS:

A. **Self-Adhesive Sheet Membrane Waterproofing:** Shall be CCW MiraDRI 860/861consisting of a 56-mil rubberized-asphalt membrane laminated to 4 mil cross-laminated polyethylene film, and shall meet or exceed the following requirements:

1. Thickness: 60 mils, ASTM D 3767
2. Tensile Strength (Membrane): 325 psi, ASTM D 412
3. Tensile Strength (Film): 5000 psi, ASTM D 882
4. Elongation: 350% minimum, ASTM D 412
5. Permeance: 0.05 Perm maximum, ASTM E 96
6. Flexibility, 180° bend over 1 in. mandrel at -45°F: Unaffected, ASTM D 1970
7. Crack Cycling at -25°F (100 cycles): Unaffected, ASTM C 836
8. Peel Strength: 10.0 lb/in, ASTM D 903
9. Lap Adhesion: 19.0 lb/in, ASTM D 1876
10. Puncture Resistance: 60 lb (min), ASTM E 154
11. Soil Burial 16 weeks: No Effect, GSA-PBS 07121
12. Water Absorption: 0.1% by wt., ASTM D 570
13. Hydrostatic Head: 230 ft., ASTM D 5385

B. **For application temperatures between** 25°F and 65°F, use CCW-861 Sheet Membrane and CCW-702, CCW-702LV, or CCW-715. For application

temperatures above 40°F use CCW MiraDRI 860 sheet membrane and CCW-702, CCW-702LV, CCW-702WB, CCW-715, CCW-AWP or Cav-Grip.

2.03 ACCESSORY PRODUCTS:

A. Surface Primer: Shall be CCW-702, CCW-702LV, CCW-715, CCW-702WB, CCW-AWP or Cav-Grip.

B. Mastic: Shall be CCW-704 Mastic.

C. Sealants: Shall be CCW-703 Vertical Grade Liquiseal Membrane or approved sealant by CCW.

D. Backer Rod: Shall be closed-cell polyethylene foam rod.

E. Drainage Composite: Shall be CCW MiraDRAIN as recommended by the manufacturer for each condition.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies or unsatisfactory conditions detrimental to the proper completion of the work. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing. Do not proceed with work until all deficiencies or unsatisfactory conditions are corrected.

3.02 SURFACE PREPARATION:

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be structurally sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods which are acceptable to manufacturer of sheet membrane waterproofing.

B. Cast-In-Place Concrete Substrates:

1. Do not proceed with installation until concrete has properly cured and dried (minimum 7 days for normal structural concrete and minimum 14 days for lightweight structural concrete).
2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type or clear resin-based materials without waxes, oils or pigments and be approved by the Carlisle representative.
3. Form release agents must not transfer to the concrete. Remove forms as soon as possible from below horizontal slabs to prevent entrapment of excess moisture. Excess moisture may lead to blistering of the membrane.
4. Concrete shall be sloped for proper drainage.

5. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non- shrink grout or ground to match the unrepaired areas. Fill form tie rod holes with concrete and finish flush with surrounding surface.
6. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
7. Surfaces at cold joints shall be on the same plane. Grind irregular construction joints to suitable flush surface.

C. Related Materials: Treat joints and install flashing as recommended by waterproofing manufacturer.

3.03 APPLICATION:

A. Refer to manufacturer's literature for recommendations on installation, including but not limited to, the following:

1. Apply primer/contact adhesive at rate recommended by manufacturer. Recoat areas which were not waterproofed the same day or if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of primer.
2. Do not install membrane until primer/contact adhesive is completely dry. Dry time will vary with weather conditions.
3. Seal installation at the end of the day with troweled bead of CCW-LM-800XL or CCW- 703V Liquiseal.
4. Apply protection board and/or MiraDRAIN and other related materials in accordance with manufacturer's recommendations.

3.04 PROTECTION COURSE:

A. Vertical Application: Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation). Stop drainage composite 6" below final grade level.

END OF SECTION

SECTION 07115

FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide fluid-applied waterproofing complete as indicated, specified, and required. As used in this Section, the term "waterproofing" means "fluid-applied waterproofing" or waterproof membrane unless otherwise defined or specified.

A. Work In This Section: Principal items include:

1. Submittals.
2. Preparation of surfaces.
3. Waterproofing membranes as indicated on drawings and on following areas and surfaces:
   a. Planter and planter walls indicated to receive membrane waterproofing.
4. Protection board.

B. Related Work Not In This Section:

1. Parge coat.
2. Concrete, and concrete unit masonry substrates.

1.02 QUALITY ASSURANCE:

A. Inspection: The work will be inspected and test cuts taken by Waterproofing Inspector “if deemed necessary” or “at the discretion of the Waterproofing Inspector”. See Section 01400. Inspector shall have the authority to regulate the quality of the Work so that it conforms to the Contract Documents and to order discontinuance of any operation causing non-conforming Work. Consultant shall submit written report to Architect upon completion of the Work.

B. Qualifications of Subcontractor: Employ waterproofing system manufacturer or his authorized applicator to prepare surfaces and install the waterproofing systems.

C. Manufacturer's Participation: At least 35 days before application of any fluid-applied waterproofing, Contractor shall notify waterproofing manufacturer in writing, with a copy delivered to Architect, or requirements of this Section pertaining to the waterproofing manufacturer's obligations to either install the waterproofing systems or designate an approved applicator, to inspect completed waterproofing and to execute specified certificate, and to execute specified warranty. Waterproofing manufacturer shall respond in writing to the Contractor and Architect acknowledging acceptance of these obligations and responsibilities with respect to the Work of this Section, and Work of this Section shall not be

installed until Architect has received such written response free of exceptions or qualification. As used in this Section, the term "manufacturer" includes the waterproofing manufacturer's technically qualified factory representative who is legally empowered to execute certificate and warranty for manufacturer.

D. **Pre-Installation Conference and Inspection**: After approval of submittals but prior to starting installation of Work of this Section, the Contractor shall hold a meeting at the site attended by representatives of the Owner, Architect, Contractor, and the Earthwork, Concrete, Masonry, Waterproofing Consultant, Landscaping, Mechanical, and Electrical Subcontractors, and a technical representative of the waterproofing material manufacturer to describe in detail waterproofing system to be installed and to establish agreement, coordination, and responsibilities among involved trades. Contractor shall prepare a detailed memo of this meeting and furnish copies to the Architect and all involved trades. The Waterproofing Subcontractor and material manufacturer's technical representative shall inspect the substrates to receive Work of this Section and report defective conditions to the Architect and Contractor for correction; refer to Article "Verification of Conditions" in Section 01400.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. **Waterproofing Manufacturer's Specification**: Not more than 60 days after execution of the Contract, submit specifications covering Work of this Section, specially prepared in detail by the waterproofing manufacturer and based on the requirements of Drawings and this Section. With the specifications, include a certification that the waterproofing manufacturer has reviewed the Drawings and this Section, and that products and systems in specifications prepared by the waterproofing manufacturer are correct for the Work as designed and comply with or exceed requirements of this Section. Specifications prepared and submitted by Waterproofing Subcontractor in lieu of waterproofing material manufacturer are not acceptable. Without limitation include complete instructions covering the preparation of substrates and adjoining or related Work, application of all materials including priming, lapping, reinforcement, membrane coatings, and the protection courses.

B. **Product Data**: With the manufacturer's specifications submit waterproofing manufacturer's complete technical product data covering all materials, systems, certified laboratory test reports, preparation and application instructions, and published specifications, and copies of Code approvals for each system proposed for use.

C. **Samples**: Submit such Samples as Architect may request.

D. **Service History**: Submit typed list of at least ten installations, with the Owner's names and addresses, on which the materials and systems proposed for use for the Work have been in satisfactory service, without failure of any kind, for at least five years.

E. **Subcontractor's Qualifications**: Submit written evidence that manufacturer will install systems or Subcontractor is licensed and approved by manufacturer.

F. **Certificate**: At completion, Contractor and manufacturer shall inspect all waterproofing and jointly certify to the Architect that installed waterproofing systems conform to this Section and approved submittals.

1.04 PRODUCT DELIVERY: Deliver materials to site in system manufacturer's original containers with the seals unbroken, factory labels intact and bearing name of manufacturer and date of manufacturer.

1.05 JOB CONDITIONS:

A. **Coordination**: Coordinate with related trades and verify concrete surfaces are correctly finished, water or sheet cured without the use of curing compound and are dry.

B. **Protection**: Place temporary coverings and protection to prevent staining or marring of surfaces not to be coated. Wherever waterproofing systems abut or lap on surfaces to remain exposed, apply non-staining pressure-sensitive masking tape to prevent staining and apply additional covering to supplement the masking tape. Keep traffic off waterproofing until covered with protection course.

C. **Weather Conditions**: Do not apply waterproofing in exterior areas during rainy, damp, foggy, or excessively windy weather, or when rain is imminent.

1.06 WARRANTY: Conform to Section 01785. The contractor and the waterproofing manufacturer shall furnish to Owner a joint and several written warranties against defects in materials or workmanship for (5) FIVE year Warranty covering the waterproofing performance of the installed waterproofing systems for the fully warranty period and accepting responsibility for ruptures in waterproofing caused by cracking of substrates up to 3/16" width. Defects covered under the warranty shall include, without limitation, loosening, softening, blistering, loss of either adhesion or cohesion, delamination, and penetration of water.

PART 2 - PRODUCTS

2.01 PRIMER: Two-component epoxy-plyamide primer-sealer or equivalent, of low viscosity, supplied by the waterproofing manufacturer.

2.02 ELASTOMERIC FLUID-APPLIED WATERPROOFING: Single-component moisture-curing modified polyurethane coating containing not less than 88% non-volatile solids, of self-leveling type with air-release properties for use on horizontal surfaces and high-build sag-resisting type for vertical and sloping surfaces, containing no material that will bleed through to or color the surface or bleed through the concrete substrate.

A. **Manufacture**: Provide one of the following waterproofing systems (refer to Section 01600, regarding proposed substitutions) all subject to conformance with following property requirements and requirement specified herein as confirmed and demonstrated in specified submittals:

1. Vulkem 201 (60 mils).
2. TREMProof 250 GC at (60 mils)
3. Pacific Polymers Elasto-Deck BT (60 mils).
4. Gaco Western Gacoflex LM-60

B. **Properties**: Waterproofing shall meet or exceed test requirements below:

Property	Test Method	Test Result
Tensile strength	ASTM D412	300 psi minimum
Elongation, ultimate	ASTM D412	650% minimum
Modulus at 100% elongation	ASTM D412	75% minimum
Hardness, Share A	ASTM D2240	30 - 50
Adhesion to concrete	ASTM D903	20 lbs per linear inch minimum
Permeability (100 mils)	ASTM E96	0.010 perms.
Coverage per dry mil		1330 S.F. maximum

C. **Ancillary Materials**: Polyurethane sealant and glass cloth reinforcing as supplied or specifically recommended by waterproofing manufacturer.

2.03 PROTECTION COURSE:

A. **Planters**: Same as for between-slab and sloping and vertical surfaces except 1/2" thick asphalt-treated fiberboard conforming to ASTM C208 may be used on surfaces that are lower than 6" below planter fill finish elevation.

B. **Vertical Surfaces**: Furnish the Apoc Protection Panels as specified above, W.R. Meadows PC-2 Standard Duty Protection Course, of J&P Petroleum Products Co., "Tex-Mastic Backerboard 501-A", as approved by waterproofing system manufacturer, 1/8' thick unless otherwise specified.

C. **Irregular Surfaces**: Where installation of rigid board protection course is impractical, use minimum thickness .060 inch thick uncured neoprene sheet flashing or comparable sheet flashing compatible with waterproofing cut and formed to fit tight against waterproofing membranes and secured with suitable mastic compatible with the membrane materials.

PART 3 - EXECUTION

3.01 INSPECTION: Refer to Section 01400 regarding verification of conditions, and verify that substrates are correctly finished, water or paper cured without the use of membrane-forming curing compounds, and are dry. Report to Architect in writing all conditions that prevent proper installation of Work of this Section and do not proceed until corrections are completed. Application of the first coat of any waterproofing system constitutes acceptance of substrates for warranty purposes. Inspection does not relieve the Contractor and applicator of responsibility for proper preparation of surfaces.

3.02 PREPARATION: Clean substrates of deleterious substrates using acid with rinsing and drying, or sandblasting as required. Conform to manufacturer's instructions. Apply membrane material to cured 30 mils per coat for preparation striping unless otherwise specified. Prepare all cracks, expansion joint areas, vertical surfaces, drain connections, and flashings prior to application of the main waterproofing.

A. **Concrete/CMU Surfaces**: Fill all holes, voids, rock pockets, and excessively rough surfaces with an epoxy grout material or grind smooth to a condition equal to adjoining satisfactory surfaces, as applicable.

B. **Priming**: Coat applied primer within 16 hours after application with first coat of the membrane material; reprime surface if a longer time period occurs. Apply primer on all concrete substrates to receive fluid-applied waterproofing.

C. **Cracks**: Rout non-moving cracks more than 1/16" wide and all moving cracks 1/16" wide or less at least 1/4" wide and deep and fill flush with elastomeric sealant, then apply primer and stripe with membrane material to at least 3" on each side of the caulking. Rout out moving cracks over 1/16" wide to size of a typical expansion joint, and treat and caulk the joint as specified for expansion joints.

D. **Expansion Joints**; Coat the expansion joint areas and at least 6' on both sides with primer and membrane materials. After material cures, provide a soft tapered foam strip over the joints, cover with a minimum 30 mil thick compatible polymer sheeting supplied by system manufacturer to at least 4' on each side of the joints and bonded in place with membrane material, then cover with at least 2 coats of the membrane material to minimum 60 mils total cured thickness.

E. **Penetration**: Reinforce and double coat each membrane penetration and all turn-ups according to waterproofing manufacturer's instructions. Apply minimum 2" face coat stripe of membrane material around pipes, drains, and vertical junctions.

F. **Drains**: Reinforce connections to drains with two or more layers of woven glass cloth extending into the clamping base and not less than 12" on all sides of drains, each layer fully embedded in and coated with membrane material. Bed clamping ring in fresh membrane material and securely tighten. Do not plug holes in drains.

G. **Flashings**; Cover flanges with a single layer of spunbound polyester set in accessory polyurethane sealant or as instructed by primary materials manufacturer.

3.03 APPLICATION: Conform to the system manufacturer's mixing and application instructions, and the following:

A. **Coats**: Apply the membrane material in two coats, of coat 30 minimum cured film thickness minimum and free of thin areas, holidays, pinholes, skips, and other defects, minimum 60 mils total cured film thickness throughout.

B. **Thickness Control**: As application progresses and before membrane material attains final set, verify the thickness of each coat at frequent intervals with a mil thickness gage. Immediately apply additional coat of membrane material on those areas found to be deficient in thickness.

3.04 POND TESTING AND INSPECTION: When membrane is completed and fully cured, set temporary dams and cover horizontal waterproofing membranes with at least 3' of standing water and maintain water level for not less than 72 hours. Repair all leaks disclosed by pond testing and repeat entire test procedure until test results are satisfactory and no leakage occurs. Visually inspect waterproofing that cannot be pond tested for voids, skips, damage, rupture, or other defects and repair all defective conditions before protection course is installed.

3.05 PLANTER WALLS AND FEATURE WALLS: Apply reinforce as instructed by primary materials manufacturer on all corners and angles with a layer of glass reinforcing cloth, strips 12" wide and centered on corner or angle, and embedded in and coated with membrane material. Apply membrane in two coats so as to achieve minimum 60 mils cured thickness.

3.06 PROTECTION COURSE: After satisfactory completion of pond testing, repair of defects, and after specified inspection for certification and drainage mat installation, cover completed membranes with specified protection course material. Secure in place with spots of urethane sealant or mastic approved by waterproofing manufacturer; verify the membrane is fully cured before placing any asphaltic type material on or against the membranes. Do not nail protection course in place.

3.07 COMPLETION: Protect membrane systems from injury during application and until finish installation is approved. Perform cleanup and disposal according the Section 01770.

3.08 FIELD QUALITY CONTROL: The work will be inspected and test cuts taken by Waterproofing Inspector “if deemed necessary” or “at the discretion of the Waterproofing Inspector” or as required by the manufacturer. Refer to Section 01400

END OF SECTION

SECTION 07177

ANTI-GRAFFITI SEALERS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide anti-graffiti sealers treatments complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Inspection of surfaces.
2. Anti-Graffiti sealer applied to areas as indicated or scheduled on drawings

B. Related Work Not In This Section:

1. Painting.

1.02 DEFINITION: The term "anti-graffiti" shall mean the protection of all substrates including paints against graffiti penetration with a clear colorless membrane. The membrane is hard, durable, and able to be cleaned many times before recoating is indicated.

1.03 QUALITY ASSURANCE:

A. Manufacturer's Supervision: Start sealer application under supervision of the sealer manufacturer. Notify manufacturer at least 72 hours prior to starting application.

B. Preliminary Tests: Sealer manufacturer and the Subcontractor for Work of this Section shall make tests on the mock-up and on each kind of surface to be treated to establish the actual application rates required to waterproof and anti-graffiti involved surfaces and meet warranty requirements. On field mock-up panels test that sealers do not darken, mottle, or discolor treated surface and that surfaces to be treated are dry. Established application rates must not be less than those recommended in the sealer manufacturer’s technical data for the kind of material surfaces.

1. Test Area: Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use the manufacturer’s application instructions. Let protective treatment test area cure before inspection. Keep test panels available for comparison throughout the protective treatment project.

1.04 SUBMITTALS: Refer to Section 01300 for procedures.

A. Samples and Data: Submit Samples of the sealer accompanied by manufacturer's technical data application instructions, and recommended coverage rates for types of surfaces to be treated, and evidence that sealers conform to all requirements specified.

B. Subcontractor: Submit written evidence that Subcontractor for the Work of this Section is skilled and experienced in application of type required, with a list of

previous projects successfully treated by Subcontractor with sealer of the type specified.

C. **Certificate and Summary Statement**: Prior to completion of Work, submit a certificate signed by Contractor and Subcontractor for Work of this Section that sealers applied conform to approved submittals and all requirements specified; in the certificate include a summary statement giving following information:

1. Number of square feet of each surface treated with sealer, classified as to kind of material treated, open pore or closed pore type, and whether vertical or horizontal.
2. The number of gallons of each type, class, or grade of sealer required to treat all involved surfaces calculated on basis of number of square feet of each kind and orientation of material classified above and in accordance with results of preliminary tests specified above.
3. Total gallons of each sealer type, class, or grade actually applied.

1.05 PRODUCT DELIVERY: Deliver all sealer materials to site in containers bearing name and batch number of manufacturer, with seals intact.

1.06 JOB CONDITIONS:

A. **Protection**: Install temporary coverings and protection, and do not allow sealer to contact plastic, planting soils, plants, asphaltic paving, roofing membranes, or other materials damaged by sealer.

B. **Weather Conditions**: Do not apply sealer during windy, wet, or excessively hot or dry weather conditions.

1.07 WARRANTY: Refer to Section 01740. The Contractor and Subcontractor shall jointly and severally warrant that repellent sealer treated surfaces will remain waterproof and free of water intrusion for at least 2 years, and that they will immediately repair and correct any deficiencies or leaks that appear in the treated surfaces during the warranty period at no cost to Owner. Sealer manufacturer shall warrant to furnish all sealer materials required to correct leakage that appears within 5 years from Date of Substantial Completion at no additional cost to Owner. Leakage caused by structural cracking or movement are excepted from the warranty.

1.08 ANTI-GRAFFITI WARRANTY: This warranty is for five years from date of application. The surface film will not peel nor chip. Exceptions: destruction of membrane due to cleaning, damage due to structural cracking, vandalism and acts of God. This warranty is for replacement of material necessary to repair damaged surfaces and does not include labor. The sealer must withstand up to five cleanings before surface must be resealed.

PART 2 - PRODUCTS

2.01 ANTI-GRAFFITI SEALER MATERIALS:

A. **Specified Manufacturer:** PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255. Email: CustomerCare@prosoco.com

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers will be acceptable in accordance with the "equal pre-approved substitution" provision specified in Section 01600 – Product Requirements

C. **Water Based Anti-Graffiti Sealer**: Sure Klean Weather Seal Blok-Guard and Graffiti Control II as manufactured by PROSOCO, Inc. Provide a Clear water based blend of polymers which contain no petroleum based solvents, type that does not darken or discolor treated surfaces, non-toxic, compatible with all standard polymer type calking and sealing materials, conforming to all local AQMD requirements and is certified by sealer manufacturer. Sure Klean® Weather Seal Blok-Guard® & Graffiti Control II is a clear-drying, water-based silicone emulsion for weatherproofing concrete block and other porous masonry materials and protecting them from graffiti attacks without altering the natural appearance. Blok-Guar® & Graffiti Control II is appropriate for interior and exterior use. Blok-Guard® & Graffiti Control II protects exterior walls exposed to normal weathering. Graffiti removal from treated surfaces is fast and easy using Defacer Eraser® Graffiti Remover.

PART 3 - EXECUTION

3.01 INSPECTION: Refer to Section 01400, Article "Verification of Conditions", and report to Architect in writing conditions that prevent or interfere with the correct preparation of surfaces and application of sealer.

3.02 PREPARATION: Remove dust, dirt, oil, grease, other deleterious substances and stains, and efflorescence or laitance from surfaces. Repair cracks or holes over 1/16" size. Spot prime cracks and holes 1/16" size and smaller and prime all horizontal surfaces other than soffits with a heavy duty sealer supplied by same sealer manufacturer. Mask and protect adjoining surfaces and glass unless sealer is harmless and easily removed.

3.03 APPLICATION: By experienced mechanics using methods recommended by sealer manufacturer, after surfaces to be treated are dry.

A. **Before applying, read "Preparation" and "Safety Information"** sections in the Manufacturer's Product Data Sheet for Weather Seal Blok-Guard® & Graffiti Control II. Refer to the Product Data Sheet for additional information about application of Blok-Guard® & Graffiti Control II. Do not dilute or alter.

1. Spray: Using low-pressure (<50 psi) spray equipment, saturate, "wet-on-wet" spraying from the bottom up. Avoid excessive overlapping. For textured and porous surfaces, apply enough material to create 6 to 8 inch rundown below the contact point. Let first application penetrate masonry surface for 2 to 3 minutes. For textured and porous surfaces, reapply in same saturating manner to ensure complete coverage of recessed surfaces. Immediately brush out runs and drips to prevent build up.
2. Brush or Roller: Saturate uniformly. Let product penetrate for 2 to 3 minutes. Re-saturate. Brush out heavy runs and drips that don't penetrate.
   a. Fluted architectural block: Saturate from the bottom up. Spray in an "overlapping X pattern" for complete coverage of recessed

surfaces. Let the first application penetrate for 2 to 3 minutes. Re-saturate. Less will be needed for the second application.

b. Dense, Smooth Surface Application Instructions: Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. Do not over apply. Over application may cause unacceptable color change. One application is normally enough. Always test for application rate.

c. Second Coat/Porous Surface Application Instructions
Some surfaces will need an additional coat for maximum protection. Apply the second wet-on-wet coat as soon as the first application is dry to the touch or within one hour. Allowing more than one hour between coats could reduce the effectiveness of the second coat or cause darkening. Immediately back roll or brush out runs and drips for a uniform appearance and to prevent build up.

B. **Drying Time:** Treated surfaces dry to the touch in 1 hour. Protect surfaces from rainfall for 6 hours following treatment. Blok-Guard® & Graffiti Control II treatments gain water repellency properties in 24 hours.

C. **Graffiti Removal**: Remove most types of graffiti with Defacer Eraser® Graffiti Remover or Enviro Klean® SafStrip.

3.04 CLEANUP: Cleanup tools, equipment and over spray with soap and warm water. Cleanup is more difficult from surfaces hotter than 95 degrees F (35 degrees C).

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide building insulation complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Thermal batt insulation for exterior walls and under roof deck and above ceilings where required and/or indicated on drawings.

B. Related Work Not In This Section:

1. Insulation for mechanical systems in Division 15.
2. Firestopping and Smoke Seals in Section 07270.
3. Roofing system in Section 07540.
4. Sound insulation in interior partitions in Section 09250.
5. Semi-rigid sound insulation board in Section 09570.

1.02 SUBMITTALS: Refer to Section 01300 for procedures. Submit insulation and prong anchor manufacturers' printed specifications and instructions.

PART 2 - PRODUCTS

0.01 THERMAL BATT INSULATION

A. Specified Manufacturer: Owens Corning Fiberglas Corporation (OCF), (419/248-8000 or 800/438-7465; local office, (714/433-2440).

B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 – Material and Equipment. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 Requirements.

1. CertainTeed Corp., (610/341-7739 or 800/233-8990)
2. Manville Building Insulation, Division of Johns Manville Corp., (303/978-2000 or 800/654-3103).

C. Thermal Batt Insulation, General: Flexible, resilient, noncombustible blankets of mineral or glass fiber, complying with ASTM C 665, type, class and facing material as indicated, with R-value of 19 in walls and R-value of 30 in the roof.

D. Thermal Batt Insulation for Concealed Locations: For locations in wall and roof framing cavities where insulation is in contact with back side of gypsum board, ASTM C 665, Type II, Class C, with R-value of 19 in the walls and R-value of 30 in the roof.

1. Product: OCF Thermal Batt Insulation.
2. Facing: Vapor-retarding kraft.
3. Surface burning characteristics: Not rated.

E. **Thermal Batt Insulation for Exposed Locations**: For locations where insulation is exposed or is not in contact with back side of gypsum board, ASTM C 655, Type III, Class A, with R-value of 19 in the walls and R-value of 30 in the roof.

1. Product: OCF Flame Spread 25 Insulation.
2. Facing: Fire-resistant, foil-reinforced-kraft (FRK).
3. Surface burning characteristics: Flame spread rating 25 and smoke developed 50; suitable for all California Building Code (CBC) construction types.

F. **Staples**: Stainless steel, monel, or copper-coated steel, size directed by batt manufacturer.

G. **String Wires**: Minimum 18 gage galvanized steel wire.

PART 3 - EXECUTION

3.01 INSTALLATION OF BATTS: Install all batts with close fit, free of gaps, holes, or sagging. Maintain a nominal 3/4" air space between insulation and interior wall or ceiling finish material. Staple flanges at 4" centers and ensure batt facings form a continuous vapor barrier. Provide taut stretched string wires along the center of horizontal or sloping batts where support spacing exceeds 16" on centers.

A. **Framing**: Provide friction-fit batts, tightly fitted to stud webs and wood furring.

B. **Roof Decks**: Install insulation secured with staple flanges together at 4" centers. Seal all stapled flanges and the joints at abutting vertical surfaces with pressure-sensitive plastic tape, forming a continuous vapor barrier. Provide 18 gage galvanized string wires under batts where necessary to prevent sagging, stretched taut.

END OF SECTION

SECTION 07265

VAPOR EMISSION REDUCTION SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Fluid-applied, water vapor control coating system** applied to all concrete floors indicated to receive wood flooring, resilient flooring and carpet. System shall include sealer for water vapor control and protective portland cement-based topcoat suitable for protection during construction activities and future floor covering removable, surface preparation and installation of new finish flooring.

1. Concrete substrate preparation shall include shot blasting and other preparatory measures necessary to provide suitable condition for application of water vapor control coating system.
2. Completed surface condition shall be suitable for installation of finish flooring specified in other Sections.

1.02 RELATED SECTIONS

A. **Section 03300 - Cast in Place Concrete**: Concrete floor slabs; remediation of defective concrete, including concrete floor slabs with excessive moisture vapor emission.

B. **Section 09625 - Resilient Athletic Flooring System:** Flooring installed over concrete substrate.

C. **Section 09645 - Cushioned Wood Flooring Assemblies:** Flooring installed over concrete substrate.

D. **Section 09650 - Resilient Flooring:** Flooring over concrete substrate.

E. **Section 09655 - Linoleum Sheet Flooring:** Flooring over concrete substrate.

F. **Section 09690 - Carpet Tile**: Flooring installed over concrete substrate.

1.03 REFERENCES

A. **ASTM International (ASTM)**: Formerly American Society for Testing and Materials.

1. ASTM E 96 - Standard Test Methods For Water Vapor Transmission of Materials
2. ASTM F 1869 - Standard Test Method For Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
3. ASTM F 710 - Standard Test Method for Preparing Floors To Receive Resilient Flooring.

1.04 SUBMITTALS

A. **Product Data**: Provide data for concrete floor cleaning, coating and preparation materials.

B. **Laboratory Testing**: Submit current independent laboratory reports, dated within 2 years of project start, for specified performance. Reports dated beyond 2 years are not acceptable.

C. **Installer's Qualifications**: Valid manufacturer's approved applicators certificate for warranted system.

D. **Installation Instructions**: Indicate procedures and processes.

E. **Warranty**: Submit manufacturer's warranty, as specified.

F. **Insurance Certificate**: Submit product manufacturer's warranty certificate listing City as additional insured.

1.05 QUALITY ASSURANCE

A. **Coating Manufacturer's Qualifications**: Manufacturer specializing in single- and two-component products meeting specified ASTM third party laboratory testing.

B. **Installer's Qualifications**: Manufacturer-approved, licensed and certified for the application of specified products.

1.06 ENVIRONMENTAL REQUIREMENTS

A. **Project Conditions**: Maintain temperatures of ambient temperature between 55 and 85 degrees F, 72 hours prior to, during and after application.

1.07 WARRANTY

A. **Extended Warranty**: Manufacturer shall furnish extended warranty to City agreeing to correct defective Work for period of 15 years from dated established by Notice of Completion.

1. Manufacturer's warranty shall cover water vapor emission coating failure, including but not limited to, suppression of water vapor emission, alkalinity and migrating salts through concrete surfaces. Emission levels after application shall not exceed flooring manufacturer's requirements.
2. Manufacturer shall provide product liability insurance in the amount of $6,000,000 per occurrence and list City as additional insured.
3. Installation shall include a cement topcoat to provide sustainable surface for future flooring updates and replacements to allow warranty coverage to be extended.

B. **Warranty Repair Work**: Include removal and replacement of flooring products, removal of portland cement topcoat, removal of water vapor emission coating, preparation of concrete substrate and application of new water vapor emission control coating system.

1. Remedial work shall include all costs to City for incidental damages, including necessary removal and reinstallation of furniture, fixtures and equipment.
2. Remedial work shall include removal and replacement of all flooring products in room so that consistent appearance and performance of flooring surface is restored.

PART 2 - PRODUCTS

2.01 VAPOR EMISSION COATING SYSTEM

A. **Specified Manufacturer**: Synthetics International, (866/646-0356).

B. **Acceptable Manufacturers**: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. DiamondStone LLC (Diamond-VRS), (888/817-8663).
2. Ardex Engineered Cements (Ardex MC), (724/203-5001 or 888/512-7339).

C. **Water Vapor Emission Control System**: Synthetic 30 manufactured by Synthetics International, fluid-applied, water vapor control coating system that penetrates and suppresses water vapor emission from portland cement concrete and creates alkali resistance to 14 pH.

1. Water vapor control coating system shall be two-coat application of proprietary two-component, low viscosity, polymer coating which forms highly insoluble film, reducing water vapor by 95 percent (ASTM E 96) and resistant to 14 pH (ASTM D 1308).
2. Water vapor control coating system shall remain resistant to 100% RH when tested according to ASTM F 2170, In-Situ Relative humidity exposure.
3. Completed application shall maintain water vapor emission rate of less than 2.0 lbs. when tested according to ASTM F 1869.

D. **Properties**: Water vapor control coating system shall be tested by independent testing laboratory tested in accordance with the following procedures and results:

1. Water Vapor Transmission - WRT:
   a. ASTM E 96 Grains/ft²/hr: Less than 0.6.
   b. ASTM E 96 Pounds/1000 ft² 24 hours: Less than 2.0.
   c. ASTM E 96 grams/h· m²: Less than 0.7.
2. Water Vapor Permeance - WVP:
   a. ASTM E 96 Perms (inch-pounds) of less than 2.4.

b. ASTM E 96 Grams/Pa· s· m² x 10-? of less than 13.6
c. ASTM E 96 Nanograms/ Pa · s · m² of less than 136.3

3. Alkali Resistance - 30 days:
   a. ASTM D 1308 - Resistant to 35% potassium hydroxide exposure.
   b. ASTM D 1308 - Resistant to 14 pH solution exposure.
4. Concrete Adhesion - Pull off:
   a. ASTM D 4541 Adhesion of 375 to 600 psi (100% concrete cohesive failure).
5. Low Emitting - VOC Content:
   a. EPA Method 24 testing of less than 62 g/liter.
   b. Meets LEED EQ Credit 4.2
   c. Meets CHPS EQ Credit 2.2
   d. Contains no formaldehyde, formaldehyde precursors and zero-carcinogens.
   e. Contains zero hazardous air pollutants (HAPs).
   f. Meets indoor air quality requirements for office, schools and healthcare by emission chamber testing.

2.02 ACCESSORY PRODUCTS

A. **Moisture Tolerant Primer:** Two-component, low viscosity liquid for chemically bonding cement products to vapor control coating.

B. **Portland Cement Topcoat**: Portland cement, single-component floor prep product as approved by coating manufacturer. Product shall be applied at nominal 1/8-inch thickness.

C. **Water Vapor Emission Test Kits**: American Moisture Test, Inc. (866/670-9700), suitable for testing according to ASTM F 1869.

PART 3 - EXECUTION

3.01 EXAMINATION

A. **Examination**:
1. Verify substrates meet manufactures requirements before starting preparation and application.
2. Verify that items which penetrate substrate to receive coating are securely installed.

3.02 PREPARATION

A. **Preparation**:

1. Remove foreign materials detrimental to system, such as curing compounds, sealers, loose patching materials or surface oil) shall be removed by mechanical scarification or shot-blasting.
2. Repair cracks, joints, low spots and bumps as acceptable to Architect and according to criteria of manufacturer of water vapor emission mitigation.
3. Vacuum all surfaces. Water vapor emission mitigation system shall not

be applied to frozen, dirty, on-absorptive or glossy surfaces. Do not acid etch or use clean sweeping agents.

4. Ensure that prepared surfaces are solid, free of loose particles, cracks, pits, rough projections or foreign matter detrimental to maximum adhesion of the water vapor control coating system.

3.03 APPLICATION

A. Application of Water Vapor Control Coating System: Comply with manufacturer's instructions and recommendations.

1. Apply moisture-tolerant primer to ensure bond of all cement products to vapor control coating.
2. Apply ultra low-viscosity moisture-alkaline penetrant over entire concrete floor surface, using lint-free nap roller or floor brush, and saturate entire concrete surface. Allow penetrant to cure according to manufacturer's requirements.
3. Apply penetrant to saturate surfaces, cracks and joints in accordance with manufacturer's spread rates and curing requirements.

B. Application of Topcoat: Mix and apply portland cement-based topcoat product to provide smooth floor surface suitable for installation of flooring. Cured thickness shall comply with manufacturer's requirements for surface capable of future flooring removal and replacement.

3.04 FIELD QUALITY CONTROL

A. Field Testing: In accordance with requirements specified in Section 01400 - Quality Control.

1. Testing shall be performed according to ASTM F 1869 after application and curing of water vapor control coating, to verify water vapor emission rate. Testing shall be minimum of 10 tests per 100 sf of floor area or portion thereof, using suitable, prepackaged calcium chloride dome test kits.
2. Should testing result in water vapor emission greater than 2.5 lbs. per 1,000 square feet in 24 hours, clean floor and reapply water vapor control coating according to manufacturer's instructions.
3. Retest and perform additional remedial measures according to manufacturer's instructions and recommendations until water vapor emission result of 2.5 lbs. is achieved.

END OF SECTION

SECTION 07270

FIRESTOPPING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide firestopping and smokeseals complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. All openings in fire-rated floors and walls both empty and those accommodating penetrating items such as cables, conduits, pipes, ducts etc.
2. Head of wall openings between walls and connecting floors or roof assemblies.
3. Openings at each level in shafts.

B. Related Work Not In This Section:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE: Firestopping materials shall conform to ratings as per ASTM E-814 (UL-1479). The ratings must be a minimum of one hour, but not less than the fire resistance rating of the assembly being penetrated. Fire tests shall be conducted with a minimum positive pressure differential of 0.03" of water column. Systems and materials and must be listed by one of the appropriate agency: City of Rancho Cucamonga and County of San Bernardino, UL, ICBO, State Fire Marshal as required.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: Within 90 calendar days after the Contractor has received the Owners notice to proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications, test data, and other data required to provide compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING: Protect the materials of this Section before, during and after installation, and protect the work and materials of all other trades. In the event of damage, immediately make replacements and repair to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 FIRESTOPPING:

A. **Manufacturers**: Where firestopping or smokeseals are called for on the Drawings or as specified herein, provide materials manufactured by one (1) of the following manufacturers:

1. Hilti Corporation
2. Dow Corning Corp., (517)496-4000.
3. 3M Contractor Products, (800)328-1687.
4. USG, (800)964-4874.
5. Tremco, Trimstop, (800) 551-3949

B. **Materials**: All materials shall restrict the transmission of temperature as well as the passage of flame, smoke and water. Materials shall be tested under ASTM E-814 (UL 1479) and pass.

1. Firestop Mortar: Single component portland cement/fly ash mortar. Requiring no support or anchoring devices to pass water hose stream tests.
2. Firestop Sealant: Single component sealant, use gun grade for walls and overhead. Intumescent, endothermic sealant, caulk or mastic as required by Code for approval.
3. Backing Material: Mineral wool, 4 pcf thickness manufactured by USG or approved equal.
4. Firestop Sleeve: Fabricated sleeve, collar or boot used around plastic pipe and other penetrations in fire-rated walls.
5. Firestop Compound: Firestop compound as required by system for Code approval.
6. Metal Components: Provide metal components as required by system manufacturer to meet fire test requirements.
7. Firestop Wrap Strips: Use intumescent wrap strips as required for Code approval.
8. Firestop Pillow System: A moisture resistive sensitive bag containing semi-intumescent material.
9. FireMaster Duct Protection System: A encapsulated fireproof blanket system for up to a 2 hour UL rating.
10. Safing Insulation: UL approved, incombustible, by USG, Tremco, or equal, with Code approved galvanized steel closures, clips, and ties to secure insulation and conform to Code.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS: Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION: Prepare the surface in accordance with approved manufacturer's recommendations.

3.03 APPLICATION: Apply the approved system and product to the designated surfaces in strict accordance with the manufacturer's recommended application procedures meeting Code requirements and approved by Architect. Firestop systems and materials shall have no adverse effect on the overall fire-rating or structural integrity of the wall assembly.

3.04 SAFING INSULATION: Pack indicated voids and other voids as required by Code, and secure with metal closures, clips, and ties according to Code.

END OF SECTION

SECTION 07413

METAL WALL PANELS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Concealed Fastener single skin metal wall panel:** Installed horizontally and used in an exterior wall back ventilated rain-screen application as shown on the drawings.

B. **Accessories including concealed fasteners**, perimeter trim and penetration treatments.

1.02 RELATED SECTIONS

A. **Section 05900** - Metal Finishes: Factory applied metal finishes

B. **Section 07600** - Sheet Metal: General requirements for sheet metal flashing and trim.

C. **Section 07900** – Caulking and Sealants: Joint sealants, applicable to sealants used to seal to surrounding construction.

1.03 REFERENCES

A. **ASTM International (ASTM)**:

1. ASTM A240; Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
2. ASTM A653; Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Alloy Coated (Galvannealed) by the Hot Dip Process.
3. ASTM A666; Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
4 ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
5. ASTM B209; Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
6. ASTM C612; Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
7. ASTM C645 Standard Test Method for Nonstructural Steel Framing Members.
8. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
9. ASTM C1311; Standard Specification for Solvent Release Sealants.
10. ASTM D2244; Standard practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

11. ASTM D4214; Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
12. ASTM E283; Standard Test Method for determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors under Specified Pressure Differences across the Specimen.
13. ASTM E330; Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
14. ASTM E331; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
15. ASTM E1592; Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

B. **Sheet Metal and Air Conditioning Contractors National Association (SMACNA**) - Architectural Sheet Metal Manual.

1.04 QUALITY ASSURANCE

A. **Manufacturer's Qualifications**: Manufacturer shall have a minimum of ten (10) years experience in the production of metal wall panels. Manufacturer shall demonstrate past experience with examples of projects of similar type and exposure.

B. **Installer's Qualifications**: Installer shall be authorized by the manufacturer and the work shall be supervised by a person having successfully completed a manufacturer training seminar regarding proper installation of the specified product.

1.05 SUBMITTALS

A. **Product Data**: Submit manufacturer current technical literature for each type of product.

B. **Delegated Design**: Design metal wall panel assembly, submit comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. **Shop Drawings** - Submit detailed drawings showing:

1. Profile
2. Gauge of panel
3. Location, layout and dimensions of panels
4. Location and type of fasteners
5. Shape and method of attachment of all trim
6. Locations and type of sealants
7. Installation sequence.
8. Other details as may be required for a weathertight installation

D. **Samples**: Provide sample panel width by 10 inches long minimum. Provide 3 x 5-inch sample of each color.

E. **Quality Assurance Submittals**

1. Manufacturer's Installation Instructions: Provide manufacturer's written installation instructions including proper material storage, material handling, installation sequence, panel location(s), and attachment methods, details and required trim and accessories.

E. **Closeout Submittals**: Manufacturer's maintenance instructions, including cleaning finish repair instructions,

1.06 ADMINISTRATIVE REQUIREMENTS

A. **Pre-installation Meeting**: Conduct a pre-installation meeting at the job site attended by Owner, Architect, Manufacturer's Technical Representative, Panel Installer, and Contractors of related trades. Coordinate structural support requirements in relation to wall panel system, installation of any separate air/water barriers, treatment of fenestration, and other requirements specific to the project.

1.07 DELIVERY, STORAGE AND HANDLING

A. **Deliver panel materials** and components in manufacturer's original, unopened, undamaged packaging with identification labels intact.

B. **Store wall panel materials** on dry, level, firm, and clean surface. Elevate one end of bundle to allow moisture run-off, cover and ventilate to allow air to circulate and moisture to escape.

1.08 WARRANTY

A. **Material Warranty**: Standard form in which manufacturer agrees to repair or replace items that fail in materials or workmanship within specified warranty period. The items covered by the warranty include structural performance and finish performance.

1. Warranty Period: Two years from date established by Notice of Completion.

B. **Finish Warranty**: Standard form in which manufacturer agrees to repair or replace metal panels that evidence deterioration of fluoropolymer finish, including flaking or peeling from approved primed metal substrate, chalk in excess of 8 when tested in accordance with ASTM D4214, Method A, and /or color fading in excess of 5 ?E Hunter units on panels when tested in accordance with ASTM D2244.

1. Warranty Period: Twenty (20) years from date established by Notice of Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. **Specified Manufacturer:** Morin; a Kingspan Group Company, Bristol, CT (800-640-9501 (Toll Free); Regional Office; 10707 Commerce Way, Fontana, CA 92337 (909-428-3747); Regional Representative, Lou Budde: 1-714-859-9036 or Loub@morincorp.com.

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers, will be considered in accordance with the substitution provision specified in Section 01600- Products and Materials using Substitution Request Form, Section 01630. Substitutions following award of bid will not be allowed.

2.02 METAL WALL PANELS, GENERAL

A. **Concealed Fastener single skin metal wall panel:** Installed horizontally and used in an exterior wall back ventilated rain-screen application as shown in the drawings.

2.03 PANEL MATERIALS

A. **Sheet Steel:**

1. Aluminum-Zinc Alloy-Coated Steel Sheet (Galvalume): ASTM_A_792, Class_AZ50 coating designation, Grade_40.
2. Thickness: Minimum 20 gage.

2.04 WALL PANEL DESCRIPTION

A. **Box-Ribbed Concealed Fastener single face metal wall panel:**

1. Exposed Panel Width: 12 inches.
2. Profile: Matrix Wall Series MX1.0, Matrix MX2.0 and Matrix MX3.0. Combined as indicated on the drawings. 20 GA.
3. Panel thickness: 1 ½”
4. Panel joints: Tongue-and-groove interlock joint.
5. Exposed face finish: Box Ribbed Configuration
6. Finish: Custom Color to match RAL 8024 as noted on the drawings.

B. **Smooth Face Concealed Fastener single face metal wall panels:**

6. Exposed Panel Width: 12 inches.
7. Profile: Matrix Wall Series MXO, 20 GA.
8. Panel thickness: 1 ½”
9. Panel joints: Tongue-and-groove interlock joint.
10. Exposed face finish: Smooth Face
6. Finish: Custom Color to match RAL 8024 as noted on the drawings.

C. Smooth Face Concealed Fastener single face metal soffit panels:

11. Exposed Panel Width: 12 inches.
12. Profile: Matrix Wall Series MXO, 20 GA.
13. Panel thickness: 1 ½”
14. Panel joints: Tongue-and-groove interlock joint.
15. Exposed face finish: Smooth Face
6. Finish: Custom Color to match RAL 8024 as noted on the drawings.

D. Panel Accessories:

1. Wall panel accessories: Provide accessories as required for a complete installation. Accessories shall be as indicated on reviewed shop drawings and as indicated on manufacturers reviewed and referenced standard details. Match material and finish of metal wall panels.

E. Furring: Galvanized steel hat channel furring as detailed and noted on the Drawings.

F. Panel Fabrication:

1. Metal wall panels shall be formed to lap and interconnect with edges of adjacent panels which are then mechanically attached through panel to supports using concealed fasteners.
2. Fabricate metal wall panels to eliminate condensation on interior side of panel and with joints between panels designed to form weathertight seals.
3. Metal wall panels shall have both factory-installed and site applied sealant at panel joints to provide a tight seal and minimize noise from movements within panel assembly.
4. Panels shall be factory formed. Field formed panels will not be acceptable.
5. Mitered Corners: Structurally bonded horizontal outside and inside trimless corners matching metal wall panel material, profile and factory applied finish shall be fabricated by metal wall panel manufacturer.
   a. Welded, riveted or field fabricated corners do not meet the requirements of this specification.
   b. Basis of Design: Morin Miterseam Corners (24” x24”)
5. Closure Strips:
   a. Closed Cell Closure Strips: Provide minimum 1-inch thick matching metal wall panel profile.
   b. Metal Profile Closure Strips: Shall be fabricated from same gauge, material and finish as metal panel.
6. Concealed Panel Clips: 18 gauge; Zinc-Coated (Galvanized) Steel Sheet: ASTM_A653, G90 coating designation

G. Sheet Metal Trim: Custom fabricated from pre-finished sheet metal matching panel material, gage and finish, formed in compliance with general requirements specified in Section 07600 - Sheet Metal. Locations include, but are not limited

to the following: Drips, sills, jambs, corners, framed openings, parapet caps, reveals and fillers.

1. Custom fabricate trim as detailed on the Drawings, using pre-finished sheet metal matching panel material, gage and finish. Comply with general requirements specified in Section 07600 - Sheet Metal.

2.05 SHEET METAL FINISH

A. Painted Sheet Metal Finish: 2-Coat Fluoropolymer finish, complying with AAMA 621. Fluoropolymer finish shall contain not less than 70 percent PVDF resin (Kynar 500 or Hylar 5000) by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Refer to Section 05900 Metal Finishes for requirements.

B. Color: Custom Color to match RAL 8024. Refer to Section 05900 Metal Finishes for requirements.

2.08 MISCELLANEOUS MATERIALS

A. Fasteners for Lap-Seam Metal Wall Panels: For concealed conditions: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

B. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

C. Panel Sealants: For use when installing panels.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape - inch (13 mm) wide and 1/8-inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

D. Field-Applied Sealants: For joints between metal wall panel system and surrounding and penetrating construction, as specified in Section 07900 - Joint Sealants. Color shall match sheet metal finish, unless otherwise directed and approved by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

A. **Examine substrates, areas, and** conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
3. Verify that air and water barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration and to drain to weeps.
4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. **Examine roughing-in for components** and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation. a.Proceed with panel and trim installation only after unsatisfactory conditions have been corrected.

C. **Examine individual panels upon** removing from the bundle; notify manufacturer of panel defects. Do not install defective panels.

3.02 PREPARATION

A. **Miscellaneous Framing:** Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written instructions and recommendations.

1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated].

B. **Examine individual panels upon** removing from the bundle; notify manufacturer of panel defects. Do not install defective panels.

3.03 INSTALLATION OF MATRIX SINGLE SKIN WALL PANELS

A. **Installation of Matrix Single Skin Wall Panels:** Comply with manufacturer’s instructions and recommendations and reviewed shop drawings

1. Apply sealant to horizontal or vertical joints at concealed fasteners, per manufacturer’s recommendations and approved shop drawings.
2. Installation shall be in accordance with manufacturer’s installation

guidelines and recommendations.

3. Install panels plumb, level, and true-to-line to dimensions and layout indicated on approved shop drawings.
4. Cutting and fitting of panels shall be neat, square and true. Torch cutting is prohibited.

B. Trim Installation:

1. Place trim and trim fasteners only as indicated per details on the reviewed shop drawings.
2. Apply sealant tape at trim, per manufacturer's details and approved shop drawings, for weather tight installation.

C. Sealant Installation at Exposed Joints:

1. Clean and prime surfaces to review exterior exposed sealants in accordance with sealant manufacturer's recommendations.
2. Follow sealant manufacturer's recommendations for joint width-to-depth ratio, application temperature range, size and type of backer rod, and compatibility of materials for adhesion.

3.04 CLEANING AND PROTECTION

A. Initial Cleaning:

1. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed, unless otherwise indicated in manufacturer's written installation instructions.
2. Upon completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.
3. Touch-up, repair or replace metal panels and trim that have been damaged.
4. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

B. Final Cleaning: Clean panels and trim to dustfree condition in preparation for Completion review. Touch-up, repair or replace metal panels and trim that have been damaged. Check and clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Protection: Protect metal panels and trim with temporary coverings and barriers to prevent soiling, scratching, marring and denting.

END OF SECTION

SECTION 07520

MODIFIED BITUMINOUS SHEET AIR AND WATER BARRIER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Modified bituminous sheet air and** water barrier for exterior face of exterior walls.

1.02 RELATED SECTIONS

A. **Section 07210 - Building Insulation**: Substrate onto which air and water barrier is applied.

B. **Section 07900 – Caulking and Sealants**: Sealant applied to joints at windows, storefronts and other penetrating elements.

1.03 QUALITY ASSURANCE

A. **Manufacturer Qualifications**: Company specializing in manufacturing products specified in this Section with minimum ten years documented experience.

B. **Installer's Qualifications**: Company specializing in performing Work specified in this Section with minimum three years documented experience.

1.04 SUBMITTALS

A. **Product Data**: Manufacturer's data stating the following properties.

1. Thermal properties.
2. Fire characteristics.
3. Fastener holding values.
4. Preparation instructions and recommendations.
5. Storage and handling requirements and recommendations.
6. Installation instructions.

1.05 PRE-INSTALLATION MEETINGS

A. **Convene meeting minimum** one week prior to commencing Work of this section.

B. **Review installation procedures** and coordination required with related Work.

C. **Inspect and make notes of job conditions prior to installation**:

1. Record minutes of the conference and provide copies to all parties present.
2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.

3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Owner's Representative and Architect.

1.06 DELIVERY, STORAGE, AND HANDLING

A. **Delivery and Storage**: Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. **Store all roofing materials** in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. **Stored in accordance with** the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. **Store at room temperature** wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. **Avoid stockpiling of materials** on roofs without first obtaining acceptance from the Architect/Engineer.

F. **Adhesive storage shall be** between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.07 COORDINATION

A. **Coordinate Work with** installation of metal flashings, windows and storefront as underlayment work proceeds.

1.08 PROJECT CONDITIONS

A. **Maintain environmental conditions** (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 WARRANTY

A. **Manufacturer's Warranty:** Upon completion of the work, provide the Manufacturer's written and signed warranty covering leakage due to defective materials. Manufacturer shall provide the Owner, at the Manufacturer's expense, all material necessary to restore defective area to watertight condition. Warranty period shall be not less than ten years from date established by Notice of Completion.

B. **Installer's Warranty**: Upon completion of the work, provide the joint warranty by Contractor and installer covering leakage of underlayment due to defective

materials for a period of five years from date established by Notice of Completion, as necessary to restore underlayment to watertight condition.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. **Specified Manufacturer**: Polyglass USA, Inc., (888-410-1375 or 954-233-1330) www.polyglass.us.

B. **Acceptable Manufacturers**: Or approved equal by the Architect

2.02 MODIFIED BITUMINOUS SHEET AIR AND WATER BARRIER

A. **Modified Bituminous Sheet Air and Water Barrier**: Polystick MTS, manufactured by Polyglass USA, Inc.

1. Reinforcement: Glass Fiber.
2. Surface/Bottom: Split Release Film/G/Polymer modified asphalt compound.
3. Use: Wall surface underlayment for air and water barrier at exterior walls over insulation board sheathing and under exterior metal panel wall finish.
4. Installation Method: Self-adhered (peel and stick over prepared substrate),
5. Thickness (Nominal): 1.5 mm
6. Weight (Nominal): 70 lbs. per roll.
7. Length: 65- feet 8-inches per roll.
8. Width: 3 feet 3-3/8 inches
9. Coverage: 200 sf per roll.
10. Standard Compliance: ASTM D1970.

2.03 ACCESSORIES

A. **Metal Flashing conditions**: As indicated on the Drawings and specified in Section 07600 - Sheet Metal.

B. **Surface Coating**: PG 700 White Elastomeric Roof Coating, for UV protection until wall finish is installed.

C. **Fasteners and Plates**: Provide FM Approved fasteners and plates and other devices as required to suit the system specified.

D. **Asphalt Primer**: Polyglass PG100 Asphalt Primer or asphalt primer conforming to ASTM D 41.

1. Primer shall be applied on all dissimilar materials except insulation.
2. Description: Black bituminous liquid.
3. Composition: Asphalt modified bitumen with thermoplastic polymers and volatile solvents.

E. Miscellaneous Materials:

1. Adhesive: Polyglass PolyPlus 35 or PG 350 Modified Adhesive. Meets or exceeds the requirements of ASTM D 3019 Type III Lap Adhesion.
2. Cement: Polyglass PG 500 Modified Cement. Meets or exceeds the requirements of ASTM D 4586 Asphalt Roof Cement Type I.
3. Flashing Cement: Polyglass PolyPlus 50 Premium MB Flashing Cement. Meets or exceeds the requirements of ASTM D 4586 Asphalt Roof Cement Type I.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examination:

1. Do not begin installation until substrates have been properly prepared.
2. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.
3. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.
4. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. General: Clean surfaces thoroughly prior to membrane installation.

1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
4. Wherever necessary, all surfaces to receive roofing materials shall be power broomed and vacuumed to remove debris and loose matter prior to starting work.
5. Do not apply membrane during inclement weather. Do not apply membrane to damp, frozen, dirty, or dusty surfaces.
6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lb. per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
7. Prime substrate as required by underlayment membrane manufacturer.

B. Insulation Substrate: Ensure that rigid board insulation is properly installed, including surface condition.

C. **Penetration Sealing**: Seal penetrations as detailed on the Drawings and according to membrane manufacturer's instructions and recommendations.

3.03 PROTECTION

A. **Membrane Protection**: Where membrane will remain exposed for time period exceeding manufacturer's limit, apply top coating to provide protection from UV light exposure.

END OF SECTION

SECTION 07520

SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Hybrid Styrene-butadience-styrene (SBS) modified bituminous membrane roofing system on wood deck, including but not limited to:
2. Roof membrane and membrane base flashings.
3. Roof surfacing consisting of mineral granulated cap sheet.
4. Title 24 compliant coating.

A. Related Work: The work includes but is not limited to the installation of:

1. Substrate Preparation
2. Roof Drains
3. DensDeck
4. Roof Membrane
5. Fasteners
6. Adhesive for Flashings
7. Roof Membrane Flashings
8. Walkways
9. Metal Flashings, with either field painted or shop applied finishes
10. Sealants

1.03 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg. F (14 deg. C), measured at the mop cart or mechanical spreader immediately before application.

C. Cold Process Roofing - An asbestos free formulation of asphalt, solvent, thixotrope, mineral stabilizer and reinforcing fibers used as an interplay or cap sheet adhesive.

1.04 ACTION SUBMITTALS

A. **Product Data**: For each type of product indicated.

B. **Shop Drawings**: For roofing system. Include plans, elevations, sections, details, and attachments to other work. Provide roof plan showing orientation and types of roof deck, orientation of membrane roofing, and fastening spacings and patterns for mechanically fastened components.

1. Base flashings and built-up terminations.
2. Indicate details meet requirements of NRCA required by this Section.
3. Crickets, saddles, and tapered edge strips, including slopes.

1.05 INFORMATIONAL SUBMITTALS

A. **Contractor's Product Certificate**: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. **Qualification Data**: For Installer, Manufacturer, and Roofing Inspector. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. **Manufacturer Certificates**: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article. Submit evidence of compliance with performance requirements, including UL listing certificate. Indicate that proposed system components are compatible.

D. **Product Test Reports**: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of built-up roofing.

E. **Warranties**: Unexecuted sample copies of special warranties.

F. **Field Quality Control Reports**: Daily reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.06 CLOSEOUT SUBMITTALS

A. **Maintenance Data**: To include in maintenance manuals.

B. **Warranties**: Executed copies of warranties.

1.07 QUALITY ASSURANCE

A. **Installer Qualifications**: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to

communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. **Manufacturer Qualifications**: Approved manufacturer with UL listed roofing systems comparable to those specified for this Project, with minimum five years' experience in manufacture of comparable products in successful use in similar applications, and able to furnish warranty with provisions matching specified requirements.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

    a. Product data, including certified independent test data indicating compliance with requirements.
    b. Samples of each component.
    c. Sample submittal from similar project.
    d. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.
    e. Sample warranty.

C. **Roofing Inspector Qualifications**: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer’s compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.
2. Contractor shall acquire five (5) inspection service days utilizing the manufacturers inspector.

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

E. **Pre-installation Roofing Conference**: Conduct conference at Project site.

1. Meet with Owner, Architect, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review drawings and specifications.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.
7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.08 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. **Protect roof insulation** materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. **Handle and store roofing** materials and place equipment in a manner to avoid permanent deflection of deck.

1.09 PROJECT 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.

B. **Daily Protection**: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
3. Remove temporary plugs from roof drains at end of each day.

4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.10 WARRANTY

A. **Warranty, General**: Warranties specified 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. Warranty shall be issued by same manufacturer issuing the metal roof system warranty.

B. **Manufacturer's Warranty**: Manufacturer's standard or customized form, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

1. Manufacturer's warranty includes roofing membrane, base flashings, fasteners, roofing membrane accessories and other components of roofing system specified in this Section.
2. Warranty Period: 20 years from date of Substantial Completion.

C. **Installer's 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 roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, and walkway products, for the following warranty period:

1. Warranty Period: 2 years from date of Substantial Completion.

D. **Extended Roof System Warranty**: Warranties specified in this Section include the following components and systems specified in other sections supplied by the roofing system Manufacturer , and installed by the roofing system Installer:

1. Sheet metal flashing and trim, including roof penetration flashings.
2. Manufactured copings, roof edge, counterflashings, and reglets.
3. Roof curb, hatch, and penetration flashings.
4. Roof and parapet expansion joint assemblies.
5. Metal roof, wall, and soffit panels and trim.

E. **Manufacturer Inspection and Preventive Maintenance Requirement**: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections and preventive maintenance is included in the Contract Sum.

1. Inspections to occur in the following years subsequent to completion: 2, 5, 10 and 15.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: **Basis of Design Manufacturers/Products**: Subject to compliance with requirements, provide products by one of the following manufacturers comparable to the Basis of Design product specified:

A. **Tremco, Inc**., (714) 335-4739, rtolsma@tremcoinc.com

2.02 PERFORMANCE REQUIREMENTS

A. **General Performance**: Roofing shall withstand exposure to weather without failure or leaks due to defective manufacture or installation.

B. **Material Compatibility**: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. **Exterior Fire-Test Exposure**: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. **Fire-Resistance Ratings**: Where indicated, provide fire-resistance-rated roof assemblies 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.

E. **Solar Reflectance Index**: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. **Energy Star Listing**: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

G. **Energy Performance**: Roofing system shall have an initial solar reflectance index of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

2.03 ROOFING MEMBRANE MATERIALS

A. **Sheathing Paper**: Red rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

B. **Base Sheet:**

1. ASTM D 4601 Type II non-perforated SBS-modified asphalt coated fiberglass/fiberglass/ polyester reinforced high tensile strength sheet dusted with fine mineral surfacing on both sides..
   a. Basis of design product: Tremco, BURmastic Composite Ply HT.
   b. Tensile Strength, minimum, ASTM D 5147: Machine direction, 165 lbf/in (28.9 kN/m); Cross machine direction, 150 lbf/in (26.3 kN/m).
   c. Tear Strength, minimum, ASTM D 5147: Machine direction, 210 lbf (0.9 kN); Cross machine direction, 185 lbf (0.8 kN).

d. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D 5147: 6 percent.
e. Thickness, minimum, ASTM D 146: 0.055 inch (1.4 mm).

C. Hybrid System Asphalt Ply Sheets:

1. ASTM D 2178 Type IV asphalt-impregnated glass-fiber ply sheet.
   a. Basis of design product: Tremco, THERMglass Type IV.
   b. Net Dry Mass, ASTM D 146: 7.5 lb/100 sq ft.
   c. Breaking Strength, ASTM D 146: 44 lbf/in.

D. SBS Modified Bituminous Cap Sheet:

1. ASTM D 6163 Type I Grade G SBS-modified asphalt-coated glass-fiber-reinforced sheet, granular surfaced.
   a. Basis of design product: Tremco, POWER ply Standard FR.
   b. Exterior Fire-Test Exposure, ASTM E 108: Class A.
   c. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 80.0 lbf/in (14.0 kN/m); Cross machine direction 70.0 lbf/in (12.0 kN/m).
   d. Tear Strength at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction, 100 lbf (440 N); Cross machine direction 100 lbf (440 N).
   e. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 5147: Machine direction 7.5 percent; Cross machine direction 7.5 percent.
   f. Low Temperature Flex, maximum, ASTM D 5147: -15 deg. F (-26 deg. C).
   g. Thickness, minimum, ASTM D 5147: 0.120 inch (3 mm).

E. Base Flashing Sheet:

1. Thermoplastic PVC/TPA sheet, ASTM D4434 Type IV internally fabric reinforced, Energy Star qualified, CRRC listed, and California Title 24 Energy Code compliant.
   a. Basis of design product: Tremco, TPA Roof Membrane.
   b. Tensile Strength at 0 deg. F (-18 deg. C), minimum, ASTM D 6509: 300 lbf/in (52 kN/m).
   c. Tear Strength at 77 deg. F (25 deg. C), minimum, ASTM D 6509: 100 lbf (440 N).
   d. Elongation at 0 deg. F (-18 deg. C), minimum at fabric break, ASTM D 6509: 25 percent.
   e. Minimum Thickness, nominal, ASTM D 751: 45 mils (1.1 mm).
   f. Exposed Face Color: White.
   g. Reflectance, ASTM C 1549: 86 percent.
   h. Thermal Emittance, ASTM C 1371: 0.86.
   i. Solar Reflectance Index (SRI), ASTM E 1980: 108.
   j. Recycled Content, minimum: 25 percent preconsumer.

F. Stripping/Target Ply Sheet: Non-woven, heat resistant, polyester sheet, with the following properties:

1. Polytherm Stripping Ply.
2. Breaking Load at 77 deg. F (25 deg. C), minimum, ASTM D 4830: machine direction, 150 lbf (667 N); cross-machine direction, 130 lbf (40.3 kN/m).
3. Trapezoid Tearing Strength, minimum, ASTM D 4830: machine direction, 60 lbf (267 N); cross-machine direction, 60 lbf (1.7 kN).
4. Elongation at 77 deg. F (25 deg. C), minimum, ASTM D 4830: machine direction, 30 percent; cross-machine direction, 30 percent.
5. Thickness, minimum, ASTM D 1777: 0.035 inch (1.2 mm).
6. Weight, minimum, ASTM D 3776: 5.5 oz./sq. ft (1.4 kg/sq. m.).

G. **Glass-Fiber Fabric**: Woven glass-fiber cloth treated with asphalt, ASTM D 1668 Type I.

2.04 ASPHALT MATERIALS

A. **Asphalt primer, water-based, polymer modified.**

1. Basis of design product: Tremco, TREMprime WB.
2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 2 g/L.

B. **ASTM D 312 Type IV hot-melt asphalt.**

1. Basis of design product: Tremco, Premium IV.
2. Softening Point, min/max, ASTM D 36: 215225 deg. F (102107 deg. C).
3. Ductility at 77 deg. F, minimum, ASTM D 113: 2.5 cm.
4. Penetration at 77 deg. F (25 deg. C), min/max, ASTM D 5: 1530 dmm.

C. **Asphalt Roofing Cement**: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.

2.05 AUXILIARY ROOFING MATERIALS

A. **General**: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. **Cold-Applied Cap Sheet Adhesive:**

1. Cold-applied roofing adhesive and surfacer, one-part, formulated for compatibility and use with specified roofing membranes and flashings.
   a. Basis of design product: Tremco, POWERply Standard Cold Adhesive LV .
   b. Volatile Organic Compounds (VOC), maximum, ASTM D 6511: 197 g/L.
   c. Nonvolatile Content, minimum, ASTM D 6511: 72 percent.
   d. Flash Point, minimum, ASTM D 93: 100 deg F (38 deg C).

C. **Joint Sealant**: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.

1. Joint Sealant, Polyurethane: ASTM C 920, Type S, Grade NS, Class 25 single-component moisture curing sealant, formulated for compatibility and use in dynamic and static joints..
   a. Basis of design product: Tremco, TremSEAL PRO.
   b. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 85 g/L.
   c. Hardness, Shore A, ASTM C 661: 40.
   d. Color: White.

D. **Fasteners**: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM Global 4470, designed for fastening roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

E. **Metal Flashing Sheet**: Metal flashing sheet is specified in Division 07 Section "Sheet Metal."

F. **Miscellaneous Accessories**: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.06 ROOF INSULATION

A. **Roof Insulation, General**: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.

1. Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
2. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes for sloping to drain and at transitions. Fabricate to slopes indicated.
   a. 1/4:12 inch slope min.
   b. Polyisocyanurate cricket material, ASTM C 1289, Type II, Class 1, Grade 2.
   c. Cricket system cover board: 1/2 inch wood fiber board, asphalt coated on all six sides, ASTM C208.

B. **Insulation Adhesive:**

1. Premium IV Asphalt

C. **Insulation Cant Strips**: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

D. **Wood Cant Strips**: Comply with requirements in Division 06 carpentry section

E. **Tapered Edge Strips**: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.07 SURFACING MATERIALS

A. **White Roof Coating Primer:**

1. Tremco SP Primer

B. **Acrylic Roof Coating, Highly-Reflective Elastomeric**: ASTM D 6083, applied as base coat plus finish coat over prepared and primed roof surfaces.

1. Basis of design product: Tremco, Solargard 6083 Base and Top Coat.
2. Solar Reflectance Index (SRI), white, ASTM E 1980: 105 initial; 100 aged.
3. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: Less than 50 g/L.
4. Tensile Strength at 73 deg. F (23 deg. C), minimum, ASTM D 2370: Not less than 250 psi (1700 kPa).
5. Elongation at 73 deg. F (23 deg. C), minimum, ASTM D 2370: Not less than 350 percent.
6. Flexibility at -15 deg F (-26 deg C), ASTM D 522: Pass 1/2 inch mandrel after 1000 hrs. accelerated weathering.
7. Solids by weight, ASTM D 1644: Not less than 60 percent.
8. Solids by volume, ASTM D 2697: Not less than 50 percent.
9. Color, Base Coat: Off-White.
10. Color, Top Coat: White.
11. Solar Reflectance Index (SRI), Top Coat, ASTM E 1980: 105 initial; 100 aged.

2.08 WALKWAYS

A. **Walkway pads, ceramic-granule-surfaced** reinforced asphalticcomposition slip-resisting pads, manufactured as a traffic pad for foot traffic, 1/2 inch (13 mm) thick minimum.

1. Basis of design product: Tremco, Trem-Tred.
2. Flexural Strength at max. load, minimum, ASTM C 203: 210 psi (1.5 kPa).
3. Granule adhesion (weight loss), maximum, ASTM D 4977: 1.1 gram.
4. Impact Resistance at 77 deg. F (25 deg. C), ASTM D 3746: No Damage to Roof.
5. Pad Size: 36 by 48 inch (914 by 1220 mm).

PART 3 - EXECUTION

3.01 EXAMINATION

A. **Examine substrates, areas, and conditions, with Installer present, for compliance** with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation. wood cants
3. Wood Roof Deck: Verify that wood deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.

B. **Proceed with installation** only after unsatisfactory conditions have been corrected.

3.02 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.

3.03 INSTALLATION, GENERAL

A. **Install roofing system** in accordance with manufacturer's recommendations.

B. **Install wood cants**, blocking, curbs, and nailers in accordance with requirements of Division 06 carpentry section.

C. **Install roofing membrane**, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FM Global 4470 as part of a membrane roofing system as listed in FM Global's "Approval Guide" for fire/windstorm classification indicated. Comply with recommendations in FM Global Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

D. **Install roofing system in** accordance with the following NRCA Manual Plates and NRCA recommendations; modify as required to comply with requirements of FM Global references above. Provide all required trim. Flashing and accessories required for proper installation:

1. Metal Parapet Cap (Coping) and Base Flashing: Plates MB-1 and MB-1S.
2. Surface-Mounted Counterflashing for Concrete Walls (at Parapet Wall): Plates MB-4 and MB-4S.
3. Base Flashing for Wall-supported Deck: Plates MB-5 and MB-5S.
4. Base and Surface-mounted Counterflashing: Plates MB-4 and MB-4S.
5. Scupper Through Raised Perimeter Edge: Plates MB-21 and MB-21S.
6. Equipment Support Curb: Plates MB-9 and MB-9S.
7. Equipment Support Stand: Plates MB-10.
8. Equipment Support Stand and Typical Rain Collar Penetration Detail: Plates MB-11 and MB-11S.

9. Raised Curb Detail at Rooftop HVAC Units, Premanufactured: Plates MB-12 and MB-12S and Division 7 Section "Roof Accessories."
10. Skylight, Scuttle (Roof Hatch), and Smoke Vents: Plates BUR-14 and BUR-14S and Division 07 Section "Roof Accessories."
11. Raised Curb Detail at Rooftop HVAC Units (Job site constructed wood curb): Plates MB-13 and MB-13S and Division 06 Section "Miscellaneous Rough Carpentry."
12. Penetration, Sheet Metal Enclosure for Piping Through Roof Deck: Plates MB-16 and MB-16S
13. Penetration, Isolated Stack Flashing: Plates MB-17 and MB-17S.
14. Penetration, Isolated Stack Flashing: Plates MB-17A and MB-17AS.
15. Penetration, Plumbing Vent: Plates MB-18 and MB-18S.
16. Roof Drain: Plates MB-20 and MB-20S.
17. Roof Drain: Plates MB-20A and MB-20AS.
18. Guide for Clearances between Pipes / Walls / Curbs - Table 4
19. Guide for Crickets and Saddles - Table 5
20. Guide for Edge Scuppers with Tapered Saddles - Table 6

3.04 INSULATION INSTALLATION

A. **Comply with built-up roofing** manufacturer's written instructions for installing roof insulation.

B. **Cant Strips**: Install and secure preformed 45-degree cant strips at junctures of built-up roofing with vertical surfaces or angle changes greater than 45 degrees.

C. **Install tapered insulation** under area of roofing to conform to slopes indicated.

D. **Install insulation with long** joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

E. **Trim surface of insulation** where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. **Install tapered edge** strips at perimeter edges of roof that do not terminate at vertical surfaces.

G. **Mechanically Fastened and Adhered Insulation**: Install first layer of tapered insulation, crickets and saddles to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg. F (14 deg. C) of equiviscuous temperature.

H. **Cover Board Installation**: Install cover board over tapered insulation, crickets and saddles with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Apply hot roofing asphalt to insulation and immediately bond cover board to installation.

3.05 HOT-APPLIED ROOFING MEMBRANE INSTALLATION, GENERAL

A. **Install roofing membrane system** according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and as follows:

1. Deck Type: Wood deck.
   a. Base Sheet: One, installed over sheathing paper.
      1) Attachment Method: Mechanically fastened
   b. Number of Glass-Fiber Ply Sheets: Two. Install additional ply in valleys and waterways.
      1) Adhering Method: Mopped.
   c. Granular-Surfaced SBS-Modified Asphalt Cap Sheet:
      1) Adhering Method: Cold-applied adhesive.

B. **Start installation of** roofing membrane in presence of roofing system manufacturer's technical personnel.

C. **Cooperate with testing** agencies engaged or required to perform services for installing roofing system.

D. **Coordinate installation of roofing** system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work configured as recommended by NRCA Roofing Manual Appendix: Quality Control Guidelines - Insulation to protect new and existing roofing.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
3. Remove temporary plugs from roof drains at end of each day.
4. Remove and discard temporary seals before beginning work on adjoining roofing.

E. **Hot Roofing Asphalt Heating**: Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg. F (14 deg. C) of

flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.

1. Apply hot roofing asphalt within plus or minus 25 deg. F (14 deg. C) of equiviscous temperature and adhere components to asphalt heated to not less than 425 deg. F (236 deg. C).

F. **Hot Roofing Asphalt Heating**, SEBS-Modified Asphalt: Heat and apply SEBS-modified elastomeric roofing asphalt according to roofing system manufacturer's written instructions.

G. **Substrate-Joint Penetrations**: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.06 BASE-SHEET INSTALLATION

A. **Loosely lay one course** of, lapping edges and ends a minimum of 2 inches and 6 inches (50 mm and 150 mm), respectively.

B. **Install lapped base-sheet course**, extending sheet over and terminating beyond cants. Attach base sheet as follows:

1. Mechanically fasten over rosin sheet to wood decks. Fasten according to manufacturers requirements.

3.07 PLY SHEET INSTALLATION

A. **Install ply sheets per roofing** system manufacturer's written instructions starting at low point of roofing system. Align base-ply sheets without stretching. Extend sheets over and terminate beyond cants.

1. Shingle side laps of ply sheets uniformly to ensure that required number of ply sheets covers substrate and insulation at any point. Shingle in direction to shed water.
2. Embed each ply sheet in a continuous void-free mopping of hot roofing asphalt to form a uniform membrane without glass-fiber ply sheets touching. Immediately broom sheets to ensure full adhesion.
3. Install additional ply sheet in waterways and valleys.

3.08 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. **Install modified bituminous roofing** membrane cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

1. Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.
2. Adhere cap sheet in cold processed adhesive according to manufacturer's written instructions for coverage rate and application.

B. **Laps**: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Install roofing membrane sheets so side and end laps shed water. Completely bond and seal laps, leaving no voids.

1. Repair tears and voids in laps and lapped seams not completely sealed.
2. Apply roofing granules to cover exuded bead at laps while bead is fluid.
3. Use 75lb roller on all installed cap sheet to help ensure adhesion.

3.09 FLASHING AND STRIPPING INSTALLATION

A. **Install base flashing** over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof; secure to substrates according to roofing system manufacturer's written instructions, and as follows:

1. Prime substrates with asphalt primer if required by roofing system manufacturer.
2. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer. Seal joints in flashing sheet.

B. **Extend base flashing up** walls or parapets a minimum of 12 inches (300 mm) above built-up roofing and 6 inches (150 mm) onto field of roof membrane. Extend base flashing under interior face of coping metal on bare walls.

1. Install 6 inch minimum skirt metal under interior face of coping and secure with fasteners with neoprene washers. Ensure fasteners engage coping metal, skirt metal, TPA base flashing and substrate.

C. **Flashing Sheet Top Termination**: Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a metal termination bar and joint sealant.

D. **Flashing Sheet Bottom Termination**: Adhere flashing sheet to roof membrane sheet continuously along bottom of flashing sheet.

1. Elastomeric Flashing Sheet: Heat weld vertical flashing joints. Seal bottom termination of base flashing by adhering to roofing membrane with a five-course application of Rock-It and Burmesh.

E. **Install two stripping plies** in hot asphalt to all metal flanges including where NRCA details call for one.

F. **Roof Drains**: Set 30 by 30 inch (760 by 760 mm) square metal flashing in bed of asphalt roofing cement on completed roofing membrane. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 6 inches

beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.

Install stripping according to roofing system manufacturer's written instructions.

3.10 COATING INSTALLATION

A. **Begin coating application** after manufacturer required roof system cure time.

B. **Prime roof system** with specified primer at 300 sq.ft. per gallon.

C. **Install Title 24 Compliant Coating** system according to manufacturer's written instructions.

1. Install coating in two coats at a coverage rate of 1.5 gallons per 100sq.ft. per coat.
2. Back roll both coats.

3.11 WALKWAY INSTALLATION

A. **Walkway Pads**: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

B. **Set walkway pads** in cold-applied adhesive.

3.12 FIELD QUALITY CONTROL

A. **Roofing Inspector**: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

B. **Roofing Inspector**: Contractor shall engage a qualified roofing inspector for a minimum of 15 full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

C. **Final Roof Inspection**: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation at commencement and upon completion.

1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

D. **Repair or remove and replace** components of built-up roofing where test results or inspections indicate that they do not comply with specified requirements.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

A. **Protect roofing system from** damage and wear during remainder of construction period. When remaining construction will 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

ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

Owner: City of Ontario
Building Name(s):
Area of Work: All Sites
Acceptance Date:
Warranty Period:
Expiration Date:

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. lightning;
   b. peak gust wind speed exceeding 74 mph (120 k/hr);
   c. fire;
   d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and
   g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the

extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed by:

Authorized Signature:
Name (printed or typed):
Title:
Date:

END OF SECTION

SECTION 07600

SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide sheet metal items complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Sheet metal flashings in connection with roofing.
2. Reglet and counterflashing assemblies.
3. Miscellaneous metal flashing and counter flashing as required, except where provided by mechanical and electrical trades.
4. Factory-manufactured reglets and counterflashing.
5. Factory-manufactured, formed aluminum parapet copings.
6. Gutters and downspouts.
7. Drip flashings.
8. Beam to wall flashings.
9. Equipment platforms.
10. Window and door head flashings.
11. Diverters.
12. Scuppers
13. Conductor heads
14. Coping caps.
15. Shop priming and field touch-up.
16. Caulking.

B. Related Work Not In This Section:

1. Sheet metal in connection with Plumbing, Air Conditioning, and Electrical.
2. Metal accessories for drywall, lathing, and acoustical treatments.
3. Finish painting and factory applied metal finishes.
4. Sleeves for embedded items.
5. Louvers and vents.

1.02 QUALITY ASSURANCE: Drawing details and requirements herein govern. Conform to the current "Architectural Sheet Metal Manual" published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) for conditions not indicated or specified and for general fabrication of sheet metal items.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit for fabricated sheet metal showing details, methods of joining, anchoring and fastening, thicknesses and gages of metals, concealed reinforcement, expansion joint details, sections, and profiles.

B. Samples and Product Data: Submit Samples and data for materials or assemblies as Architect may request.

1.04 WARRANTY: Refer to Section 01740. Furnish to the Owner a written warranty against all defects in materials, workmanship and/or water tightness for all Work of this Section in fully watertight condition for a period of 2 years, including drain fittings, sheet metal in connection with roofing.

PART 2 - PRODUCTS

2.01 BASIC MATERIALS:

Galvanized steel:	ASTM A525, coating G90, mill phosphatized for paint adhesion, 24 gage unless otherwise indicated or specified.
Aluminum:	T6065-T5 alloy, temper best suited for each purpose.
Lead:	FSQQ-L-201 4 lbs. sheet lead
Solder:	ASTM B32, B284.
Solder flux:	Standard brand non-corrosive acid-base type.
Fasteners:	Zinc or cadmium coated steel or stainless steel.
Felt:	ASTM D226, 15-pound type.
Primer:	Approved brand of zinc-dust zinc-oxide primer per Section 09900 with manufacturer's pretreatment materials.
Sealant:	Conforming to Section 07900.

2.02 RELATED MATERIALS:

A. **Reglets and Counterflashings**: Fry Reglet Corp. flashing systems complete with unions and preformed corners of necessary types for particular locations, of 26 gage galvanized steel, or approved equals by Metco Metal Products Co., Pacific Loxtite Flashing Co., National Cornice Works, Redco, Lane-Air, or equal. Use single manufacturer's products throughout equivalent to Type CO at concrete, Type MA at masonry, Type ST at plaster, or Type SM, as required by Drawings and details.

2.03 GENERAL FABRICATION REQUIREMENTS: Fabricate to avoid distortion and overstress of fastenings due to expansion and contraction. Provide expansion joints where necessary in continuous runs of sheet metal, constructed watertight and spaced 30-feet apart maximum. Lock and solder corners and blind hem exposed edges. Make joints with 4" lap and solder unless otherwise shown or specified. Fill single lock seams with sealant where soldering is not feasible. Extend flanges 4" minimum onto roof and wall surfaces. Fabricate sheet metal items in nominal 8-foot lengths unless otherwise shown or specified.

A. **Soldering**: Do soldering slowly, immediately after application of flux, seams showing evenly flowed solder. Clean and neutralize finished soldering.

B. **Shop Priming**: Clean completed items, apply pretreatment, and prime all exposed surfaces with specified primer.

C. **Finish:** Refer to either Section 05900 – Metal Finishes or Section 09920 – Coating Systems for Exterior Metals.

2.04 FORMED ALUMINUM PARAPET COPINGS:

A. **Specified Manufacturer**: MM Systems Corporation, 404/938-7570 or 800/241-3460; local representative, Specialty Building Components, Whittier, CA, 310/945-8951.

B. **Acceptable Manufacturers**: Equivalent products of W.P. Hickman Co., Asheville, NC (704/274-4000) will be acceptable in accordance with the "or equal" provision specified in Section 01600 Requirements- Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Requirements.

C. **Formed Aluminum Parapet Coping**: MM Systems Snap-Lok Coping System, muliti-part coping system, style to suit size indicated on Drawings and existing wall conditions.

1. Coping shall be formed from 0.063 inch (1.6 mm) aluminum sheet to profile and of thickness indicated.
2. Anchor plate shall be minimum nominal 0.0276-inch (0.7-mm) thick, zinc-coated steel anchor plate or cleat located at coping joint.
3. Provide formed aluminum gutter chair or gutter/splice plate or compression pad/gutter.
4. Inside and outside corners shall be prefabricated, with miters welded before finishing.
5. Coping system shall require no exposed fasteners.

0.05 FABRICATION AND FINISHING

A. **Formed Aluminum Parapet Coping Fabrication**:

6. Furnish units in longest practicable lengths to minimize number of end joints. Minimize site splicing.
7. Provide hairline mitered corners where coping changes directions or abuts other materials.
8. Provide factory splices, guttering and other components of manufactured coping system. Installed coping shall present continuous faces and edges, with no apparent joints from ground level.
9. Back paint components in contact with cementitious materials to prevent electrolysis.

B. **Metal Finishes, General**: Comply with NAAMM - Metal Finishes Manual, for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

C. **Aluminum Finishes**:

1. Concealed aluminum components: AA-M10 (unspecified mill finish).
2. Exposed aluminum components: PVDF coating system containing minimum 70 percent Kynar 500/Hylar 5000 polyvinylidine fluoride (PVDF) resin, shop- or factory-applied as specified in Section 05900 -

Fluoropolymer Paint Finishes on Aluminum. Color shall match other aluminum components, as noted on the Drawings or Architect's selection.

D. **Concealed Steel Components**: Hot-dipped galvanized or stainless steel.

2.06 FABRICATED ITEMS: Of 24 gage galvanized steel except as otherwise indicated on drawings or specified.

A. **Drip Flashings**: Hemmed exposed edges, 1-piece lengths.

B. **Gutters and Downspouts**: As detailed, gutter joints riveted and soldered tight or filled with sealant, all galvanized. Provide 1/4" mesh balloon strainers at all downspout outlets. Provide covered expansion joints midway between outlets.

C. **Diverter**: Fabricate as detailed on drawings of 20 gage galvanized steel, all joints soldered. Install as detailed and in accordance with SMACNA requirements.

D. **Scuppers**: All joints locked and soldered watertight, flanges extending at least 4" into roofing, outer edges hemmed.

E. **Conductor Head**: Of 20 gage galvanized, all joints locked and soldered, top edge beaded for stiffening, outlet flange riveted and soldered. Provide a 1/4" mesh galvanized leaf strainer at top, secured in place but removable.

F. **Equipment Platforms**: All joints locked and soldered watertight, flanges extending at least 4" into roofing, outer edges hemmed.

0.07 SHEET METAL FINISHES

A. **Sheet Metal Finishes**: Unless otherwise indicated, all exposed exterior sheet metal is intended to receive field-applied primer and finish coatings.

1. Sheet metal fascias, parapet caps, fascia gutters, downspouts, flashing and trim exposed to public view: Fabricated from factory-finished Galvalume sheet steel as specified, including finish color.
2. Sheet metal exposed at metal roofing: Fabricated from factory-finished Galvalume sheet steel as specified, including finish color. Sheet metal flashing and trim shall be integral components of metal roofing system.
3. Sheet metal at other locations not exposed to public view: Hot-dipped galvanized sheet steel, field coated (primed and painted) as specified in Section 09970 - Coatings for Exterior Steel,
4. Sheet metal at valley (built-in) gutters: Primer and finish coatings as specified in Section 09970 - Coatings for Exterior Steel, for weathering and corrosion resistance.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS: Install metal items as indicated, according to approved submittals, and as required to complete the Work. Securely fasten and assemble, and make watertight and weathertight.

A. **Coordinate Sheet Metal Items** in connection with roofing for proper installation and furnish in sufficient time to avoid delay in roofing construction. Install roofing sheet metal simultaneously with roofing.

B. **Caulking**: Provide sealant calking as indicated and required to seal and complete Work of this Section. Conform to Section 07900.

C. **Isolation**: Isolate sheet metal from contact with concrete or masonry with one layer of roofing felt, except embedded items.

0.02 PARAPET COPINGS INSTALLATION

A. **Installation of Parapet Copings**: Install extruded aluminum parapet coping in accordance with manufacturer's instructions and recommendations, ensuring weather-tight installation.

3.03 COMPLETION: Examine installed sheet metal, water test if necessary or directed, and correct damaged or defective items.

END OF SECTION

ROOF ACCESS HATCHES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Roof access** hatches.

B. **Access** ladders

1.02 RELATED SECTIONS

A. **Section 05500** - Miscellaneous Metal Fabrications: Fixed roof access ladders.

B. **Section 07540** – Thermoplastic Membrane Roofing: Requirements for provisions in roofing accessories to receive TPO roofing.

C. **Section 07600** - Sheet Metal Flashing and Trim: Roof flashing.

D. **Section 08710** - Door Hardware: Padlock for roof hatch.

1.03 SUBMITTALS

A. **Product Data**: Submit manufacturer's complete descriptive literature and specifications.

B. **Installation Instructions**: Submit manufacturer's installation instructions and recommendations. Include instructions for the particular products and conditions of Project.

1.04 WARRANTY

A. **Extended Warranty, Roof Hatches**: Manufacturer's standard warranty for period of 5 years from date established by Notice of Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. **Specified Manufacturer**: The Bilco Company, New Haven, CT (203/934-6363; local representative, Specialty Building Components, Whittier, CA, 562/945-8951).

B. **Acceptable Manufacturers**: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Product Requirements.

1. Dur-Red Products, Cudahy, CA (323/771-9000).
2. Milcor, Lima, OH (419/227-6899).
3. Wasco Products, Inc., Sanford, ME (207/324-8060 or 800/388-1181).

2.02 ROOF HATCHES

A. Roof Access Hatches, General:

1. Covers shall be reinforced to support a minimum live load of 40 psf (195kg/m2) with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
2. Operation of the covers shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
3. Operation of the covers shall not be affected by temperature.

B. Vertical Ladder Roof Access Hatches (Scuttles): Bilco Type E, steel roof scuttle for installation at vertical roof access ladder, single-leaf door, pre-assembled by manufacturer. Scuttle shall have clear inside curb dimensions of 3-feet 0-inches (914 mm) by 3-feet 0-inches (914 mm).

1. Curb: 12-inches high, fabricated from 14 gage steel, formed with 3-1/2-inch flanges with drilled holes for attachment to roof deck. Provide curb with integral cap flashing formed from 14 gage galvanized steel.
2. Cover: 14 gage galvanized steel sheet with 3-inch beaded flange, neatly welded.
3. Cover hardware: Heavy pintel hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and padlock hasps inside and outside, and thermoplastic rubber gasket.
4. Cover operator: Automatic hold-open arm complete with red vinyl grip handle to permit easy release and one-hand control of cover to closed and latched position. Compression spring operators shall be enclosed in telescopic tubes to provide, smooth, easy and controlled cover operation throughout entire arc of opening and closing.
    a. Upper tube shall be outer tube to prevent accumulation of moisture, grit and debris inside lower tube assembly.
    b. Lower tube shall interlock with flanged support shoe welded to curb assembly.
    c. Compression spring tubes shall be anti-corrosive composite material. Springs shall have electrocoated acrylic finish for corrosion resistance.
5. Hinges: Heavy pintle hinges, zinc-plated and chromate sealed.
6. Latch: Enclosed two-point spring latch with interior and exterior turn handles, with interior and exterior padlock hasps. Latch strike shall be a stamped component bolted to the curb assembly.
7. Hold-open: Covers shall automatically lock in open position with rigid hold-open arm equipped with 1-inch (25.4mm) diameter red vinyl grip handle to permit easy release for closing.
8. Cover operator: Automatic hold-open arm complete with red vinyl grip handle to permit easy release and one-hand control of cover to closed

and latched position.

9. Hardware attachments: Cover hardware shall be bolted into heavy gage channel reinforcing welded to underside of cover and concealed within insulation space.
10. Access ladder safety post: Bilco Company, Model 1 LadderUP, safety post of high strength steel with telescoping tubular section that locks automatically when fully extended. Provide one for each roof scuttle (vertical ladder hatch).
    a. Upward and downward movement shall be controlled by a stainless steel corrosion-resistant alloy spring balancing mechanism.
    b. Finish: Black enamel.
    c. Mounting: Factory assembled with fasteners for securing to rungs of access ladder, specified elsewhere.
11. Access hatch finish: Factory primer finish, ready for field finish painting as specified in Section 09970 - Coatings for Exterior Steel.
12. Cover hardware: Heavy pintel hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles and padlock hasps inside and outside, and thermoplastic rubber gasket.
13. Cover operator: Automatic hold-open arm complete with red vinyl grip handle to permit easy release and one-hand control of cover to closed and latched position.

C. Access Hatch Finish: Intended to be unpainted, hot-dipped galvanized steel.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation: Install prefabricated roof accessories in accordance with manufacturer's instructions and recommendations.

1. Touch-up galvanized steel finish as necessary, as specified in Section 09920 - Galvanized Finishes on Steel.

END OF SECTION

SECTION 07900

CAULKING AND SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. This Section covers calking of openings and joints indicated, specified, and required to make the entire building weatherproof and watertight, covers calking requirements for the entire Work, and pertains to any Section requiring calking, unless specified otherwise. Coordinate with Firestopping Section 07270 for fire rated joint materials. Provide where required paintable acrylic calking materials, refer to Section 09900 and 09920 for Painting for paint materials.

1.02 QUALITY ASSURANCE: Employ a specialist-calking contractor having not less than 5 years experience in calking installations of size and complexity required for the Work. Prior to award of any subcontract for calking, submit qualifications and project history of the proposed Calking Subcontractor, including bid price information. If proposed Calking Subcontractor is not approved, provisions of the General Conditions will apply.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Samples and Data: Submit the following:

1. Submittals for calking and sealants shall be provided at exposed conditions only, review shall be for color only. Samples of cured sealants showing full range of designated colors.

1.04 PRODUCT DELIVERY: Deliver calking and sealant materials in unopened factory labeled containers, each label bearing statement of conformance to standards specified for each material.

1.05 WARRANTY: Refer to Section 01740. Furnish a written warranty against defects in materials for 5 years and defects in workmanship for 2 years, covering all loss of adhesion or cohesion, deterioration, color changes, leaking, and other defects.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: Provide sealants by one of the following manufacturers; Pecora, Dow Corning, Tremco, Sonneborn, General Electric and Johns Manville or approved equals. Obtain each type of joint sealant through one source from a single manufacturer. If sealants from separate manufacturers must be used and could come in contact with each other, provide written certification from every manufacturer involved that the sealants are compatible and will adhere to each other.

2.02 MATERIALS: Furnish sealants meeting following in-service requirements: Normal curing schedules are acceptable; Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultra-violet) radiation are required. Furnish the products of only one manufacturer unless otherwise approved,

sealant colors as selected to match the adjoining surfaces; special colors may be required. Use sealants selected from the following types where required on drawings and as appropriate to the joint being sealed. The manufacturer shall confirm that the appropriate calking or sealant(s) are used for on each type application required.

A. **Type A Sealant**: Urexpan NR 200 Sealant, self-leveling or non-sag two-part urethane Type I, conforming to FS SS-T-00227 and ASTM D1850 as manufactured by Pecora, Trimco or approved equal.

B. **Type B Sealant**: Dyntrol II Sealant, three-part polyurethane sealant conforming to FS SS-T-00227 Type II, Class A as manufactured by Tremco, Pecora or approved equal.

C. **Type C Sealant**: Pecora 895 or 896 for door and window frames (all types) in stucco areas and Dow Corning 999 Silicone Glazing Sealant, one-part silicone rubber sealant, this is not used on masonry, all conforming to FS TT-S-001543A and FS TT-S-00230C or approved equal.

D. **Type D Sealant**: Sikaflex 1A or Dynatrol I-XL or AC-20 Acrylic Latex Sealant polyurethane conforming to FS TT-S-00230C, Type II, Class A by Sonneborn or Pecora or approved equal.

E. **Type E Sealant**: Sanitary 1700 Silicone Rubber Sealant or 898 Sanitary Silicone Sealant with mold inhibitors, as manufactured by General Electric, Pecora or approved equal.

F. **Type F Sealant**: Pecora AC-20 FTR Firestopping Systems by Pecora or Type 3-6548 Silicone RTV foam as manufactured by Dow Corning or RTV850 as manufactured by General Electric or Fire Resistive Joint Sealing System as manufactured by Trimco with backup of Cerablanket-FS backups, primers and bond breakers as manufactured by Johns Manville.

G. **Type G Sealant**: Proglaze System, including silicone construction sealant, Polyslim Tape, Poly-Wej gasket, Aro-Shim spacer and CCN sponge, as manufactured by Trimco or approved equal.

H. **Type H Sealant**: AC-20 FTR or AIS-919 Acoustical and Insulation Latex Sealants by Pecora or Trimco Acoustical Sealant or approved equal.

I. **Type I Sealant**: Pecora 895 or Trimco Proglaze or approved equal.

J. **Type J Traffic Bearing Application**: Furnish multi-component self leveling, non-sag, non-tracking sealant with Shore "A" Hardness range of 40 to 55 where subject to foot or vehicular traffic, meeting requirements of ASTM 920-79 or Federal Specification TT-S-227E, "Sealing Compound, Elastomeric Type, Multi-Component".

1. HPL, by Tremco.
2. SL-2, by Sonneborn.
3. Dynatred, by Pecora.

K. **Sealant Primer**: Non-sagging sealant meeting requirements of ASTM C920-79. Sealant primer as recommended by sealant manufacturer.

L. **Joint Cleaner**: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

M. **Joint Backing Material**: ASTM D1056 or ASTM D1565; round, closed cell polyethylene urethane or neoprene foam rod; oversized 30 to 50 percent larger than joint width; #92 Closed-Cell Polyethylene Backer Rod by Pecora.

N. **Bond Breaking**: Pressure sensitive tape as recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.01 INSPECTION: Refer to Section 01400. Inspect surfaces and joints to be calked. Report to Architect in writing all conditions that prevent correct preparation, priming, and calking installation.

3.02 TECHNICAL ASSISTANCE: Furnish sealant manufacturer's technical field assistance as required to ensure proper use of sealants, preparation, and application.

3.03 PREPARATION AND PROTECTION: Conform to sealant manufacturer's instructions and apply materials to clean dry surfaces free of grease, oil, wax, or other matter that destroys or impairs adhesion. Remove lacquer and apply temporary masking tape on both sides of joints where surface staining may occur. Fill joints with joint backing material until the joint depth does not exceed 50% of joint width. Provide bond breaker to prevent bonding of sealant to backing material wherever joints exceed 1/2" width, or joint width is shown or required to exceed depth. Prime surfaces as required by manufacturer's instructions.

3.04 APPLICATION: Do not exceed 3/8" sealant depth unless specifically dimensioned. Minimum joint width is 1/8" for metal-to-metal joints and maximum 3/4" width elsewhere unless otherwise shown. Apply all sealant under sufficient pressure to fill voids. Finish exposed joints smooth and flush with adjoining surface unless recessed joints are shown. Remove temporary masking as soon as joint is completed.

3.05 SCHEDULE: Sealants shall conform to the following application schedule, unless the manufacturer requires another type of material.

A. **Expansion and Control Joints in Masonry and Concrete**. - Type B.

B. **Expansion and Control Joints in Glass, Aluminum and Plastic**.- Type C.

C. **Expansion and Control Joints in Horizontal Traffic Surfaces**. - Type J

D. **Nonexpanding Joints in Concrete, Masonry, Aluminum, Steel and Wood**: - Type D

E. **Nonexpanding Joints in Glass and Plastic**: - Type C

F. **Around Plumbing Fixtures in Toilet and Bath**: - Type E

G.	**Mechanical, Ductwork and Air Conditioning**:	- Type D
H.	**Acoustical Applications**:	- Type H
I.	**At Floor, Wall and Ceiling Penetrations Requiring Vibration Isolation, Sound or Fire Rating**:	- Type F
J.	**At Window Wall Where Channel Glazing is Required**:	- Type I
K.	**Cross Joints in all Copings**:	- Type D
L.	**Any Gypsum Board Joints and/or Settings**:	- Type D
M.	**For Sink, Tub or Bath Areas Including Countertop Joints**:	- Type E
N.	**Intersection of Wall Surface and Metal Cap Strip at Resilient Flooring Integral Cove Sealant**:	- Type D
O.	**Traffic Bearing Application**:	- Types A or J
P.	**Sealant at Doors, Windows and Penetrations in Other Material Application**:	- Types C

3.06 CLEANING: Clean material from surfaces not to receive sealant and restore the finish as required. If surfaces adjoining joints are stained and cleaning is not acceptable, remove the affected Work and provide new Work as directed and approved, at no extra cost to Owner.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Flush hollow** steel doors.

B. **Rolled steel door frames**, welded construction, for exterior door openings.

C. **Rolled steel door frames**, knock-down construction for interior door openings and borrowed lights (interior windows).

D. **Vision lights** and louvers in doors.

1.02 RELATED SECTIONS

A. **Section 06100 – Rough Carpentry:** Framing of door openings.

B. **Section 08710 - Door Hardware:** Products and other requirements for steel frames preparation.

C. **Section 08800 - Glass and Glazing:** Glass and glazing for steel frames and door vision lights.

D. **Section 09900 - Field Painting:** Field finishing of interior hollow metal frames and interior faces of exterior steel doors.

E. **Section 09920 - Coatings for Exterior Steel:** Field finishing of exterior hollow metal frames and exterior faces and edges of exterior steel doors.

1.03 SUBMITTALS

A. **Shop Drawings:**

1. Submit shop drawings and schedules for doors and frames.
2. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.
3. Indicate door elevations, internal reinforcement and closure method.
4. Coordinate submittal with Door Hardware Schedule submittal specified in Section 08710 - Door Hardware.
5. Coordinate submittal with submittals for Section 08210.

1.04 QUALITY ASSURANCE

A. **Industry Standards:** Steel doors and frames, and their installation, shall conform to the following requirements of the Steel Door Institute:

1. ANSI A250.8 - Standard Steel Doors and Frames (supersedes SDI 100).
2. SDI-105 - Recommended Erection Instructions for Steel Frames.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspection: Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Storage: Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet Steel for Doors and Frames: Prime quality cold rolled, annealed, stretcher leveled steel, conforming to Commercial Standard CS 242 or CS 211, with bonderized finish.

B. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

C. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

1. Interior conditions: Minimum A40 (ZF120) zinc-iron-alloy (Galvannealed) coating designation.
2. Exterior conditions: Minimum G60 (Z180) or A60 (ZF180)] metallic coating designation.

E. Supports and Anchors: Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.

F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are built into exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D as applicable.

G. Shop-Applied Primer: Applied after fabrication, rust-inhibitive enamel or paint, either air-drying or thermosetting, complying with ANSI A224.1 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames, suitable as a base for finish paints specified in Section 09905 - Field Painting.

H. Field-Applied Primer and Finish Paints:

1. Exterior conditions: As specified in Section 09920 - Coatings for Exterior Steel.
2. Interior conditions: As specified in Section 09900 - Field Painting.

2.02 ROLLED STEEL FRAMES, WELDED CONSTRUCTION

A. Rolled Steel, Welded Steel Frames: Full-formed sheet steel frames for doors, transoms, sidelights, borrowed lights, fixed windows and other openings, of types and styles as shown on Drawings and schedules, with concealed fastenings, welded construction, ANSI A250.8 or equivalent custom fabricated frames conforming to referenced NAAMM standards, 16 gage minimum gage steel, galvanized steel, shop primer finish.

B. Shapes: As indicated on the Drawings.

C. Fabrication: Mitered and welded corners and intersections.

1. At exterior frames, fully weld across both outside and inside of frame, for full length of joint, from exterior face to interior face. Create weathertight joint.
2. At interior frames, as minimum, fully weld outside of frame across frame face.
3. Weld, grind and fill welds for invisible joint while retained shape of formed metal.

D. Reinforcements, General: Provide in accordance with SDI 107.

1. Hinge Reinforcements: 9 gage, full mortise.
2. Closer Reinforcements: 9 gage.
3. Strike Reinforcement: 11 gage.

E. Wide Openings: Reinforce frames wider than 48 inches with roll formed steel channels, minimum 12 gage, fitted tightly into frame head, or provide frames of minimum 14 gage steel.

F. Preparations for Door Hardware: Comply with ANSI A115. Provide factory-prepared cutouts from hardware instructions and templates. Refer to Section 08710 - Door Hardware. Prepare cutouts with fully drilled and tapped fittings.

G. Plaster Guards: 24 gage, at strike and head cutouts, welded to back of hardware openings at locations where grout, plaster or other materials might interfere with

hardware installation and operation. Provide plaster guards at cement plaster (stucco} and mortar-set tile conditions, typically.

H. Anchors, General: Provide in accordance with ANSI A250.8 (SDI 105). Anchors at fire rated frames shall also conform to UL Standard 10B.

I. Anchors at Stud Partitions: Provide at least 3 wall anchors per jamb at hinge and strike levels.

J. Anchors at Door Frames in Concrete: Frames erected after concrete construction.

1. Floor anchors: 12 gage angle welded to frame, full width of frame section, one each jamb.
2. Jamb anchors: 12 gage channel or Z welded to frame full width of frame section less wall finish thickness with tube sleeve welded to anchor and to flame stop, drilled and deep dimpled for anchor and flat head screw for completely concealed fastening.
3. Head Anchors: Provide anchors same as for wall, located at center of head, for pairs of doors only.

K. Anchors at Door Frames in Concrete: Frames erected before concrete construction.

1. Jamb anchors: 12 gage T-anchor, loose in frame, full width of frame engaging frame returns, T-leg equal to wall thickness less 2-inches or frame width whichever is less. T-leg shall be 6-inches long with 1/2-inch diameter hole for reinforcement bar dowel, 3 per jamb.
2. Head anchors: Provide T-anchor same as wall anchors, located at center of head, at pairs of doors only.

L. Glazing Stops: Channel glazing stops, miter at corners, drill and countersink for oval head screws, completely fit ready for removal and glazing at site.

M. Built-up Transom and Sill Bars: Fabricate from same material as for frames as detailed. Fabricate concealed portions from tube stock, double channels, roll formed sections or break shape; maintain structural adequacy. Fabricate exposed portions, break shape to profile detail.

N. Double Mullions: Fabricate same as frame, back to back with welded and filled seam.

O. Door Silencers: Drill stops at frames to receive button-type silencers specified in Section 08710 - Door Hardware.

1. Provide three silencers on strike jamb stop for single leaf doors and two at head stop for pairs of doors.
2. Omit silencers where head and jamb where door seals (weatherstripping and smoke or sound seals) are specified.
3. Omit silencers where in violation of fire rating.

2.03 FLUSH STEEL DOORS

A. **Flush Steel Doors, General:** Full flush panel steel doors, SDI 100, grade and model as specified, or equivalent custom products produced in conformance to referenced NAAMM standards.

B. **Steel Doors for Exterior Locations:** Extra Heavy-Duty rated, SDI 100, Grade III, Model 2 (full flush composite construction with vertical edge seam) or equivalent custom products produced in conformance to referenced NAAMM standards, minimum 16-gage faces. Provide flush top and bottom, not open channel.

C. **Internal Construction:** Core material as indicated below, with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards and as require for fire resistance rating.

1. Non-rated, exterior doors: Polyurethane or polystyrene foam, for thermal insulation. Provide thermal-rated assemblies with U factor of 0.24 Btu/(hr x ft sq x degrees F) or better.
2. Non-rated, interior doors: Honeycomb, polyurethane, polystyrene, unitized steel grid, vertical steel stiffeners, or rigid mineral fiber core.

D. **Facing Material:**

1. Interior dry conditions: ASTM A 653/A 653M, Commercial Steel (CS), Type B, minimum A40 (ZF120) zinc-iron-alloy (Galvannealed) coating designation.
2. Exterior and interior damp or wet conditions: ASTM A 653/A 653M, Commercial Steel (CS), Type B, minimum G60 (Z180) or A60 (ZF180)] metallic coating designation.

E. **Door Tops and Bottoms:** Seal top and bottom edges integrally with door construction, or use minimum 16 gage steel channels to form flush closure. Tops shall be fully weather sealed.

2.04 VISION LIGHT

A. **Specified Manufacturer**: Air Louvers, Inc., Pico Rivera, CA (310/948-3495).

B. **Acceptable Manufacturers**: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Anemostat Door Products, Division of Dynamics Corporation of America, (213/775-7441 or 800/9829000).
2. Leslie-Locke, Inc., (404/953-6366 or 800/321-3415).

C. Vision Lights:

1. Fire Rated Vision Lights; Air Louver Model VLF, for ¼" thick wire glass, square profile with UL or Warnock-Hersey Classification to suit fire rating of door.
2. Non-rated Vision Lights; Air Louvers Model VLF, square profile for ¼" thick wire glass.
3. Glazing: As specified in Section 08810 – Glass and Glazing. Confirm glass type and thickness with notes in the Door Schedule in the Drawings
4. Finish: Manufacturer's standard grey primer finish for field applied finish paint to match the door face as specified in Section 09905 – Field Painting.

2.05 DOOR LOUVERS

A. Specified Manufacturer: Air Louvers, Inc., Pico Rivera, CA (310/948-3495).

B. Acceptable Manufacturers: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Anemostat Door Products, Division of Dynamics Corporation of America, (213/775-7441 or 800/9829000).
2. Leslie-Locke, Inc., (404/953-6366 or 800/321-3415).

C. Louvers, Exterior Steel Doors: Formed sheet metal, Z-blade configuration, 18 gage steel, Air Louvers Model 900, with Style A-1 mounting frame, factory prime finish, for field-applied finish paint to match door face.

2.06 HARDWARE PREPARATION

A. Hardware Preparation, General: Conform to SDI 107, SDI 109 and ANSI A115.1 through A115.14.

B. Reinforcement: SDI 100, Table IV.

C. Hardware Locations: SDI 100.

D. Lock Strikes: Set out for proper clearance for silencers, weatherstripping and sound seals.

E. Preparation for Contacts for Security Alarm System: At doors indicated on the Drawings or identified by Owner to have alarm contacts, factory prepare door frames provide to suit alarm contact. Preparation shall not void fire rating of frame.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Welded Steel Frames Installation: Install frames in compliance with ANSI A250.8 and SDI 105. At fire-rated openings, comply with requirements of listing authority.

1. Install frames in conformance to ANSI/SDI-100 and ANSI/SDI-105. Comply with requirements for fire-rated assembly.
2. Install frame solid in the wall, plumb and square, with proper opening width and height.
3. Fasten clip angles to floor construction and brace frames so as to retain their position and clearance during construction of adjacent Work.
4. Install anchors for stud partitions on hinge jamb immediately above each hinge reinforcing plate and below the top hinge reinforcement (minimum 4 per jamb) and locate anchors directly opposite on the strike jamb.

B. Welded Steel Frames Installation:

1. Install frame solid in the wall, plumb and square, with proper opening width and height.
2. Fasten clip angles to floor construction and brace frames so as to retain their position and clearance during construction of adjacent Work.
3. Install anchors for concrete at each jamb for each 2-feet 6-inches of height or fraction thereof starting at 12-inches above the finished floor (minimum 3 per jamb).
4. Install anchors for stud partitions on hinge jamb immediately above each hinge reinforcing plate and below the top hinge reinforcement (minimum 4 per jamb) and locate anchors directly opposite on the strike jamb.
5. Grouting: Grout exterior door frames solid after installation.

C. Flush Steel Doors Installation, General: Comply with manufacturer's instructions and recommendations and to ANSI A250.8 and SDI 105. Hang doors and adjust for proper clearances and operation. Refer to Section 08710 - Door Hardware for hardware requirements.

D. Flush Steel Doors Installation Tolerances: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI-100. For fire-rated doors, conform to NFPA Standard No. 80 and Uniform Building Code Standard 17-2.

E. Vision Lights and Louvers Installation: Conform to manufacturer's instructions, including requirements for fire rated installations**.**

3.02 ADJUSTING AND CLEANING

A. Protection Removal: Immediately prior to final inspection, remove protective plastic wrappings from prefinished doors.

B. Repairs:

1. Make repairs only if permitted by Architect. Otherwise, replace damaged components.
2. Fill surface depressions with metallic paste filler, allow to thoroughly cure, sand flush, and smooth for an invisible appearance with adjacent metal surfaces.
3. Sand smooth all rusted areas.
4. Apply touch-up paint using air drying primer compatible with shop-applied finish.

3.03 CLEANING AND PROTECTION

A. Prime Coat Touch-up: Immediately after installation, sand smooth all corroded (rusted), damaged and deteriorated areas of prime coat and apply touch-up coat of compatible air-drying primer. Refer to requirements for field-applied primer in Section 09900 - Painting, for interior conditions, and Section 09920 - Coatings for Exterior Steel, for exterior conditions.

B. Protection: Protect installed frames and doors from damage.

1. Provide protective coverings and other devices as necessary, in conformance to requirements specified in Section 01500 - Temporary Facilities and Controls.
2. Remove protective devices from prefinished components for Completion review.

C. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

D. Cleaning: Clean doors and frames of surface contaminants detrimental to bonding of field-applied finishes.

END OF SECTION

SECTION 08210

STILE AND RAIL AND SOLID WOOD DOORS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. **Stile and rail** paneled and glazed wood doors.

B. **Solid core** wood doors.

C. **Prefinished standard** and fire rated type wood flush and panel doors.

D. **Pre-fitting,** Pre-machining, and Pre-finishing wood doors.

1.02 RELATED SESCTIONS

A. **Section 06200 - Finish Carpentry:** Wood door frames for non-rated doors.

B. **Section 08400 – Aluminum-Framed Storefronts**: Aluminum door frames where indicated on drawings

C. **Section 08710 - Door Hardware:** Door hardware for stile-and-rail wood doors.

D. **Section 08800 - Glass and Glazing:** Requirements for glass and glazing in stile-and-rail wood doors, including tempered safety glass.

E. **Section 09900 - Painting:** Field finishing of stile-and-rail wood doors.

1.03 REFERENCES

A. **American National Standards Institute (ANSI):**

1. A115-W – 1995, WOOD DOOR HARDWARE STANDARDS Hardware Preparations.
2. A117.1 – 1998, Accessible and Usable Buildings and Facilities.
3. A208.1 – 2016, Composite Panel Association for Particle Board

B. **American Society for Testing and Materials (ASTM):**

1. ASTM E 119-00a, Standard Test Methods for Fire Tests of Building Construction and Materials.
2. ASTM E 90-09, 2016 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
3. ASTM E 413-16, Classification for Rating and Sound Insulation

C. Door and Hardware Institute (DHI):

1. Locations for architectural hardware for standard steel doors and frames, 1996.
2. Sequence and format for the hardware schedule, January 2001.
3. Hardware for Labeled Fire Doors, February 1993 edition.
4. Hardware for Health Care Facilities, June 1993.
5. Abbreviations and Symbols, September 2001.

D. HPVA – Hardwood and Plywood Veneer Association.

E. California Building Code (CBC 2016)

F. National Electrical Manufacturers Association (NEMA)

G. National Fire Protection Association (NFPA):

1. NFPA-80 Standard for Fire Doors and Windows, 2016 edition.
2. NFPA-80A Recommended Practice for Protection of Buildings from Exterior Fire Exposures, 2017 edition.
3. NFPA-101 Life Safety Code, 2015 edition.
4. NFPA-101A Guide on Alternative Approaches to Life Safety, 2013 edition.
5. NFPA-101B Code for Means of Egress for Buildings and Structures, 2002 edition.
6. NFPA-105 Recommended Practice for the Installation of Smoke-Control Door Assemblies, 2016 edition.
7. NFPA-252 Standard Methods of Fire Tests of Door Assemblies, 2017 edition.

H. Steel Door Institute (SDI):

1. SDI-105-17 A250.11-12 Recommended Erection Instructions for Steel Frames.
2. SDI-117-13 Manufacturing Tolerances for Standard Steel Doors and Frames.
3. SDI-122-15 Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
4. SDI-124-16 Maintenance of Standard Steel Doors and Frames.

I. Underwriters Laboratories (UL):

1. UL 10C/UBC7-2-97 Fire Tests of Door Assemblies Positive Pressure
2. UL 1784-90 Air Leakage Tests of Door Assemblies
3. Door Assemblies Air Leakage Test (1784-90)

J. Uniform Building Code (UBC):

1. UBC 7-2 1997, Fire Test of Door Assemblies.

K. Window and Door Manufacturers Association (WDMA):

1. IS 1-A 2013 Industry Standard for Architectural Flush Wood Doors.
2. IS 6-A 2013 Industry Standard for Interior Architectural Stile and Rail Wood Doors
3. IS 10 – Industry Specifications for Testing Cellulose Composite Materials
4. TR-08, Catalyzed Polyurethane

1.04 SUBMITTALS

A. Schedule: Coordinate with submittals for Section 08110 – Steel Doors and Frames, and Section 08400 – Aluminum Framed Storefront and Section 08710 – Door Hardware.

1. Provide door and frame schedule in DHI horizontal format.
2. Fire rated wood doors to meet positive pressure Category A or B (as required by the specification).
3. Provide a quantity of 3 catalog cut sheets of each item.
4. Submit samples of wood veneer and factory finishing in accordance with WDMA I.S. 6A and WDMA I.S. 1A sections G-18 and Guide Specification 1.02 11. D.
5. Submit a quantity of three 12” x 12” corner sample of each different type of door, i.e. PC, SCL, FD1
6. Submit shop drawings in accordance with Section 013300. Indicate general construction, jointing methods, hardware and louver locations, and locations of cut outs for glass.
7. Submit certification that doors and frames comply with applicable local codes.
8. Submit door schedule for each door and frame.
9. Show elevations and indicate details of wall construction, dimensions, undercuts, factory finishes and hardware preparation.
10. Number doors in conformance with Door Schedule, including room number.

B. Warranty: Submit promptly upon completion of door installation.

1.05 QUALITY ASSURANCE

A. Industry Standard: Stile and Rail, and Architectural Flush wood doors, construction and installation shall meet or exceed the minimum requirements of Window and Door Manufacturers Association (WDMA) 1.S.-6A and I.S.-1A “Industry Standard for Wood Stile and Rail & Solid Core Doors for the grade, or grades specified. Markings, labels, or indicators of compliance with WDMA I.S.-6A, and I.S.-1A shall be applied to the hinge edge of each door.

B. Safety Glass: Provide glass complying with ANSI Z97.1 and testing requirements of 16 CFR, Part 1201, for Category II materials, unless those of Category I are expressly indicated and permitted. Refer to Section 08800 - Glass and Glazing.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies in accordance

NFPA 252 and which are labeled and listed for ratings indicated by ITS – Warnock Hersey, UL or other testing and inspection agency acceptable to authorities having jurisdiction.

D. WDMA I.S. 1-A and I.S. 6A 2013 Quality Standard: Window and Door Manufacturers Association Quality Standards for grade of door, core, construction, finish, and other requirements.

1. Doors Comply with UBC 7-2 1997 where required.
2. Provide intumescent requirements in compliance with UL-10C Category A or B.
3. Provide doors that comply with UL10C Category B and coordinate with Section 08 71 00 for applied Category G sealing systems.

E. Temperature Rise Rating: At stairwell enclosures, provide doors which have Temperature Rise Rating of 250 degrees F maximum in 30 minutes of fire exposure.

F. Substitutions: Apply for substitutions in compliance with the requirements set fourth in Division 1 and no less than 10 business days prior to bid date.

G. Certification of Label Construction:

1. Intertek Testing, Inc. (WH-ETL)
2. Underwriters Laboratories, Inc. (UL)

1.06 PACKAGING, DELIVERY, STORAGE AND HANDLING

A. Delivery, Storage, and Handling General: Site Conditions: Storage area for wood doors is to be in a dried, conditioned and secure area with controlled and stabilized humidity per manufacturers' published and listed recommendations.

B. Packaging and Shipping:

1. Seal all four edges of doors prior to shipment.
2. Do not expose doors to excessive moisture, humidity or other conditions that would adversely affect the serviceability or appearance of the doors.
3. Provide adequate protection against physical abuse.
4. Wrap pre-finished doors in vented polyethylene bags with Identifying marks.
5. Do not remove wrappers until ready to hang door.

C. Delivery:

1. Deliver doors to Project site after finishes are dry and building has reached average prevailing relative humidity of locality.
2. Deliver doors in manufacturer's original unopened protective materials or container, clearly marked with manufacture's name, brand name, size, thickness and identifying symbol on covering.
3. Coordinate delivery with installer not less than three weeks prior to delivery.

D. Storage and Protection:

1. Store doors in dry location, not subject to high relative humidity.
2. Store doors off floor at least 6-inches.
3. Store doors in horizontal position with spacers, or corner cap separators.
4. Follow the Care and Installation guidelines as described in WDMA I.S. 6A and WDMA I.S.1A 2013.
5. Doors are to be stored flat and palletized with not more than 30 door leafs per pallet.
6. Doors to be a minimum of 6” above floor while in storage.

H. Handling:

1. Handle doors per the manufacturers’ published and listed recommendation.
2. Handle with clean, white soft cotton gloves to prevent contamination by hand oils and dirt. Gloves are to be provided by whomever handles doors at any given time.

1.07 PROJECT CONDITIONS

A. Building Environmental Conditions: Enclosed, dry and of relative constant temperature.

B. Allow doors to become conditioned to prevailing temperature and humidity conditions prior to hanging.

1.08 WARRANTY

A. Guarantee: Provide manufactures’ guarantee for all wood doors.

1. Guarantee Period: Lifetime of Installation. Doors exhibiting defects in materials or workmanship including warp, and delamination within the guarantee period shall be replaced, including labor for rehang and refinish with new doors. These items shall be part of the manufacturers’ warranty.

B. Extended Warranty: Stile-and-rail wood doors shall be warranted against deficiencies in materials and workmanship for period two years from date established in Notice of Completion.

1. Warranty shall provide for replacing including cost of rehanging and refinishing, wood doors exhibiting defects in materials or workmanship including warp and delamination.
2. Warp and twist in excess of 3/16-inch shall constitute a defective door installation.

PART 2 – PRODUCTS

2.01 STILE AND RAIL GLAZED WOOD DOORS

A. Specified Manufacturer: Simpson Door Company (800) 356-4424)

B. **Acceptable Manufacturers:** Equivalent products of manufacturers listed below will be acceptable in accordance with the “or equal” provision in Section 01600-Requirements.

1. Woodport Doors, (715-526-2146)
2. VT Industries, Inc. (712-368-4381)

C. **Stile and Rail Glazed Wood Doors:** Solid hardwood lumber doors, fabricated to dimensions, and configurations indicated on drawings. Door materials shall conform to WDMA 1.S. 6A for Premium Grade.

D. **Wood Specie and Grade:** Select White Maple, WDMA Premium Grade requirements, suitable for transparent finish. Stile and rail doors shall match grain, and color of flush wood veneer doors specified.

E. **Construction:** Dimension after sanding.

1. Door Thickness: As scheduled on drawings.
2. Stiles, Top, and Intermediate Rails, Interior Doors: Dimensions as indicated on drawings. If dimension is not shown, provide these components not less than 4-1/2 inches full face wide.
3. Stiles, Top, and Intermediate Rails, Exterior Doors: Dimensions as indicated on drawings. If dimension is not shown, provide these components not less than 5-3/8 inches full face wide.
4. Bottom Rail: Dimensions as indicated on drawings. If dimension is not shown, provide bottom rail not less than 11-3/8 inches full face wide.
5. Wood Stop Profile: Square sticking method.

F. **Moldings:** Solid stock hardwood.

G. **Adhesive:** Type I, waterproof.

H. **Glazing:**

1. Non-rated doors: Clear tempered glass, as per specified in Section 08800 – Glass and Glazing.
2. Fire-rated doors: Clear, fire-rated glass, as specified in Section 08800 – Glass and Glazing.

I. **Wood Finish:** Clear urethane varnish finish, as specified in Section 09900 – Field Painting, matching Architects sample.

2.02 SOLID CORE FLUSH WOOD DOORS

A. **Solid core wood** flush face doors, conforming to WDMA I.S. 1A standard and requirements herein 5-ply finished doors, if prior approval is obtained from Architect.

1. Heavy Duty Construction or greater, or approved equal.

B. **Specified Manufacturer:** Doormerica Manufacturing, American Series (951-316-3674)

C. **Acceptable Manufacturers:** Equivalent products of manufacturers listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 – Requirements.

1. Mohawk Industries (570-473-3557)
2. VT Industries, Inc. (712-368-4381)

D. **Core:** SCLC (Structural Composite Lumber Core), or Solid LD-1 Particleboard core with minimum 32 pcf density conforming to Type I, Density C, Class I of CS 236, hot press resign bonded.

E. **Edges:** Minimum total 1-1/8 inch wide top, and bottom rails with minimum 1/2 inch thick hardwood edge banding, and minimum total 1-3/8 inch wide stiles with minimum 1/2-inch thick hardwood edge banding, 1 piece or laminated. Fully bonded laminated edge strips together and to core before cross banding is applied. Provide vertical banding of species to match face veneers for transparent finished doors.

F. **Crossbanding:** For 5-Ply wood doors, minimum 1/16 inch thick hardwood, or High Density Fiberboard, extending to four edges.

G. **Face Veneer:** AA Grade, Select White Maple, in accordance with WDMA I.S. 1A for premium transparent finishes. Flush wood veneer doors shall match grain and color of stile and rail doors specified herein. Quarter Sliced, book matched, center balanced, pair, and set match with Premium Grade AA face, suitable for transparent finish as published in WDMA I.S. 1A Section F7-TR-8 for transparent finish requirements. Minimum 1/50 inch at 12% moisture content after sanding.

H. **Opaque Finish:** AB Grade, Prime Coat, or MDO for opaque finish in accordance with WDMA I.S. 1A Section F7-OP-8finish requirements.

I. **Adhesives:** Type I Low VOC, and Formaldehyde Free adhesive for interior doors. Shall be classified Type I per WDMA TM-6 "Adhesive Bond Test Method". Architectural wood flush doors are not recommended for exterior doors when using Type I cores, crossbanding, and face veneers. Check with manufacturers' published and listed application requirements.

J. **Factory Finishing:**

1. Comply with referenced WDMA Section F-7 "Factory Finishing".
2. Pre-finish wood doors at factory.
3. Transparent finish: Match finish as indicated in WDMA F-7 system TR-8.

2.03 PRE-FITTING AND MACHINING

B. **Pre-Fitting and Pre-Machining:** Provide all stile-and-rail wood doors prefit and pre-machined. Refer to Section 08710 - Door Hardware and Door Schedule on the Drawings for door hardware requirements.

C. **Fitting:** Fit to frames for uniform clearance at each edge, as required by reference standards. Bevel lock and hinge edges 1/8-inch in 2-inches.

D. **Hardware Preparation:** Prepare stile-and-rail doors in shop, using templates, Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

2.04 FABRICATION

A. **Fabricate wood doors** in accordance with requirements of WDMA I.S. 1-A 2013 Quality Standards.

B. **Fabricate fire rated doors** in accordance with requirements of ITS – Warnock Hersey, or Underwriters' Laboratories, on each door including UL-10C.

C. **Provide blocking for hardware** per hardware manufacturers requirements for hardware to be installed without thru-bolts on all mineral core doors where locks, closers, panics and or protection plates are installed.

D. **Fabricate doors with WDMA** Quality Standards hardware blocking options as follows:

1. Provide HB-1 – head and HB-2 – sill rails and HB-4 – lock block on all doors.
2. Provide HB-6 only when exit devices are specified for door.
3. Provide HB-8 for pivots or when floor bolts are specified under Section 08710 – Finish Hardware.

E. **Non-rated and 20-minute** rated shall have vertical edges that shall be veneer banded stiles (or) optional 2-ply solid wood 7/16 prior to bevel.

F. **Make cutouts and provide** stops for glass and louvers. Install metal door louvers. Seal cut-outs prior to installation of moldings.

1. For full light doors: Provide cut out from flush wood door, with vertical grain direction.

G. **Bevel lock and hinge** edges of single acting doors 3 degrees or 1/8 inch in 2 inches. Radius strike edge of double acting swing doors as required by pivot hinge manufacturer.

H. **Prepare doors to receive** hardware. Refer to Section 08710 - Hardware and NFPA 80 for hardware requirements including UL-10C.

1. Prefit and bevel to net opening size less 1/4 inch in width on single swing doors, and 3/16 inch in width for single and paired doors. Provide clearance based on NFPA-80 allowable clearances above finished floor, unless otherwise indicated on drawings. Provide 1/8 inch clearance at top of door.
2. Slightly ease vertical edges.
3. Predrill pilot holes for all butt hinge mortise preps.

I. **Fire Rated Pair of Doors Greater than 20 minute:** Supply overlapping astragals or metal edge sets only as required by NFPA 80 1999 or by door manufacturer's fire door authorities. If an astragal is required, to comply with fire rated labeling requirements for pairs of fire rated doors, provide door manufacturer's standard tested astragal as required. No Metal Edges or astragal required for 20-minute rated pairs.

2.05 SOURCE QUALITY CONTROL

A. **Inspect doors prior** to shipment, any doors that are damaged, not machined properly or defective shall be repaired to manufacturers' quality standards for new doors or be replaced prior to shipment.

PART 3 – EXECUTION

3.01 EXAMINATION

A. **Examination of Doors:** Examine doors. Reject doors with defects; notify General Contractor of all deficiencies immediately.

B. **Verification:**

1. Verify that field environmental conditions conform to requirements specified herein and as required by door manufacturer.
2. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
3. Proceed with installation only after all deficiencies have been corrected.

C. **Remedial Actions:** Report in writing to Construction Manager and Architect all unsatisfactory conditions and describe proposed remedial measures to be taken. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 DOOR INSTALLATION

A. **Stile-and-Rail & Solid Core Wood Doors Installation:** Comply with manufacturers' instructions and recommendations. For fire-rated doors, comply with requirements of listing authority.

1. Install door hardware in accordance with hardware manufacturer's instructions and requirements as specified in Section 08710- Door Hardware.
2. Hang doors and adjust for proper clearances and operation.
3. Field cutting and fitting: Make cuts and perform fitting only as permitted by door manufacturer within door warranty qualifications. Fire rated doors to comply with NFPA, California Building Codes, and local authorities having jurisdiction.

4. Seal all field cuts in top and bottom edges, using two coats of spar-varnish at stained finishes and using primer and finish in accordance with Section 09900 - Painting.
5. Replace, at no change in Contract Time and Contract Sum, all doors which exceed specified and allowable tolerances including warp.

B. Rejected Doors: Furnish new doors conforming to requirements of this Section as replacements for doors rejected because of damaged surfaces, improper fitting or hardware preparation, or other cause, at no extra cost to Owner. Patching is not permitted for correction of defects.

C. Clearances:

1. Jambs and heads: 1/8-inch.
2. Meeting stiles at pairs of doors: 1/8-inch unless otherwise required for schedule hardware. Fire rated openings shall not exceed 1/8-inch vertically for hinge and strike edge of door, horizontally at head, and door stile meeting edges.
3. Undercuts: As shown on scheduled and Drawings; if not shown, provide as required for finish flooring and thresholds; verify with Architect. Fire rated openings shall not exceed 3/4-inch maximum gap above finished floor to bottom edge of door.

D. Checking and Adjusting: Check and adjust operations of all doors and hardware immediately prior to Substantial Completion.

1. Doors without closers shall hang straight and still; hardware shall operate smoothly.
2. Immediately remove and replace, at no change in Contract Time or Contract Sum, all damaged, misaligned and warped doors.
3. General Contractor to clean doors per manufacturer’s instructions and be free from all foreign debris.

E. Tolerances:

1. Maximum diagonal distortion (warp): 1/8-inch (3 mm) measured with straight edge or taut string, corner to corner, over an imaginary 36 x 84 inch (915 x 2 130 mm) surface area.
2. Maximum Vertical Distortion (Bow): 1/8-inch (3 mm) measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inch (915 x 2 130 mm) surface area.
3. Maximum width distortion (cup): 1/8-inch (3 mm) measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inch (915 x 2 130 mm) surface area.

F. Remedial Work: Immediately remove and replace, at no change in Contract Time or Contract Sum, all damaged, misaligned and warped doors.

3.03 CLEANING AND PROTECTION

A. **Cleaning:** Provide protective wrappers and coverings as necessary to prevent marring, soiling and discoloration. Remove protective measures and clean door faces in preparation for field finishing.

B. **Protection:** Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration.

1. Protect doors from damage by other trades.
2. Keep area around doors free from trash and debris.
3. At unfinished and clear finished doors, do not partially cover door surfaces with paper, cardboard, or any other opaque covering that will create uneven aging of wood veneer.
4. Protect doors as directed under Section 01700.

END OF SECTION

SECTION 08400

ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Storefront framing and** glazing support members of extruded aluminum, for building entrances, exterior window walls and exterior fixed windows where vertical unanchored span is less than 10 feet.

B. **Glazed aluminum**-framed entrance doors.

1.02 RELATED SECTIONS

A. **Section 05090 - Anchors and Fasteners:** General requirements for anchors and fasteners to building substrates.

B. **Section 05500 - Metal Fabrications:** Miscellaneous structural support and backing components.

C. **Section 05900 – Metal Finishes:** Painted finish on aluminum framing components.

D. **Section 07600 - Sheet Metal Flashing and Trim:** Head and sill flashing at storefront framing.

E. **Section 07900 – Caulking and Sealants:** Perimeter sealing between aluminum-framed storefront or window and surrounding construction.

F. **Section 08425 – Automatic Swing Doors:** Door openers for aluminum-framed entrance doors.

G. **Section 08710 - Door Hardware:** Door hardware for aluminum-framed entrance doors.

H. **Section 08800 - Glass and Glazing:** Glass and glazing products.

I. **Section 08911 – Curtain Wall Aluminum-Framed:** Entrance framing and glazing support members of extruded aluminum, for modifications to existing building entrance and adjacent fixed glazing, where vertical dimension is less than 10 feet.

1.03 DESIGN REQUIREMENTS

A. **Thermal Performance:** Provide for free and noiseless vertical and horizontal thermal movement of components subjected to expansion and contraction of glazing system components resulting from an ambient temperature differential of 120 degrees F, which may result in a metal surface temperature range of 180 degrees F within glazing system framing, without causing buckling, excessive

stresses on structural elements or fasteners, stresses on glazing, failure of seals, reduction of performance, or other detrimental effects on appearance and performance.

B. Structural Performance: Design structural support framing components under direct supervision of a Structural Engineer experienced in design of this Work and licensed to practice in the State of California, in compliance with California Building Code (CBC) requirements.

1. Design Wind Load: As required by Authority Having Jurisdiction (AHJ) and indicated in notes on Structural Drawings, for locale, exposure, height and Project conditions. At a minimum, system shall resist load of 90 mph (40 m/s) basic wind speed, Exposure C.
2. Mullion Deflection: Maximum 1/175 or flexural limit of glass with full recovery of glazing materials, whichever is less, ASTM E 330 and allowable stress with a safety factor of 1.65 minimum.

C. Weathering Performance:

1. Internal Drainage: Drain to exterior all water entering joints, condensation occurring in glazing channels or migrating moisture within system. All drainage shall be concealed and through face of system.
2. Air Infiltration: Through framing and glazing assembly, 0.06 cfm/sf at 6.24 psf of surface area, when tested according to ASTM E 283.
3. Water Leakage: No leakage at pressure differential of 8 psf, when tested according to ASTM E 331. Water leakage is defined as any amount of water which appears on any interior exposed surface of glass or metal.

D. Resistance to Forcible Entry: Jambs adjacent to door locks shall resist a force of 1600 pounds.

1.04 SUBMITTALS

A. Product Data: Storefront framing systems, including aluminum-framed entrance doors. Submit prequalifying Test Reports containing constrution detailing and installation instructions.

B. Shop Drawings: Complete, indicating elevation views of all units, attachments to surrounding construction of Project, type of glazing, and all door hardware and weatherstripping. Include full-size details. Include details of provisions for accommodation of thermal and building movement.

C. Calculations: Submit calculations demonstrating that system complies with applicable California Building Code (CBC) and other requirements as required by Authority Having Jurisdiction (AHJ). Structural calculations shall be prepared by a Structural Engineer licensed to practice in the State of California, demonstrating compliance with structural performance criteria.

D. Certification: Manufacturer's certification that products meet or exceed minimum California Building Code (CBC) requirements and design criteria.

1.05 QUALITY ASSURANCE

A. **Regulatory Requirements:** Comply with California Building Code (CBC) requirements for structural performance, safety glazing, accessibility and exit devices.

B. **Installer's Qualifications:** Installer shall be licensed or otherwise approved by aluminum-framed storefront and entrance manufacturer and shall have a minimum of five years experience in the installation of comparable aluminum-framed storefront and entrance systems. Installer shall employee workers who are thoroughly trained in the necessary skills and are completely familiar with the specific requirements and techniques needed to perform the required work.

C. **Single-Source Responsibility:** Storefront framing and doors shall be the product of one manufacturer.

D. **Testing:** Storefront and entrance system shall have been tested by an independent testing and inspection agency engaged and paid by the manufacturer.

E. **Product Options:** Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of aluminum storefront framing. 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.

1.06 PROJECT CONDITIONS

A. **Coordination:** Coordinate curtain wall installation with adjacent Work specified in other Sections, to provide proper allowances for tolerances in construction, fabrication, and installation of various elements of the Work specified in other Sections. Sizes, locations and alignment of storefront components and wall openings shall take such tolerances into account in the design and installation so as not to adversely affect the allowable width constraints of the aluminum storefront perimeter sealant joints.

B. **Dimensions:** Verify dimensions shown on Drawings and obtain field measurements of actual construction prior to preparing shop drawings and ordering products.

C. **Substrate Conditions:** Verify that conditions of substrate and adjoining Work are suitable for proper installation of aluminum framed storefront Work. Verify that conditions of substrate and adjoining Work are suitable for proper installation of entrance and storefront Work. Do not begin work until unsatisfactory conditions have been corrected. Commencement of installation shall be considered as acceptance of the substrate and conditions as being suitable for the installation of product(s).

1.07 WARRANTY

A. **Extended Warranty for Aluminum-Framed Storefront and Entrances:** Submit a written warranty signed by authorized representatives of the Contractor and installer agreeing to repair or replace defective Work related to aluminum-framed storefront and entrances and joint sealing to surrounding construction during a 5-year period following date established by Notice of Completion.

1. "Defective" is defined to include the following:
   a) Failure of the system to meet structural, air and water infiltration, and thermal performance requirements, including resulting glass breakage.
   b) Failure of glazing and weather seals, including leakage.
   c) Failure of structural sealant glazing, including leakage and failure of bond.
   d) Failure of operational parts to function normally.
   e) Deterioration or discoloration of finishes.
2. Extended warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. **Specified Manufacturer:** Arcadia Architectural Products, Los Angeles, CA (323/269-7300).

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Requirements.

1. Kawneer Company, Inc., (770/449-5555).
2. United States Aluminum Corporation, (213/268-4230).

2.02 STOREFRONT, ENTRANCE, WINDOW WALL AND FIXED WINDOW FRAMING

A. **Aluminum Members:** Alloy and temper recommended by the manufacturer for strength, corrosion resistance and specified finish.

1. Aluminum Extrusions: ASTM B 221.
2. Aluminum sheet or plate: ASTM B 209, flat sheet with strength and durability properties of alloy 5005-H32.
3. Aluminum bars, rods and wire: ASTM B 211.

B. **Carbon Steel Reinforcement for Aluminum Framing Members:** Comply with ASTM A 36 (ASTM A 36M) for structural shapes, plates and bars, ASTM A 611 for cold rolled sheet and strip, or ASTM A 570 (ASTM A 570M) for hot rolled sheet and strip.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components. Fasteners that are subject to loosening or turning out due to vibration, thermal and/or structural movements use self-locking devices.

1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches (3.2 mm) thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
2. Material: Provide fasteners of aluminum, non-magnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
3. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125-inch (3.2 mm) thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.
4. Exposed Fasteners: Do not use exposed fasteners except for application of hardware. For application of hardware, use Phillips flat-head machine screws that match the finish of member or hardware being fastened.

E. Dissimilar Metals: Isolate aluminum from steel, galvanized steel and cementitious products with suitable paint or sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead, bitumen or materials incompatible with joint sealers.

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. Weatherseal shall accommodate a 50 percent increase or decrease of joint width as measured at time of application in accordance with ASTM C 719. Provide manufacturer's recommended backer rod.
2. Sealants for aluminum framing joints to one another shall be as standard with the manufacturer.
3. For sealing of perimeter of aluminum framing to adjoining construction, provide sealants as specified in Section 07900 - Joint Sealants.

H. Glazing Materials: As recommended by storefront system manufacturer, EPDM extrusions.

I. Anchors to Building Substrates: As specified in Section 05090 - Anchors and Fasteners. Provide aluminum, non-magnetic stainless steel, zinc plated steel, or

other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components. Do not use exposed fasteners.

2.03 FRAMING SYSTEMS

A. Framing Systems, General: Provide systems for storefronts and fixed windows of sizes and details as indicated on Drawings. Provide accessory trim as indicated on the Drawings to suit wall openings.

B. Drainage: Provide inconspicuous weep holes or equal method to ensure positive drainage of internal moisture or condensate to the exterior. Detail all weep holes on Shop Drawings for Architects approval.

C. Entrance, Window Wall-Curtain Wall and Fixed Window Framing System

1. INTERIOR: Arcadia AF450 Series, nominally 2-inches by 4-1/2 inches, offset glazing system with ¼" glass.
2. EXTERIOR: Arcadia AFG451 Series, nominally 2-inches by 4-1/2 inches, offset glazing system for 1-inch glass (shear block system).
3. EXTERIOR: Arcadia T500-OPG25600 Series, nominally 2-1/2" by 6 inches pressure plate glazing system for 1" insulated glass

D. Reinforced Mullions: See Drawings for frame sizes and locations. Fabricate as necessary to accommodate applied loads, nominal outside dimensions to suit framing system, with internal reinforcement of shaped steel structural section.

E. Door Mullions: Provide framing members with integral or applied stops, for outswing door operation.

F. Vertical Movement: Provide for allowances to account for building deflection and other movements in framing.

G. Attachment Provisions: Provide internal reinforcement in framing sections for rigid attachment of framing members, suitably located and sized to withstand imposed loads.

1. Fasteners: Provide fasteners of aluminum, non-magnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
2. Exposed Fasteners: Where possible, use countersunk phillips head screws, finished to match framing system in exposed conditions.
3. Material: Provide fasteners of aluminum, non-magnetic stainless steel, zinc plated steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum components, hardware, anchors and other components.
4. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125-inch (3.2 mm) thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard noncorrosive pressed-in splined grommet nuts.

2.04 ENTRANCE DOORS

A. **Exterior Glazed Aluminum Doors:** Arcadia Series as indicated on drawings, wide stile design, 1-3/4 inches thick, for 1/4-inch glazing, with square glazing stops and with nominal 5-inch wide vertical stiles, 5-1/8 inch top rail and minimum 10-inch high composite bottom rail, complying with applicable California Building Code (CBC), Chapter 11B accessibility requirements.

B. **Door Weatherstripping:** Provide manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

C. **Aluminum Entrance Door Hardware:** As scheduled in Section 08710 - Door Hardware. For hardware products not scheduled, provide products as standard with aluminum entrance door manufacturer, suitable for heavy institutional use.

2.05 FRAMING AND DOORS FINISH

A. **Aluminum Framing and Doors Finish:** Refer to Section 05900 – Metal Finishes.

2.06 STOREFRONT FRAMING FABRICATION

A. **Storefront Framing Fabrication, General:** Fabricate aluminum entrance and storefront components to designs, sizes and thicknesses indicated and to comply with indicated standards.

B. **Pre-Fabrication:** Complete fabrication, assembly, finishing, hardware application, and other Work to the greatest extent possible before shipment to the Project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
2. Do not drill and tap for surface-mounted hardware items until time of installation at project site.
3. Pre-glaze door and frame units to greatest extent feasible.

C. **Welding:** Comply with AWS recommendations. Welding behind finished surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

1. Grind exposed welds smooth to remove weld spatter and welding oxides.
2. Restore mechanical finish.

D. **Reinforcing:** Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

E. **Dissimilar Metals:** Separate dissimilar metals with bituminous paint, or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead.

F. **Continuity:** Maintain accurate relation of planes and angles with hairline fit of contacting members.

G. **Fasteners:** Conceal fasteners wherever possible.

2.07 GLASS AND GLAZING MATERIALS

A. **Glass and Glazing Materials, General:** For 1-inch thick glazing, as specified in Section 08800 - Glass and Glazing and as indicated on Drawings.

B. **Safety Glazing:** Provide safety glazing as required by California Building Code (CBC) and as indicated on Drawings.

2.08 DOOR HARDWARE

A. **Door Hardware for Aluminum Entrances and Storefronts:** As specified in Section 08710 - Door Hardware. Factory prepare doors and framing for specified hardware.

1. Weatherseals shall be provided with storefront framing and entrance doors.
2. Hinges, closers, locksets, exit devices, pulls, thresholds and other components shall be provided as specified in Section 08710 - Door Hardware.

2.09 ACCESSORY MATERIALS

A. **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.

PART 3 - EXECUTION

3.01 FABRICATION

A. **Fabrication:** Shop or field fabricate framing system into complete units.

B. **Workmanship:** Fabricate framing in accordance with the manufacturer's instructions and recommendations. Accurately miter and fit all members to hairline joints. Weld or mechanically fasten along entire line of contact on the unexposed side.

3.02 FRAMING INSTALLATION

A. **Framing Installation, General:** Install framing with adequate provision for building movements, settling, expansion and contraction without distorting or breaking glass.

B. **Anchoring:** Firmly anchor framing using fasteners as required by structural calculations, sized to suit loads and type suitable for substrate, to positively attach members for long life under hard use.

C. **Adjustment:** Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. **Protection:** Wherever aluminum is in contact with concrete or dissimilar metal, apply isolation material compatible with joint sealant specified in Section 07900 - Joint Sealants.

E. **Protection:** Wherever aluminum is in contact with concrete or dissimilar metal, apply bituminous paint or other isolation compatible with adjacent materials and approved in advance by the Architect as acceptable.

F. **Sill Flashing:** Install sheet metal sill flashing to prevent water migration under framing. Comply with requirements specified in Section 07600 - Sheet Metal Flashing and Trim. Set sill flashing in bedding sealant as specified in Section 07900 - Joint Sealants.

3.03 DOORS INSTALLATION

A. **Doors Installation:** Assemble doors in shop with glazing installed.

B. **Door Joints:** Make joints rigid and suitable for heavy use.

C. **Hardware:** Shop install hardware using templates provided. Refer to Section 08710 - Door Hardware for related Work and additional installation requirements for door hardware generally.

D. **Adjustment:** Adjust operating hardware and door operation for smooth movements, without binding and without exceeding allowable forces of handicapped accessibility regulations.

3.04 GLAZING

A. **Glazing Installation, General:** Install glazing as specified in Section 08810 - Glass and Glazing, except butt glazing shall be as recommended by framing system and glass manufacturers.

B. **Testing:** Water test all storefront and glazing after completion by spraying with hose heavily for 5 minutes. Repair all leaks discovered by testing procedures and repeat test until leak-free performance is achieved.

3.05 JOINT SEALING

A. Joint Sealing: Install perimeter sealant in compliance with requirements specified in Section 07900 - Joint Sealants, to seal between aluminum framing and surrounding construction.

3.06 TOLERANCES

A. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet whichever is less.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.07 FIELD QUALITY CONTROL

A. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.

B. Field Testing Services: Testing Laboratory will conduct tests and inspections of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages 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. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
   a) Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2 shall be used.
      1) A minimum of four areas on each building face shall be tested.
      2) Repair installation areas damaged by testing.
2. Structural-Sealant Glazing Inspection: After installation of curtain-wall systems are complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations.
3. Water Penetration: Areas shall be tested according to ASTM E 1105 at minimum uniform and cyclic static-air-pressure difference of 0.67 times the pressure specified under Part 1 "DESIGN REQUIREMENTS" Article, but not less than 8.0 psf (300 Pa) and shall not evidence water penetration. Conduct three tests, at 10 percent, 50 percent and 75 percent completion.

C. Remedial Work: Repair or remove work where test results and inspections indicate that it does not comply with specified requirements. Retesting and additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.

3.08 CLEANING

A. Protective Coverings: Remove protective materials from prefinished aluminum surfaces immediately prior to cleaning for Substantial Completion review.

B. Cleaning: For initial cleaning and for cleaning prior to Substantial Completion review.

1. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
2. Take care to remove soiling and dust accumulation from corners.
3. Flush thoroughly and wipe surfaces clean.
4. Remove excess sealant and spilled sealant immediately according to instructions by sealant manufacturer that will not discolor framing finish.

C. Glass Cleaning: See Section 08800 - Glass and Glazing.

END OF SECTION

SECTION 08425

SLIDING AUTOMATIC ENTRANCE DOORS

PART I - GENERAL

1.01 SUMMARY

A. **Work Included**: Furnish complete automatic aluminum door system, as specified, that has been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

B. **Related Work:**

1. Concrete: Division 03, applicable sections.
2. Masonry: Division 04, applicable sections.
3. Thermal and Moisture Protection: Division 07, applicable sections.
5. Openings: Division 08, applicable sections.
6. Electrical: Division 26, applicable sections.

1.02 REFERENCES

A. **American Architectural Manufacturers Association** (AAMA) 101: Appendix Dissimilar Materials.

B. **American Association of Automatic Door Manufacturers** (AAADM).

C. **American Architectural Manufacturers Association** (AAMA) 1303.5: Voluntary Specifications for Forced-Entry Resistant Aluminum Sliding Glass Doors

D. **American National Standards Institute** (ANSI):

1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Methods of Test.
2. ANSI A156.10 - 2011: For Power Operated Pedestrian Doors; Sliding Doors Section.
3. ANSI A156.5: Standard for Auxiliary Locks and Associated Products

E. **American Society For Testing And Materials** (ASTM);

1. ASTM B221: Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes.

F. **Building Officials And Code Administrators International** (BOCA)

G. **International Conference Of Building Officials / Uniform Building Code** (ICBO/UBC)

H. **International Code Council / International Building Code** (ICC/IBC)

I. **National Fire Protection Association** (NFPA) 101:

1. NFPA 101: Code for Safety to Life from Fire in Buildings & Structures.
2. NFPA 70: National Electrical Code (NEC).

J. **The Aluminum Association** (AA) Aluminum Finishes Manual.

K. **Underwriters Laboratory, Inc. (USA & Canada)** UL 325: Electrical Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.03 SUBMITTALS

A. **Product Data**: Submit manufacturer's complete product and installation data.

B. **Shop Drawings**: Submit drawings showing layout, profiles, product components including anchorage, accessories, finish and glazing details (where required).

C. **Closeout Submittals**: Submit the following:

1. Owner’s Manual.
2. Warranty document as specified herein.
3. AAADM inspection compliance form completed and signed by certified AAADM inspector prior to doors being placed in operation as proof of compliance with ANSI A156.10 - 2011.

1.04 QUALITY ASSURANCE AND PERFORMANCE REQUIREMENTS

A. **Installers Qualifications**: Installer shall be factory trained, certified by AAADM, and experienced to perform work of this section.

B. **Manufacturer’s Qualifications**: Manufacturer to have minimum (5) five years successful experience in the fabrication of automatic doors of the type required for this project. Manufacturer capable of providing field service representation during installation, approving acceptable installer and approving application method.

C. **Certifications**: Automatic sliding door systems and options shall be factory certified to meet performance design criteria in accordance with the following standards:

1. ANSI A156.10 - 2011: For Power Operated Pedestrian Doors; Sliding Doors Section.
2. NFPA 101: Code for Safety to Life from Fire in Buildings & Structures.
3. UL 325: Electrical Door, Drapery, Gate, Louver, and Window Operators and Systems.
4. BOCA: Means of Egress, Power Operated Doors
5. ICBO/UBC: Egress Through Lobbies
6. ICC/IBC: Egress Section

D. **Forced Entry Resistance**: Sliding doors shall meet requirement of AAMA 1303.5.

E. **Operating Range**: -30° F to 130° F (-34° C to 54° C)

F. **Opening Force Requirements For Emergency Egress**:

1. Slide-swing panels shall require no more than 50 lbf. (222 N) of force to swing open. Slide-swing panels shall be capable of swinging out 90° from any position of slide movement.
2. Slide-swing panels and swing-out sidelites shall have torsion spring designed to re-close panel if pushed open in the direction of egress.
3. If power fails, slide panels can be manually slid open with no more than 15 lbf (222 N) of force.
4. Units are UL listed as an exit way and are compliant with NFPA 101.

G. **Closing Force Requirements**: Maximum force required to prevent sliding panel from closing = 28 lbf. (124.5 N) Adjustable Reversing Circuit will reopen door unit if closing path is obstructed.

H. **Header Capacity**: Header shall be capable of supporting:

1. Biparting: Up to 300 lbs. (136 kg) per slide panel over spans up to 14’-0” (4280mm) without intermediate supports.
2. Single Slide: Up to 500 lbs. (227 kg) per slide panel over spans up to 9’-0” (2743mm) without intermediate supports

1.05 WARRANTIES

A. **Manufacturer's Warranty**: Units to be warranted against defect in material and workmanship for a period of one year from the Date of Substantial Completion.

Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.

B. **Distributor's Warranty**: One year warranty: Labor & transportation charges for defective parts replacement.

1.06 PROJECT CONDITIONS

A. **Field Measurements**: Verify actual dimensions/openings by field measurements before fabrication and record on shop drawings. Coordinate with fabrication and construction schedule to avoid construction delays.

1.07 DELIVERY, STORAGE AND HANDLING

A. **Ordering And Delivery**: Comply with factory's ordering instructions and lead time requirements. Delivery shall be in factory's original, unopened, undamaged containers with identification labels intact.

B. **Storage And Protection**: Provide protection from exposure to harmful weather conditions and vandalism.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. **Horton Automatics**, a division of Overhead Door Corporation, shall manufacture automatic sliding door(s) of type(s) and size(s) specified on plans and door schedule. OR APPROVED EQUAL

2.02 EQUIPMENT

A. **Manufactured Door Units**: Shall include operator, header with roller track, carrier assemblies, framing jambs, sliding door panel(s), sidelite(s), activation, safety devices and accessories required for complete installation.

1. Configuration: Biparting O-SX-SX-O
2. Mounting Type: Perimeter mounted within rough opening with sliding panel(s) sliding along sidelite.
3. Door Type: Type 110: Sliding panel(s) 'X' shall slide along interior side.
4. Door Width: 14'-0" wide HD Sliding
5. Door Height: Standard 7'-8" unit height

B. **Operator**: The Electric Operating Mechanism shall be HD-Slide® Series 2500 Elegant Belt Drive. Maximum current draw shall not exceed 3.15 amps. The heavy-duty operator shall be mounted and concealed within the header.

1. Operating force shall be accomplished through a 1/8 HP DC permanent magnet motor with heavy duty worm gear transmission and 1800 RPM working with reinforced drive belt, attached 1/4" thick steel door hangers, and idler pulley (1/4 HP motor required for door panels weighing 500 lbs). Drive belt to be steel reinforced nylon, 1" (25.4 mm) wide. Idler pulley to be reinforced, metallic material.
2. Master Control shall be 16 bit microprocessor controller with dual on-board seven-segment alphanumeric diagnostic display and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. The control shall have minimum of 28 programmable parameters including the following functions as required by ANSI A156.10 - 2011:
   a. Adjustable opening and closing speeds.
   b. Adjustable back-check and latching.
   c. Adjustable braking.
   d. Adjustable hold-open time between 1 to 30 seconds.
   e. Adjustable Reversing Circuit will reopen door unit if closing path is obstructed.
   f. Separate day and night modes of operation with security over-ride.
3. Finger Safety: When unit slides open, strike rail of sliding panel will stop short of adjacent sidelite; resulting opening is net slide.
4. On/Off Switch shall be supplied. When switched OFF, unit reverts to free manual operation (likewise during electrical power failure).

C. Security and Safety Power Fail Options:

1. Automatic lock: Automatically locks slide function of door when in closed position. Additional power supply for autolock not acceptable.
   a. Autolock Fail Safe: If power fails the lock disengages.

D. HD-Slide® Header: Shall be 6" (152 mm) deep by 8" (203 mm) high, heavy duty aluminum construction with removable face plate and extruded support brackets for dead load and lateral strength.

E. Carrier Assemblies And Header Roller Track: Carrier assemblies shall support door panels with minimum four rollers per panel. Rollers will be non-metallic high quality ball bearing wheels 2" (51 mm) diameter. Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel. Overhead header roller track shall be continuous aluminum and replaceable.

F. Sliding Panel(S) And Sidelite(S): Shall be 1/2" (13 mm) thick tempered glass with polished vertical edges mounted in top and bottom horizontal aluminum rails. Weather-stripping retained in top and bottom rails and in clear acrylic extrusions mounted along vertical edges of sliding glass panel.

G. Breakout Panels: Slide-swing panels can swing out 90° from any position of slide movement and require no more than 50 lbf. (222 N) of force applied at the lock stile to open. Slide-swing panels shall utilize spring loaded ball detent.

1. Slide-swing panels and swing-out sidelites shall have torsion spring designed to re-close panel if pushed open in the direction of egress.
2. Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop during emergency egress.
3. Units with breakout feature are UL listed as an exit away and are compliant with NFPA 101.

H. Jambs/Frame: Shall be aluminum. Jamb dimensions to be 1 3/4" (44mm) deep by 4 1/2" (114mm) wide.

I. Threshold: Shall be aluminum, 1/2" (25 mm) tall by 4” (102 mm) wide.

J. Hardware: Provided and installed in bottom rail shall be Maximum Security Lock with 31/32" (25 mm) backset and Two-point keyed 1 5/32" (29 mm) standard size cylinder. Deadlock dropbolt into threshold.

2.03 RELATED EQUIPMENT

BASIC SENSOR SYSTEM: Shall be 24 VDC, class ll circuit and shall be adjusted and installed in compliance with ANSI A156.10. System shall include the following:

A. **Activation Sensors**: Microwave or active infrared sensor shall be header-mounted each side of door unit for detection of traffic from each direction.

B. **Threshold Presence Sensors**:

1. Header mounted sensors shall provide active infrared presence detection on each side of the door unit and shall remain active throughout the entire door opening and closing cycle.
2. Hold-open beams: Two pulsed infrared photoelectric beams to be mounted in vertical rails of sidelite or in jambs. Sender/receiver arrangement parallels door opening.

2.04 RELATED WORK REQUIREMENTS

A. **Electrical**: 120 VAC, 50/60 cycle, single phase, dedicated 20 amp circuit per operator. Non-North American voltages can be 240 VAC 50/60 cycle (operator must have 240 volt power supply).

B. **Glass And Glazing**: Glass stops, glazing vinyl and setting blocks for field glazing as per Safety Glazing standard ANSI Z97.1.2. Contractor to coordinate acquisition of glass in thickness and type in accordance with manufacturer's recommendations for prescribed design.

2.05 MATERIALS, FINISHES AND FABRICATION

A. **Extruded Aluminum**: ASTM B221, 6063-T5 alloy and temper, anodized:

1. Structural Header Sections: Minimum 3/16" (5 mm) thickness.
2. Structural Frame Sections: Minimum 1/8" (3 mm) thickness.
3. Structural Panel Sections: Commercial grade.

B. **Finishes** (for all exposed aluminum surfaces)::

1. Paint Coating:
   a. Powder Coat: Match PPG Duranar XL Champagne Gold #UC51568XL

C. **Frame Construction**: Butt joints, mechanically secured with screws and formed alum. corner brackets.

D. **Operator Construction**: Electromechanical, modular type construction.

PART 3 - EXECUTION

3.01 EXAMINATION

A. **Site Verification Of Conditions**: Installer must verify that base conditions previously installed under other sections are acceptable for product installation according to with manufacturer's instructions. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of work. Do not start

work until all negative conditions are corrected in a manner acceptable to the installer and manufacturer.

3.02 INSTALLATION

A. **General**: Installer shall be factory trained, certified by AAADM, and experienced to perform work of this section. Install door units plumb, level and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.

B. **Dissimilar Materials**: Comply with AAMA 101, Appendix Dissimilar Materials by separating aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points.

C. **Weather-Tight Construction**: Install header and framing members in a bed of sealant or with joint filler or gaskets. Coordinate installation with wall flashings and other components of construction.

D. **Electrical**: General or electrical contractor to install all wiring to operator on a separate circuit breaker routed into header. General or electrical contractor also to install all necessary power and low voltage wiring for proper operation of associated security systems.

3.03 CLEANING, ADJUSTMENT AND PROTECTION

A. **Cleaning**: After installation, installer to take following steps:

1. Remove temporary coverings and protection of adjacent work areas.
2. Remove construction debris from construction site and legally dispose of debris.
3. Repair or replace damaged installed products.
4. Clean product surfaces and lubricate operating equipment for optimum condition and safety.

B. **Adjustment**: AAADM certified technician to inspect and adjust installation. Comply with ANSI A156.10-2011.

C. **Advise Contractor**: Of precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Door hardware, including electric hardware.
2. Storefront and entrance door hardware.
3. Gate Hardware.
4. Power supplies for electric hardware.
5. Door position switches.
6. Key cabinets.

B. Related Divisions:

1. Division 06 – door hardware installation
2. Division 07 – sealant at exterior thresholds
3. Division 08 – metal doors and frames, interior aluminum frames, wood doors and storefront.
4. Division 16 – fire and life safety systems
5. Division 16 – security access systems

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.

1.02 REFERENCES**:**

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
   a) ANSI 156.18 – Materials and Finishes.
2. BHMA – Builders Hardware Manufacturers Association
3. 2016 California Building Code
   a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
4. UL – Underwriters Laboratories
   a) UL10C – Positive Pressure Fire Tests of Door Assemblies.
   b) UL 305 – Panic Hardware
5. WHI – Warnock Hersey Incorporated State of California Building Code

6. Local applicable codes
7. SDI – Steel Door Institute
8. WI – Woodwork Institute
9. AWI – Architectural Woodwork Institute
10. NAAMM – National Association of Architectural Metal Manufacturers
11. AWI – Architectural Woodwork Institute
12. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers**:** see table at 2.1.A of this section
2. Finishes**:** see 2.7 of this section.

1.03 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS**:** Refer to Section 01300 for procedures. Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information**:**

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Point-to-point wiring diagrams.
12. Manufacturer’s technical data and installation instructions for electronic hardware.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

C. Deviations**:** Highlight, encircle or otherwise identify deviations from “Schedule of Finish Hardware” on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.04 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

    a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.05 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.06 PROJECT CONDITIONS AND COORDINATION**:**

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination**:** Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information**:**

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.
5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
6. Coordinate: low-voltage power supply locations.
7. Coordinate: back-up power for doors with automatic operators.
8. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
9. Manufacturers' templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations**:** segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

1.07 WARRANTY**:**

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents:

C. Minimum warranties:

1.	Locksets**:**	Three years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices**:**	Three years mechanical One year electrical
4.	Closers**:**	Thirty years mechanical Two years electrical
5.	Hinges**:**	One year
6.	Other Hardware	Two years

1.08 COMMISSIONING**:**

A. Conduct these tests prior to request for certificate of substantial completion**:**

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. **Listed acceptable alternate manufacturers:** these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE ALTERNATE:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE) Ives	Select
Pivots	(IVE) Ives	Rixson
Floor Closers	(RIX) Rixson	Dorma
Key System	(SCH) Schlage	Owner standard
Mechanical Locks	(SCH) Schlage	Owner standard
Electronic Locks	(SCE) Schlage Electronics	Owner standard
Exit Devices	(VON) Von Duprin	Owner standard
Closers	(LCN) LCN	Owner standard
Auto Flush Bolts	(IVE) Ives	DCI
Coordinators	(IVE) Ives	DCI
Silencers	(IVE) Ives	Rockwood, Trimco
Push & Pull Plates	(IVE) Ives	Rockwood, Trimco
Kickplates	(IVE) Ives	Rockwood, Trimco
Stops & Holders	(IVE) Ives	Rockwood, Trimco
Overhead Stops	(GLY) Glynn-Johnson	ABH
Thresholds	(NGP) NGP	Zero, Reese
Seals & Bottoms	(NGP) NGP	Zero, Reese
Key Cabinets	(LUN) Lund	TelKee
Aluminum Door Locks	(ADA) Adams Rite	None

2.02 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.
2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:

1. Geared-type aluminum.
    a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
    b) If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powdercoat finishes subject to Architect approval.
2. Pinned steel/stainless steel type: continuous stainless steel, 0.25-inch diameter stainless-steel hinge pin.
    a) Use engineered application-specific wide-throw units as needed to provide maximum swing degree of swing, advise architect if required width exceeds 8 inches.

2.03 LOCKSETS, LATCHSETS, DEADBOLTS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Universal lock case – 10 functions in one case.
3. Floating mounting tabs automatically adjusts to fit a beveled door edge.
4. Latchbolts: 0.75 inch throw stainless steel anti-friction type.
5. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
    a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
    b) Inside lever applied by screwless shank mounting – no exposed trim mount screws.
    c) Levers rotate up or down for ease of use.

d) Vandalgard locks**:** locked lever freely rotates down while remaining securely locked. This feature prevents damage to internal lock components when subjected to excessive force.

6. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
7. Turnpieces**:** accessible offset turn-lever design not requiring pinching or twisting motions to operate.
8. Deadbolts**:** stainless steel 1-inch throw.
9. Electric operation**:** Manufacturer-installed continuous duty solenoid.
10. Strikes**:** 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
11. Scheduled Lock Series and Design**:** Schlage L series, 03A design.
12. Certifications**:**

    a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

13. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 2016 11B-404.2.7 and 11B-309.4.

2.04 EXIT DEVICES / PANIC HARDWARE

A. General features**:**

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. Deadlocking latchbolts, 0.75 inch projection.
4. End caps**:** impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
8. Exterior doors scheduled with XP-series devices**:** Static load force resistance of at least 2000 pounds.
9. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 2016 11B-404.2.7 and 11B-309.4.

    a) Mechanical method: Von Duprin “AX-“ feature, where touchpad directly retracts the latchbolt with 5 lb or less of force.
    b) Electrical method: Von Duprin’s “RX-QEL-“, where lightly pressing the touchpad with 5 lb or less of force closes an electric switch, activating quiet electric latch retraction.

B. Specific features**:**

1. Non-Fire Rated Devices**:** cylinder dogging.
2. Lever Trim**:** breakaway type, forged brass or bronze escutcheon min. 0.130 inch thickness, compression spring drive, match lockset lever design.

3. Rod and latch guards with sloped full-width kickplates for doors fitted with surface vertical rod devices with bottom latches.
4. Fire-Labeled Devices**:** UL label indicating “Fire Exit Hardware”. Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
5. Inpact recessed devices**:** 1.25 inch projection when push-pad is depressed. Sloped metal end caps to deflect carts, etc. No pinch points to catch skin between touchbar and door.
6. Delayed Egress Devices**:** Function achieved within single exit device component, including latch, delayed locking device, request-to-exit switch, nuisance alarm, remote alarm, key switch, indicator lamp, relay, internal horn, door position input, external inhibit input plus fire alarm input. NFPA 101 “Special Locking Arrangement” compliant.
7. Electrically Operated Devices**:** Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
8. Removable Mullions**:** Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

C. Surface Closers**:** 4041

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 10,000,000 cycles.
4. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. As allowed per 2013 California Building Code Section 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.
    a) Exception: exterior doors’ pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
9. Exterior door closers**:** tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors**:** seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
11. Non-flaming fluid, will not fuel door or floor covering fires.
12. Pressure Relief Valves (PRV) not permitted.

D. Overhead Concealed Closers**:** Power transmitted to door separately from hanging means. Closer spindle does not support the door. Cast iron cylinders with hydraulically checked rack and pinion construction and single piece forged pistons. Separate non-critical sweep and latch speed valves.

1. (2030) concealable in 1-3/4inch x 4inch tube, forged single-lever arm & extruded track power transmission, concealed-in-track bumpers where scheduled.
2. (5030) concealable in 1-3/4inch x 4-1/2inch tube, forged double-lever arm power transmission.
3. (2010) 10,000,000 cycle-tested cylinder, single-lever forged arm & extruded track power transmission, concealed-in-track bumpers where scheduled.
4. (5010) 10,000,000 cycle-tested cylinder, forged double-lever arm power transmission.
5. (6030) double-acting, concealed in 1-3/4inch x 4inch tube, forged single-lever arm & extruded track power transmission, concealed-in-track bumpers where scheduled, independent latch and power adjustment valves for either direction of swing.

2.05 OTHER HARDWARE

A. Automatic Flush Bolts**:** Low operating force design.

B. Overhead Stops**:** Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates**:** Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops**:** Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum**:** 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Sound-reducing adjustable seals: coordinate lockset backsets, rim exit device strikes, and parallel arm closers. Fabricate 7ga “Z”-brackets as bridging pieces to facilitate installation. Brackets: mild carbon steel, or stainless steel.

F. Automatic door bottoms**:** low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

1. Include automatic type door bottoms, as opposed to fixed sweeps, at stairs and elevator lobbies to allow fine-tuning of pressurization systems.

G. Thresholds**:** As scheduled and per details. Comply with CBC 2016 11B-404.2.5. Substitute products**:** certify that the products equal or exceed specified material’s thickness. Proposed substitutions**:** submit for approval.

2. Saddle thresholds**:** 0.125 inches minimum thickness.

3. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".
4. Fire-rated openings, 90-minutes or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.
5. Fire-rated openings, 3-hour duration: Thresholds, where scheduled, to extend full jamb depth.
6. Acoustic openings: Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.
7. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
8. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

H. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

1. Exception: surface-mounted overhead stops, holders, and friction stays.

I. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent: door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal.

2.06 FINISH:

A. Generally: BHMA 626 Satin Chromium.

1. Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

2.07 KEYING REQUIREMENTS**:**

A. Key System**:** Schlage Everest [D] Primus [29] high-security utility-patented keyway, interchangeable core throughout. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and/or owner representatives to determine system keyway(s), keybow styles, structure, stamping, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system; do not order keys or cylinders without written confirmation of actual requirements from the Owner. Contractor will install permanent cylinders/cores.

1. New factory-registered master key system.
2. Primus Level 9
3. Construction keying**:** furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
4. Temporary cylinders/cores remain supplier's property.
5. Furnish 10 construction keys.
6. Furnish 2 construction control keys.
7. Key Cylinders**:** furnish 6-pin solid brass construction.

B. Cylinders/cores**:** keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.

C. Permanent keys**:** use secured shipment direct from point of origination to Owner.

1. For estimate**:** 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
2. For estimate**:** VKC stamping plus "DO NOT DUPLICATE".

D. Bitting List**:** use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS**:**

A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.02 PREPARATION**:**

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1008.1.9.2 and 11B-404.2.7.
2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops**:** before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.03 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets**:** install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
4. Replace fasteners damaged by power-driven tools.

A. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

B. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

C. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

D. Drill pilot holes for fasteners in wood doors and/or frames.

E. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.04. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods**:** repair or replace to Owner's satisfaction.
2. Adjust doors to fully latch with no more than 1 pound of pressure.

a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
4. Adjust door closers per 1.9 this section.

B. Inspection of fire door assemblies and means-of-egress panic-hardware doors**:** Per 2016 NFPA-80 5.2.1: hire an independent third-party inspection service to prepare a report listing these doors and include a statement that there are zero deficiencies with the fire-rated assemblies and the openings with panic hardware.

C. Fire-rated doors**:**

1. Wood doors**:** adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors**:** adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

D. Final inspection**:** Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following**:**

1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

3.05 DEMONSTRATION**:**

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.06 PROTECTION/CLEANING**:**

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.07 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

DOOR HARDWARE SCHEDULE

Hardware Group No. 01

For use on Door #(s):
101 102

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	MORTISE CYLINDER	20-061 36-083		626	SCH
2	EA	PRIMUS CORE	20-740-XP		626	SCH
	EA	NOTE	ALL HARDWARE BY SLIDING DOOR MFG			B/O

ALL HARDWARE BY ALUMINUM STOREFRONT SLIDING DOOR MANUFACTURER
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 02

For use on Door #(s):
G1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	PANIC HARDWARE	CD-OUT-AX-98-NL-OP-110MD-WH		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	ANTII VANDAL PULL	1097HA-FC		630	TRI
1	EA	SURFACE CLOSER	4041 DEL SCUSH SRI WMS		689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		689	LCN
3		GATE HINGE	BY GATE FABRICATOR			

BALANCE OF FINISH HARDWARE TO PROVIDE BY GATE FABRICATOR
GATE HINGE TO BE PROVIDED BY GATE FABRICATOR
GATE TO BE REINFORCE FOR THE SPECIFIED HARDWARE
ANTI-VANDAL PULL

Hardware Group No. 02.2

For use on Door #(s):
G2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	STOREROOM LOCK	L9080T 03A 10-072		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	ELECTRIC STRIKE	6211 FS 12/16/24/28 VAC/VDC	✓	630	VON
1	EA	SURFACE CLOSER	4041 DEL SCUSH SRI WMS		689	LCN
1	EA	PA MOUNTING PLATE	4040XP-18PA		689	LCN
3		GATE HINGE	BY GATE FABRICATOR			
1	EA	CUSTOM ELECTRIC STRIKE BOX	PROVIDE BY GATE FABRICATOR			TBD

BALANCE OF FINISH HARDWARE TO PROVIDE BY GATE FABRICATOR
GATE HINGE TO BE PROVIDED BY GATE FABRICATOR
GATE TO BE REINFORCE FOR THE SPECIFIED HARDWARE
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 02.3

For use on Door #(s):
G3

Provide each PR door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

ALL HARDWARE BY GATE FABRICATOR

Hardware Group No. 02.4

For use on Door #(s):
G4

Provide each PR door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

ALL HARDWARE BY DRIVEWAY GATE FABRICATOR

Hardware Group No. 03

For use on Door #(s):
123 124 125 126

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112HD		628	IVE
1	EA	PANIC HARDWARE	CDSI-9849-EO		630	VON
1	EA	PANIC HARDWARE	CDSI-9849-NL-OP-110MD		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
2	EA	MORTISE CYLINDER	20-061 36-083		626	SCH
3	EA	PRIMUS CORE	20-740-XP		626	SCH
2	EA	OFFSET PULL	1191-3		630	TRI
2	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
2	EA	KICK PLATE	KO050 10" X 1" LDW B-CS		630	TRM
1	EA	GASKETING	188SBK PSA		BK	ZER
2	SET	MEETING STILE	328AA-S		AA	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A-MSLA-10 OR AS DETAILED		A	ZER
2	EA	DOOR CONTACT	7764		628	SCE

EXTERIOR SIDE - DURING THE DAY DOOR IS MECHANICALLY DOGGED IN UNLOCKED POSITION
EXTERIOR SIDE - AFTER HOURS MECHANICALLY UNDOGGED THE DOOR IN LOCKED POSITION
INTERIOR SIDE - ALWAYS FREE TO EGRESS
DOOR CONTACT SWITCH TO INTERFACE WITH ALARM SYSTEM

Hardware Group No. 04

For use on Door #(s):
128 132

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112HD EPT		628	IVE
2	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-AX-9849-EO-LBL		630	VON
1	EA	ELEC PANIC HARDWARE	RX-QELX-AX-9849-NL-OP-110MD-LBL		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
2	EA	OFFSET PULL	1191-3		630	TRI
2	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
2	EA	KICK PLATE	KO050 10" X 1" LDW B-CS		630	TRM
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
2	EA	MEETING STILE	328AA		AA	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A-MSLA-10 OR AS DETAILED		A	ZER
2	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK 120/240 VAC			VON

DOOR CONTACT SWITCH TO BE CONNECTED TO INTRUSION ALARM
EXTERIOR - DURING THE DAY DOOR IS ELECTRICALLY DOGGED IN UNLOCKED POSITION
EXTERIOR - AFTER HOURS THE ACCESS CONTROL CONTROL SYSTEM RELEASES THE ELECTRICALLY DOGGED THE DOOR IS IN LOCKED POSITION
INTERIOR - ALWAYS FREE TO EGRESS
CONTACT SWITCH IS WIRED TO INTRUSION ALARM
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 05

For use on Door #(s):
129

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	700		630	IVE
1	SET	AUTO FLUSH BOLT	3810 X 3810		630	TRM
1	EA	STOREROOM LOCK	L9080T 03A 10-072 7/8" LIP 626 09-663 626		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	COORDINATOR	3094 SERIES X 3094 FILLER BAR		BLK	TRM
2	EA	MOUNTING BRACKET	3095/3096		BLK	TRM
2	EA	SURFACE CLOSER	4041 DEL SCUSH WMS		689	LCN
2	EA	KICK PLATE	KO050 10" X 1" LDW B-CS		630	TRM
1	EA	GASKETING	188SBK PSA		BK	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	MEETING STILE	44STST		STST	ZER
1	EA	THRESHOLD	546A-W/HOLES-223 OR AS DETAILED		A	ZER
1	EA	RAIN DRIP	142A		A	ZER
2	EA	DOOR CONTACT	7764	✓	628	SCE

Hardware Group No. 06

For use on Door #(s):
133

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	700		630	IVE
1	EA	PANIC HARDWARE	LD-AX-9849-EO-LBL		630	VON
1	EA	PANIC HARDWARE	LD-AX-9849-L-NL-03-LBL		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
2	EA	SURFACE CLOSER	4041 DEL SCUSH WMS		689	LCN
2	EA	KICK PLATE	KO050 10" X 1" LDW B-CS		630	TRM
1	EA	GASKETING	188SBK PSA		BK	ZER
2	SET	MEETING STILE	328AA-S		AA	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	546A-W/HOLES-223 OR AS DETAILED		A	ZER
2	EA	DOOR CONTACT	7764	✓	628	SCE

DOOR CONTACT SWITCH TO INTERFACE WITH ALARM SYSTEM

Hardware Group No. 07

For use on Door #(s):
127

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112HD		628	IVE
1	EA	PANIC HARDWARE	CDSI-9849-EO		630	VON
1	EA	PANIC HARDWARE	CDSI-9849-NL-OP-110MD		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
2	EA	MORTISE CYLINDER	20-061 36-083		626	SCH
3	EA	PRIMUS CORE	20-740-XP		626	SCH
2	EA	OFFSET PULL	1191-3		630	TRM
2	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	THRESHOLD	103A-MSLA-10 OR AS DETAILED		A	ZER
2	EA	DOOR CONTACT	7764		628	SCE

EXTERIOR SIDE - DURING THE DAY DOOR IS MECHANICALLY DOGGED IN UNLOCKED POSITION
EXTERIOR SIDE - AFTER HOURS MECHANICALLY UNDOGGED THE DOOR IN LOCKED POSITION
INTERIOR SIDE - ALWAYS FREE TO EGRESS
DOOR CONTACT SWITCH TO INTERFACE WITH ALARM SYSTEM
SEALS, DOOR BOTTOM AND EDGE SEALS BY ALUMINUM STOREFRONT DOOR AND FRAME MANUFACTURER

Hardware Group No. 08

For use on Door #(s):
109

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112HD EPT		628	IVE
2	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9849-EO 24 VDC		630	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-9849-NL-OP-110MD 24 VDC		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
2	EA	OFFSET PULL	1191-3		630	TRM
2	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	THRESHOLD	103A-MSLA-10 OR AS DETAILED		A	ZER
2	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 900-BBK 120/240 VAC			VON

DOOR CONTACT SWITCH TO BE CONNECTED TO INTRUSION ALARM
SEALS, DOOR BOTTOM AND EDGE SEALS BY ALUMINUM STOREFRONT DOOR AND FRAME MANUFACTURER
EXTERIOR - DURING THE DAY DOOR IS ELECTRICALLY DOGGED IN UNLOCKED POSITION
EXTERIOR - AFTER HOURS THE ACCESS CONTROL CONTROL SYSTEM RELEASES THE ELECTRICALLY DOGGED THE DOOR IS IN LOCKED POSITION
INTERIOR - ALWAYS FREE TO EGRESS
CONTACT SWITCH IS WIRED TO INTRUSION ALARM
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM

Hardware Group No. 09

For use on Door #(s):
121

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		630	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 03A 10-072 RX 12/24 VDC		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	FLOOR STOP	FS436		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR BOTTOM	355			ZER
1	EA	THRESHOLD	547A-NH-223 OR AS DETAILED		A	ZER
1	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902			VON

CARD READER AND WIRING BY ACCESS CONTROL SYSTEMS

Hardware Group No. 10

For use on Door #(s):
118 122

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080T 03A 10-072	630	SCH
1	EA	PRIMUS CORE	20-740-XP	626	SCH
1	EA	SURFACE CLOSER	4041 DEL SCUSH MC	689	LCN

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 11

For use on Door #(s):
115

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		630	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 03A 10-072 RX 12/24 VDC		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	FLOOR STOP	FS436		626	IVE
1	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902			VON

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTURER
CARD READER AND WIRING BY ACCESS CONTROL SYSTEMS

Hardware Group No. 12

For use on Door #(s):
117

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		630	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	EU MORTISE LOCK	L9092TEU 03A 10-072 RX 12/24 VDC		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	FLOOR STOP	FS436		626	IVE
1	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902			VON

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTURER
CARD READER AND WIRING BY ACCESS CONTROL SYSTEMS

Hardware Group No. 13

For use on Door #(s):
105 108 112 113 114

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		630	IVE
1	EA	STOREROOM LOCK	L9080T 03A 10-072		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4041 DEL REG OR PA AS REQ MC		689	LCN
1	EA	FLOOR STOP	FS436		626	IVE

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 14

For use on Door #(s):
106 107 110 111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5		652	IVE
1	EA	PANIC HARDWARE	CDSI-AX-98-NL-OP-110MD		630	VON
1	EA	RIM CYLINDER	20-057		626	SCH
1	EA	MORTISE CYLINDER	20-061 36-083		626	SCH
2	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	OFFSET PULL	1191-3		630	TRM
1	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 15

For use on Door #(s):
103 104

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1HW 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 8" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	CONCEALED CLOSER	2030 BUMP WMS SERIES		689	LCN
1	EA	MOP PLATE	8400 4" X 2" LDW B-CS		630	IVE

SEALS TO PROVIDED BY ALUMINUM FRAME MANUFACTIRER
STONE THRESHOLD BY FLOORING SECTION

FUNCTION: (F07) Storeroom Lock
Latchbolt retracted by key outside or by lever inside. Outside lever always inoperative. Auxiliary latch deadlocks latchbolt when door is closed.

Hardware Group No. 16

For use on Door #(s):
130 131

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	3CB1 4.5 X 4.5 NRP		630	IVE
1	EA	AUTO FLUSH BOLT	FB41P		630	IVE
1	EA	DUST PROOF STRIKE	DP2		626	IVE
1	EA	CLASSROOM LOCK	L9070T 03A 10-072 7/8" LIP		630	SCH
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	MOUNTING BRACKET	MB1		689	IVE
2	EA	SURFACE CLOSER	4041 DEL SCUSH WMS		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	MEETING STILE	44STST		STST	ZER

Hardware Group No. 17

For use on Door #(s):
116 119 120

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5		630	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 03A		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	FLOOR STOP	FS436		626	IVE

SEALS TO BE PROVIDED BY ALUMINUM FRAME MANUFACTURER

Hardware Group No. 18

For use on Door #(s):
134

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	3CB1 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	L9080T 03A 10-072		630	SCH
1	EA	PRIMUS CORE	20-740-XP		626	SCH
1	EA	SURFACE CLOSER	4041 DEL SCUSH WMS		689	LCN
1	EA	RAIN DRIP	142A		AL	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	546A-W/HOLES-223 OR AS DETAILED		A	ZER
3	EA	SILENCER	SR64		GRY	IVE
1	EA	DOOR CONTACT	7764	✓	628	SCE

DOOR CONTACT SWITCH TO INTERFACE WITH ALARM SYSTEM

Miscellaneous Items

Qty		Description	Catalog Number	Finish	Mfr	Handing
1	EA	WALL KEY CABINETS	1201-B		LUN	

END OF SECTION

SECTION 08800

GLASS AND GLAZING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Vision glass:** Clear, low-E coated and tinted.

B. **Safety glass:** Tempered glass. Laminated Glass.

D. **Sealed insulating glass** ("double-glazed") units.

E. **Unframed Mirrors**.

F. **Glazing materials**.

G. **Field installation of glazing** for doors and windows provided open for field glazing.

1.02 RELATED SECTIONS

A. **Section 05700 – Ornamental Metals:** Refer to this Section for the components that will make up the framing elements.

B. **Section 07900 - Joint Sealants:** Sealants other than for glazing.

C. **Section 08400 - Aluminum-Framed Storefronts:** Framing and doors to be glazed; glazed aluminum-framed doors.

D. **Section 08911 - Aluminum-Framed Curtain Wall:** Framing and doors to be glazed; glazed aluminum-framed doors.

1.03 DEFINITIONS

A. **Manufacturer:** As used in this Section, refers to firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. **Glazing Performance, General:** Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

1.05 SUBMITTALS

A. Product Data: Product data for each glass product and glazing material specified.

B. Samples: Provide samples for verification purposes.

1. Glass: 12-inch square samples of each type of glass specified, if other than specified product of specified manufacturer. Include spandrel glass samples manufacturer's opacifier material.
2. Sealed insulating glass unit: Minimum 12-inch square samples.
3. Sealants and glazing: 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the all applicable codes and ordinances, including California Building Code (CBC), Chapter 24, and US Consumer Product Safety Commission Standard 16CFR1201 CI and CII.

B. Industry Standards: Comply with GANA Glazing Manual, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

C. Manufacturer's Instructions and Recommendations: Comply with referenced documents as applicable and all other instructions and recommendations of glass and glazing products manufacturers.

D. Heat-Strengthened Glass: Surface compression of heat strengthened glass shall comply with ASTM C 1048 and be within range selected by glass manufacturer to preclude spontaneous breakage due to nickel sulfide stone.

E. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

F. Insulating Glass: Each insulating glass unit shall comply with Sealed Insulating Glass Manufacturers Association (SIGMA) standards for construction and insulating value and shall have passed class CBA test in accordance with ASTM E 774. Label each insulating glass unit.

G. Glazing Installer's Qualifications: Minimum experience 10 years with products similar in material, design, and extent to that indicated for Project with a verifiable record of successful in-service performance.

1. Glazing mechanics: Minimum experience 5 successful years with products similar in material, design, and extent to that indicated for Project.

H. Work Conditions:

1. Do not start field glazing Work until the outdoor temperature is above 40 degrees F and rising, unless approved provisions are made to warm the glass and rabbet surfaces. Do not perform glazing Work during damp or rainy weather.
2. Create an environment sufficiently dust free for sealant and glazing Work.
3. Provide sufficient ventilation to prevent condensation of moisture on glazing Work during installation.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery, Storage and Handling, General: Package, handle, and store glass so that water does not touch or condense on glass surfaces.

1. Protect glass edges against chipping and other damage.
2. Furnish labels identifying each type of glass. Keep labels in place until glass is installed.

B. Delivery: Deliver, store and handle glass in accordance with manufacturer's instructions and recommendations. Package, handle, and store glass so that water does not touch or condense on glass surfaces.

C. Storage: Store glass and glazing products in controlled environment, out of sunlight, so that temperature does not go above 80 degrees F. Bring glazing materials to at least 40 degrees F, or higher temperature if recommended by producer, before installing.

D. Labels: Provide identification labels on each type of glass.

1.08 WARRANTY

A. Installer's Warranty: Glass products and installation shall be free from defects for not less than two years from date established by Notice of Completion. Glass products and installation shall be free from defects for not less than two years from date established by Notice of Completion.

B. Manufacturer's Guarantees: For insulating glass units, seal shall be warranted for 5 years from date established by Notice of Completion.

C. Remedial Provisions: Upon notification of defects, within the warranty or guarantee period, party providing warranty or guarantee shall remove and replace defective glass and glazing at no cost to City.

PART 2 - PRODUCTS

2.01 GLASS, GENERAL

A. Acceptable Manufacturers: The manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product

Requirements, subject to acceptable visible and performance matches as determined by Architect.

1. Vitro Architectural Glass, (855) 887-6457
1. Guardian Industries, Inc., (559/896-6400).
2. Pilkington Building Products North America, (419/247-4926).
3. Viracon, Inc., (800/533-2080).

A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern. All glass shall be cut under factory or shop conditions.

B. Heat-Treated Glass Standard: Provide heat-treated (heat-strengthened) glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

1. Heat-treat glass to maximum strength of 6000 psi for use at building exterior.
2. Roller distortions shall run horizontal in installed glass.

C. Tempered Glass: Provide tempered glass where required by California Building Code (CBC), Section 2406 - Safety Glazing, and US Consumer Product Safety Commission Standard 16CFR1201 CI and CII, including all openings of non-rated doors, all glazed openings within 4 feet of the side of a door and all glazed openings within 18-inches of the floor or walkway adjacent and wherever safety glazing or tempered glass is indicated or specified.

D. Laminated Glass: Provide laminated glass where required by California Building Code (CBC) and where noted on the drawings.

2.02 VISION GLASS

A. Vision Glass, General: Vision glass shall conform to ASTM C 1036 or ASTM C 1048, as applicable.

1. Provide tinted glass at exterior locations as indicated on the Drawings.
2. Provide tinted glass at exterior glazed entrance doors.
3. Provide clear glass typically at interior locations.
4. Thicknesses, where shown, are minimum. Determine thickness in conformance to applicable California Building Code (CBC) requirements and standards. Provide greater glass thickness if required by glass manufacture's criteria for light size and wind load and with applicable provisions of California Building Code (CBC), Chapter 24.

B. Clear Float Glass: Q3 (Glazing Select) quality, annealed, heat-strengthened or tempered as indicated. Provide double-strength (DS) glass typically except where tempered glass in required. Unless otherwise indicated, interior clear glass shall be 3/16-inch thick, minimum.

C. **Tinted Float Glass:** Q3 (Glazing Select) quality, annealed, heat-strengthened or tempered as indicated, Solarban70 (2) Solexia + Clear Glass as manufactured by Vitro Architectural Glass, (855) 887-6457. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Provide double-strength (DS) glass, 1/4-inch thick typically.

D. **Low-Emissivity Coated Float Glass:** Vitro Architectural Glass, (855) 887-6457 with Solarban70 (2) Solexia, Low E Glass, annealed clear coated float glass meeting requirements of ASTM C 1036, Type 1, Class 1, Quality q3; with pyrolitic coating on Surface 3 in sealed insulating glass units, thickness and performance attributes as specified below for sealed insulating glass units.

E. **Unframed Mirrors**: Clear or smoke where indicated, mirror quality float glass, Type I, Class 1, Quality q1 silvering and 1/4" thick unless otherwise indicated, edges ground and polished, double silvered, with electro-deposited copper backing and protective back paint coat equal to Palmer Products "Mirro-Bac Paint". Provide unequal leg channels at top and bottom edges unless otherwise shown or directed, of clear anodized extruded aluminum or stainless steel.

2.03 SAFETY GLASS

A. **Tempered Glass:** ASTM C 1048, Kind FT, Condition A, Type I, Class 1 or 2, Quality q3, 1/4-inch thick unless otherwise noted.

1. Provide tempered glass where required by California Building Code (CBC) Section 2406 - Safety Glazing, including use in openings of all non-rated doors, all glazed openings within 4 feet of the side of a door and all glazed openings within 18-inches of the floor or walkway adjacent and wherever safety glazing or tempered glass is indicated or specified.
2. Temper glass by horizontal (roller hearth, "tongless") process, to be free of tong marks. Roller distortions shall run horizontal in installed glass.
3. Label all tempered glass by permanent method, indicating glass type, manufacturer and compliance with applicable standard.

B. **Fabricate Laminated Glass**: Conform to either ASTM C1036 annealed, ASTM C1048 Kind HS heat strengthened, or ASTM C1048 Kind FT fully tempered glass as determined by manufacturer to accommodate Project design and performance requirements specified herein. Minimum thickness 9/16" with polished and mitered flat edges.

2.04 GLAZING MATERIALS

A. **Glazing Materials, General:** Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. **Metal Accessories:** Provide non-corroding metal accessories.

C. Primer - Sealers and Cleaners: As recommended by the glass, glazing and sealant manufacturers.

D. Glass Setting Blocks, Edge Blocks, Spacers and Gaskets: Chloroprene (neoprene), EPDM or silicone.

1. Applicable standard: ASTM C 864.
2. Hardness of setting blocks: Sufficient to compress no more than 20 percent under weight of glass.

E. Shims and Spacers for Leveling and Securing Framing Members: Aluminum, compatible stainless steel, or other plated or corrosion resistant non-resilient material. Do not use wood for shims.

F. Compressible Filler Rod: Closed-cell or waterproof-jacketed foam of polyethylene, butyl rubber, neoprene, polyurethane or vinyl, tested for compatibility with specified glazing sealants, of 5 to 10 psi compression strength (25 percent deflection), recommended by sealant manufacturer for use in glazing channel to prevent sealant exudation from the channel.

G. Cleaners, solvents: As recommended by glazing material producer for each type of glass, glazing material and substrate.

2.05 ELASTOMERIC GLAZING SEALANTS

A. Elastomeric Glazing Sealants, General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
3. Colors: Provide color of exposed joint sealants to comply with the following:
4. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.06 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, non-staining and non-migrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated.

2.07 COMPRESSION GASKET AND PREFORMED GASKET DRY GLAZING

A. Compression Gasket and Preformed Gasket Dry Glazing: Chloroprene (neoprene), EPDM, or silicone compression gaskets in a soft and a dense formulation for the two sides of the glass. Select soft gasket to compress 25 to 40 percent when glass and dense gasket are in place.

1. Where small lites (as in doors) can be glazed with a continuous preformed elastomeric glazing extrusion, use a gasket of the dense formulation, compressed to watertightness outside and inside, with either a bent joint or a tightly compressed cut joint at corners.

B. Applicable Standards:

1. Soft gaskets: ASTM C 509.
2. Dense gaskets: ASTM C 864.

2.08 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabrication: Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

2.09 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated.

1. Provide double-glazed sealed insulating glass units as standard with glass fabricator.
2. Coordinate with framing specified in Section 08400 - Aluminum-Framed Storefronts. Units shall be 1-inch net thickness, consisting of 1/4-inch thick exterior light of specified tinted vision glass, 1/2-inch air space and 1/4-inch thick interior light of specified clear low-E coated glass with coating on No. 3 surface. Where noted on Drawings as "spandrel," provide opacifying film on No. 4 surface.
3. Provide tempered glass where indicated and required by California Building Code (CBC).

B. Performance of Sealed Insulating Units:

1. Transmittance:
   a) Visible light: 56 percent.
   b) Ultra-violet light: 8 percent.
   c) Total solar energy: 25 percent.

2. Reflectance:
   a) Visible light: 11 percent.
   b) Total solar energy: 11 percent.
3. U-value:
   a) Winter: 0.29.
   b) Summer: 0.29.
4. Shading coefficient: 0.42.
5. Solar heat gain coefficient: 0.6.
6. Light to solar gain (LSG): 2.15

C. Sealing System: Dual seal, with primary and secondary sealants as standard with manufacturer.

D. Spacer Specifications: Manufacturer's standard spacer material and construction, using aluminum with black color-anodized finish.

1. Desiccant: Molecular sieve or silica gel, or blend of both.
2. Corner construction: Manufacturer's standard corner construction.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examination: Examine frames and other construction which supports or underlies glazing Work.

1. Determine prior to start of field glazing that framing, flashing, fasteners and trim are of proper materials and will not create staining problems on glass.
2. Where frames are out of square, out of plane, subject to excessive deflection, or where substrates contain bond breaking substances, moisture, unsound material, or where there are other conditions unsuitable for proper installation or performance of the glazing Work, do not start glazing Work until defects have been corrected.
3. Remove dust and other bond breaking substances from surfaces to be glazed.
4. Do not glaze wet, damp, or uncured surfaces.

B. Measurements: Measure actual openings to determine glazing sizes to provide the required edge clearances.

C. Glass Preparation, General: Unless otherwise specified or approved, conform to applicable recommendations in the Glass Association of North America (GANA) - Glazing Manual and GANA - Glazing Sealing Systems Manual. Shop prepare all glass to be field installed.

1. Cut glass and grind smooth all edges of glass that will be exposed in finish Work. Do not field cut tempered glass.
2. Remove dust and other bond breaking substances from surfaces to be glazed.

D. **Exterior Glazing Preparation:** For exterior glazing, do not start glazing until each lite is provided with 2 or more weepholes, not more than 3 feet o.c.

E. **Preparatory Cleaning:** Remove dust and other bond breaking substances from surfaces to be glazed. Do not glaze wet, damp, or uncured surfaces.

3.02 GLASS INSTALLATION

A. **Glazing Installation, General:** Installation shall include such Work as surface preparation, priming, cleaning, protecting, and repairing or replacing defective and damaged Work.

1. Install glazing systems in accordance with GANA - Glazing Manual and manufacturers' instructions and recommendations.
2. Items to be glazed shall be either shop or field glazed using glass of the quality and thickness specified or indicated.

B. **Glass Orientation:** Orient glass so that wave and other distortions run horizontally.

C. **Handling:** Handle and install glazing materials in accordance with the manufacturer's instructions.

D. **Tempered Glass:** Provide tempered safety glass in lites where required by 16CPR1201 and public authorities, and at other locations as specified herein.

1. Completely fabricate in shop to sizes required, including all edgework. Do no field fabrication or modification.
2. Cut and set tempered glass so that visible lines, waves and other distortions run horizontally.
3. Set all tempered glass with tong marks concealed, consistently at top of opening.

E. **Stop Glazing:** Use beads or stops which are furnished with the items to be glazed to secure the glass in place.

1. Where frames are not provided with resilient glazing gaskets, set glass in full beds of glazing compound at sides of rabbets. Use setting blocks and spacer shims to center glass in rabbets and maintain proper edge clearances. After glazing, strip excess compound at an angle (not undercut).
2. Apply removable stops with cadmium plate screws at steel frames, stainless steel screws at aluminum frames, and brass screws at wood frames. Screws shall be spaced not more than 8-inches on centers, and shall be countersunk flat head types.
3. At exterior conditions, provide screws with tamper-resistant heads.

F. **Completed Installation:** No visible chips or fissures; edges clean and straight.

3.03 GLASS PROTECTION

A. Glass Protection: Take precautionary measures as necessary to prevent damage to glazing products. Replace scratched and damaged units prior to Completion Review, at no change in Contract Time or Contract Sum.

B. Temporary Identification: Identify glazed areas by hanging narrow streamers from walls and mullions. Do not mark glass nor affix decals to glass.

C. Factory Labels: Leave labels in place until the installation is reviewed.

D. Sash and Doors Protection: Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

E. Exterior Glass Cleaning: In addition, clean outside of exterior glass once each month until time of Completion Review.

3.04 GLASS CLEANING

A. Progress Cleaning: Clean installed glass frequently during construction. Do not place other materials in contact with glass nor in such a way as to create a heat trap.

B. Exterior Glass Cleaning: In addition, clean outside of exterior glass once every 90 days maximum until time of Completion Review, to prevent heavy accumulation of soiling. Within 10 days of Completion Review, thoroughly clean outside of all new and existing glass.

C. Final Cleaning: Within 10 days of Completion review, thoroughly clean inside and outside of all new and existing glass.

1. Thoroughly clean glass surfaces and remove labels, paint spots, and other defacement.
2. Avoid scratching glass and frames. Tinted glass shall receive special cleaning attention in accordance with manufacturer's instructions and recommendations, to avoid scratching and marring, according to manufacturer's instructions and recommendations.

END OF SECTION

SECTION 08911

ALUMINUM-FRAMED CURTAIN WALL

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Curtain wall framing system** and glazing support system of extruded aluminum, for conditions where vertical unsupported dimension exceeds 10 feet.

1.02 RELATED SECTIONS

A. **Section 05090 - Anchors and Fasteners:** General requirements for anchors and fasteners to building substrates.

B. **Section 05500 - Metal Fabrications:** Miscellaneous structural support and backing components.

C. **Section 05900 – Metal Finishes:** Painted finish on aluminum framing components.

A. **Section 07900 - Joint Sealants:** Perimeter sealing between aluminum framing and surrounding construction.

B. **Section 08400 - Aluminum-Framed Storefronts:** Entrance framing and glazing support members of extruded aluminum, for modifications to existing building entrance and adjacent fixed glazing, where vertical dimension is less than 10 feet.

C. **Section 08800 - Glass and Glazing:** Glass and glazing products.

1.03 DESIGN REQUIREMENTS

A. **Contract Drawings and Specifications:** The intent of these documents is to provide a performance criteria for the design, fabrication and installation of aluminum window wall systems. Contractor shall be responsible for engineering design and testing of all components and materials, as well as fabrication, installation and in-place performance of the window wall systems.

1. The details shown on Architectural Drawings are intended as a guide for aesthetic and interfacing requirements with other Work.
2. The requirements shown on Architectural Drawings are intended to establish basic dimensions, sight lines and profiles of components.
3. Glazed aluminum curtain wall systems, including anchorages and sealant joints to surrounding construction, shall be capable of withstanding, without failure, the effects of the following:
   a) Structural loads.
   b) Thermal movements.
   c) Movements of supporting structure indicated on Drawings including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads, including seismic loads for delta S and delta M.

B. **Delegated Design:** Design structural-sealant-glazed curtain walls, including comprehensive engineering analysis by a qualified structural engineer, registered to practice in the State of California, using performance requirements and design criteria indicated.

C. **Structural-Test Performance:** Provide structural-sealant-glazed curtain walls tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, 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 veloOwner, but not less than 10 seconds.

D. **Structural Performance:** Design of framing and structural sealant glazing shall be by curtain wall framing manufacturer. Component sizes, internal reinforcements and connection details shall suit loadings determined by framing manufacturer in compliance with applicable California Building Code (CBC) requirements as interpreted by Authority Having Jurisdiction (AHJ).

1. Design Wind Load: As required by Authority Having Jurisdiction (AHJ), for locale, exposure, height and Project conditions. At a minimum, system shall resist 100 mph (44 m/s) basic wind speed.
2. Mullion Deflection: Maximum 1/175, 3/4-inch or flexural limit of glass, with full recovery of glazing materials, whichever is less, tested according to ASTM E 330 with allowable stress with a safety factor of 1.65 minimum.

E. **Story Drift:** Provide structural-sealant-glazed curtain-wall systems that accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As required by California Building Code (CBC) and requirements of Authority Having Jurisdiction (AHJ).

F. **Air and Water Infiltration:** Design and installation of framing system shall be according to manufacturer's instructions and recommendations to permanently resist leakage of air and water through the system in accordance with the following:

1. Internal Drainage: Drain to exterior all water entering joints, condensation occurring in glazing channels or migrating moisture within system.
2. Air Infiltration: Through framing and glazing assembly, 0.06 cfm/sf at 6.24 psf of surface area, when tested according to ASTM E 283.
3. Water Penetration: There shall be no water leakage on any internal exposed surface of the curtain wall system, as defined in AAMA 501, when tested in accordance with ASTM E 331 at a minimum differential pressure of 20 percent of inward design wind load but not less than 8.0 lbf per sq. ft.

G. **Thermal Performance:** Provide for free and noiseless vertical and horizontal thermal movement of component parts. Design for surface temperature from + 20 degrees F to 180 degrees F.

H. **Seismic Performance:** Delta S and delta M according to California Building Code (CBC).

1. Test Performance: No glass breakage, anchor failures, or structural damage when tested according to AAMA 501.4.

I. **Resistance to Forcible Entry:** Jambs adjacent to door locks shall resist a force of 1600 pounds.

1.04 SUBMITTALS

A. **Shop Drawings:** Complete, indicating elevation views of all units, attachments to surrounding construction of Project, type of glazing and door weatherstripping installed in framing. Include full-size details. Coordinate and submit with shop drawings for Section 08411 - Aluminum-Framed Storefronts. Submit two additional copies to Authority Having Jurisdiction (AHJ) for review and approval. Include:

1. Elevations: Appearance of curtainwall framing layouts.
2. Details:
   a) Interface with adjacent construction; include requirements for support and bracing at openings.
   b) Installation details.

B. **Calculations:** Submit calculations demonstrating that system and anchorages comply with applicable California Building Code (CBC) and other requirements as required by Authority Having Jurisdiction (AHJ). Structural calculations shall be prepared and signed by a structural engineer licensed in the State of California Engineer and shall demonstrate compliance with structural performance criteria. Submit two additional copies of calculations to Authority Having Jurisdiction (AHJ) for review and approval.

C. **Certification:** Manufacturer's certification that framing system meets or exceed minimum requirements of California Building Code (CBC) and design requirements specified above.

D. **Test Data:** Submit certified test reports, verifying compliance with design requirements specified above in Article titled, "DESIGN REQUIREMENTS."

1. Preconstruction Sealant Test Reports: Compatibility and adhesion test reports from sealant manufacturer indicating that materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with sealants; include sealant manufacturer's interpretation of test results for sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
2. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for structural-sealant-glazed curtain-wall systems.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with California Building Code (CBC) requirements for the following:

1. Structural performance of framing and glazing, including seismic performance.
2. Safety glazing.
3. Accessibility.
4. Exits.

B. Single-Source Responsibility: All curtain wall components shall be the products of one manufacturer. Coordinate with products specified in Section 08400 - Aluminum-Framed Storefronts.

C. Testing: Curtain wall system shall have been tested by an independent testing and inspection agency engaged and paid by the curtain wall manufacturer.

D. Installer's Qualifications: Installer shall be licensed or otherwise approved by aluminum-framed curtain wall manufacturer and shall have a minimum of five years experience in the installation of comparable aluminum-framed curtain wall systems and shall employee workers who are thoroughly trained in the necessary skills and are completely familiar with the specific requirements and techniques needed to perform the required Work.

E. Preconstruction Sealant Testing: Perform sealant manufacturer's standard tests for compatibility and adhesion of sealants with each material that will come in contact with sealants and each condition required by curtain-wall systems.

1. Test a minimum of five samples of each metal, glazing, and other material.
2. Prepare samples using techniques and primers required for installed systems.
3. Perform tests under environmental conditions that duplicate those under which systems will be installed.
4. For materials that fail tests, determine corrective measures required to prepare each material to ensure compatibility with and adhesion of sealants, including, but not limited to, specially formulated primers. After performing these corrective measures on the minimum number of samples required for each material, retest materials.

F. Preconstruction Testing Service: Testing Laboratory will test structural-sealant-glazed curtain-wall systems for compliance with specified requirements for performance and test methods. Provide test specimens and assemblies representative of proposed materials and construction.

1. Select sizes and configurations of assemblies to adequately demonstrate capability of structural-sealant-glazed curtain-wall systems to comply with performance requirements and according to AAMA 501 recommendations.
2. Before performing testing, remove at least one of every type of glazing panel from each test specimen and replace them using reglazing procedures required for systems specified.
3. Notify Architect seven days in advance of the dates and times when assemblies will be constructed.

G. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

H. Preinstallation Conference: Conduct conference at Project site in compliance with requirements specified in Section 01041 - Project Coordination. Review methods and procedures related to structural-sealant-glazed curtain-wall systems including, but not limited to, the following:

1. Review structural load limitations.
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 required testing, inspecting, and certifying procedures.

1.06 PROJECT CONDITIONS

A. Coordination: Coordinate curtain wall installation with adjacent Work specified in other Sections, to provide proper allowances for tolerances in construction, fabrication, and installation of various elements of the Work specified in other Sections. Sizes, locations and alignment of windows and window openings shall take such tolerances into account in the design and installation so as not to adversely affect the allowable width constraints of the window perimeter sealant joints.

B. Dimensions: Verify dimensions shown on Drawings and obtain field measurements of actual construction prior to preparing shop drawings and ordering products.

C. Substrate Conditions: Coordinate and verify that conditions of substrate and adjoining Work are suitable for proper installation of aluminum-framed curtain wall and joint sealant Work. Verify that conditions of substrate and adjoining Work are suitable for proper installation of storefront Work. Do not begin work until unsatisfactory conditions have been corrected. Commencement of installation shall be considered as acceptance of the substrate and conditions as being suitable for the installation of product(s).

1.07 WARRANTY

A. Extended Warranty for Curtain Wall Framing: Submit a written warranty signed by authorized representatives of the Contractor and installer agreeing to repair or replace defective Work related to aluminum-framed curtain wall and joint sealing to surrounding construction during a 5-year period following date established by Notice of Completion.

1. "Defective" is defined to include the following:
   a) Failure of the system to meet structural, air and water infiltration, and thermal performance requirements, including resulting glass breakage.
   b) Failure of glazing and weather seals, including leakage.
   c) Failure of structural sealant glazing, including leakage and failure of bond.
   d) Failure of operational parts to function normally.
   e) Deterioration or discoloration of finishes.
2. Extended warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents, and

is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. **Specified Manufacturer:** Arcadia Architectural Products, Los Angeles, CA.

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Kawneer Company, Inc., Norcross, GA (770/449-5555).
2. United States Aluminum Corporation, Vernon, CA (323/268-4230).
3. Vistawall Architectural Products, Modesto, CA (209/545-5231).

2.02 FRAMING, GENERAL

A. **Aluminum Extrusions:** ASTM B 221, 6063-T5 alloy, temper as suitable for use.

B. **Aluminum Sheet:** Flat sheet complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy 5005-H32.

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. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

E. **Anchors:** Three-way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

F. **Dissimilar Metals:** Isolate aluminum from steel, galvanized steel and cementitious products with suitable paint or sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces. Do not use coatings containing lead, bitumen or materials incompatible with joint sealers.

G. **Concealed Flashing:** Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

H. Framing Sealants:

1. Sealants for aluminum framing joints to one another shall be as standard with the manufacturer.
2. For sealing of perimeter of aluminum framing to adjoining construction, provide sealants as specified in Section 07900 - Joint Sealants.

2.03 ALUMINUM-FRAMED CURTAIN WALL SYSTEM

A. Framing System, General: Provide system of extruded aluminum framing members, connectors, closures and anchors to suit configurations indicated on Drawings.

1. Manufacturer shall be responsible for design of aluminum-framed curtain wall and structural sealant glazing in compliance with design requirements specified above and California Building Code (CBC).
2. Design shall include attachment details to structural framing behind curtain wall, as indicated on the Drawings, and shall include internal structural reinforcements in aluminum framing members as necessary to maintain consistent member sizes.

B. Aluminum-Framed Curtain Wall: Arcadia Series T500-OPG25700 nominally 2-1/2 inches by 7 inches pressure plate glazing system for 1” insulated glass. Refer to Section 08800 - Glass and Glazing and to Drawings.

1. Perimeter, exposed vertical and horizontal framing members: Nominally 2-1/2 inches wide by 7 inches in depth indicated on the Drawings.
2. Concealed (structural silicone glazed, two-sided system) vertical framing members:

C. Head Receptor: Provided sub-head receptor at head of openings to allow for deflection and other movements in framing. Anchorage at curtain wall head member shall be designed to accommodate expected seismic and thermal movement.

D. Glazing Gasket: Compression-type design, replaceable, molded or extruded santoprene, polyvinyl chloride (PVC), or ethylene propylene diene monomer (EPDM).

E. Structural-Sealant Joints: Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

1. Structural sealant for butt-glazed installation shall be capable of withstanding tensile and shear stresses imposed by aluminum-framed systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   a) Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
   b) Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
2. Secondary seal or weatherseal silicone sealants shall be compatible with the structural silicone sealant. Weatherseal shall accommodate a 50 percent

increase or decrease of joint width as measured at time of application in accordance with ASTM C 719. Provide manufacturer's recommended backer rod.

D. Door Weatherstripping: Provide manufacturer's standard replaceable compressible weatherstripping gaskets of molded neoprene complying with ASTM D 2000 or molded PVC complying with ASTM D 2287.

2.04 FRAMING FINISH

A. Aluminum Framing and Doors Finish: Refer to Section 05900 – Metal Finishes.

2.05 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials, General: As specified in Section 08800 - Glass and Glazing and as indicated on Drawings.

B. Safety Glazing: Provide safety glazing as required by California Building Code (CBC), as specified in Section 08800 - Glass and Glazing and as indicated on Drawings.

C. Glazing Gaskets: As recommended by storefront system manufacturer, EPDM extrusions.

D. Glazing Sealants: As recommended by manufacturer for joint type and as follows:

1. Structural Sealant: ASTM C 1184, neutral-curing silicone formulation compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant, and approved by structural-sealant manufacturer for use in curtain-wall systems indicated.
   a) Color: Black.
   b) Type: Manufacturer's standard single or two component.
   c) Minimum Tensile Strength: 100 psi (690 kPa).
   d) Modulus of ElastiOwner: As required by structural-sealant-glazed curtain-wall system design to meet performance requirements.
2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; neutral-curing silicone formulation compatible with structural sealant and other system components with which it comes in contact; and recommended by structural- and weatherseal-sealant and curtain-wall manufacturers for this use.
   a) Joint Movement Capability: Accommodates a 50 percent increase or decrease in joint width at time of application when measured according to ASTM C 719.
   b) Color: Matching structural sealant.

E. Contact and Weather Seal: Silicone, ultraviolet radiation resistant for 2000 to 4000 micro-watts minimum for 21 days; types, cure and minimum adhesion tensile strength as determined and recommended by framing system manufacturer for conditions of the Project.

2.05 SHEET METAL FABRICATIONS

A. Aluminum Sheet Metal Fabrications: As indicated on the Drawings for sunshade element integrated into curtain wall framing.

1. Coordinate dimensions and attachment methods of ornamental formed-metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned, unless otherwise indicated.
2. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch wide hem on the concealed side, or ease edges to a radius of approximately 1/32-inch and support with concealed stiffeners.
3. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
4. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce ornamental formed-metal items as needed to attach and support other construction.
5. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install ornamental formed-metal items.
6. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.
7. Finish sheet metal fabrications to match curtain wall framing.

2.06 CURTAIN WALL FABRICATION

A. Fabrication: Shop or field fabricate curtain wall framing system into complete units. Fabricate components that, when assembled, have the following characteristics:

1. Sharp profiles, straight and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Internal guttering systems or other means to drain water passing joints, condensation occurring 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 prevent glazing-to-glazing contact and to maintain required glazing edge clearances.
6. Structural-sealant joints that do not carry gravity loads of glazing.
7. Provisions for field replacement of glazing from exterior. Include accommodations for using temporary support device (dutchman) to retain glazing in place while sealant cures.

B. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight, unless otherwise indicated.
3. Pressure equalize system at its interior face.
4. Install glazing in compliance with requirements specified in Section 08800 - Glass and Glazing. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

C. Workmanship: Accurately fabricate framing in accordance with the manufacturer's instructions and recommendations. Surfaces exposed to view shall be without blemishes.

PART 3 - EXECUTION

3.01 FRAMING INSTALLATION

A. Framing Installation, General: Install framing with adequate provision for settling, expansion and contraction without distorting or breaking glass and without loss of weatherability.

B. Anchoring: Firmly anchor framing using fasteners as recommended by manufacturer, sized to suit loads and type suitable for substrate, to positively attach members for long life under hard use.

C. Adjustment: Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Fire Containment: Install perimeter fire-containment systems (safing insulation) as specified in Section 07270 - Firestopping and Smoke Seals.

E. Protection: Isolate aluminum from steel, galvanized steel and cementitious products with suitable paint or sealant, or a nonabsorptive plastic or elastomeric tape, or a gasket between the surfaces.

3.02 GLAZING

A. Glass Installation: Install glazing as specified in Section 08800 - Glass and Glazing, utilizing curtain wall manufacturer's recommended glazing methods to achieve performance criteria.

3.03 PERIMETER SEALING

A. Perimeter Sealing: Install backer rod and joint sealant at perimeter of aluminum framing as specified in Section 07900 - Joint Sealants.

3.04 TOLERANCES

A. Erection Tolerances:

1. Maximum variation from plumb: 0.06-inch in every 3 ft non-cumulative or 0.5-inch per 100 ft, whichever is less.
2. Maximum misalignment of two adjoining glass panes and framing abutting in plane: 1/32-inch.
3. Sealant space between framing system components and adjacent construction: Within limits according to sealant manufacturer's instructions and recommendations.

3.05 FIELD QUALITY CONTROL

A. Manufacturers' Field Surveillance: Aluminum framing and silicone joint sealer manufacturers shall provide field surveillance of the installation of their products according to provisions specified in Section 01400 - Quality Control.

1. Manufacturers' field surveillance services shall be included in Contract Sum and Contract Time.
2. Manufacturers' representatives shall submit written report to Construction Manager, Architect and Contractor, describing installation procedures, inspections and tests conducted, unacceptable conditions, remedial measures to be performed, and other pertinent observations.

B. Field Testing Services: Testing Laboratory will conduct tests and inspections of representative areas to determine compliance of installed systems with specified requirements. Testing will take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of next area until test results for previously completed areas show compliance with requirements.

1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
   a) Destructive test method, Method A, Hand Pull Tab (Destructive) in ASTM C 1401, Appendix X2 shall be used.
      1) A minimum of four areas on each building face shall be tested.
      2) Repair installation areas damaged by testing.
2. Structural-Sealant Glazing Inspection: After installation of curtain-wall systems are complete, structural-sealant glazing shall be inspected and evaluated according to ASTM C 1401 recommendations.
3. Water Penetration: Areas shall be tested according to ASTM E 1105 at minimum uniform and cyclic static-air-pressure difference of 0.67 times the pressure specified under Part 1 "DESIGN REQUIREMENTS" Article, but not less than 8.0 psf (300 Pa) and shall not evidence water penetration. Conduct three tests, at 10 percent, 50 percent and 75 percent completion.

C. Remedial Work: Repair or remove work where test results and inspections indicate that it does not comply with specified requirements. Retesting and additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional Work with specified requirements.

3.06 CLEANING

A. Protective Coverings: Remove protective materials from prefinished aluminum surfaces immediately prior to cleaning for Substantial Completion review.

B. Cleaning: For initial cleaning and for cleaning prior to Substantial Completion review.

1. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths.
2. Take care to remove soiling and dust accumulation from corners.
3. Flush thoroughly and wipe surfaces clean.
4. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and framing finish manufacturers.

C. Glass Cleaning: See Section 08800 - Glass and Glazing.

END OF SECTION

SECTION 09200

LATH AND PLASTER

PART 1 - GENERAL

1.01 DESCRIPTION: General Conditions and Division 1 apply to this Section. Provide a lath and plaster system complete as indicated, specified herein, and required.

A. Work In This Section: Principal items include:

1. Provide all labor, materials, equipment and accessories including flashings, control joints, reveals and trim necessary for completion of the Polymer Modified Plaster System Scratch and Brown Coat, Polymer Modified Plaster Dry Skim Coat System and Polymer Modified Plaster Fine Sand Finish System related work for this project, as required by the drawings and specifications.
2. The Polymer Modified Plaster System products, shall be installed over an existing substrate system which has been designed to (1) be resistant to water penetration into the system and (2) to allow drainage of water out of the system if water penetration should occur.
3. The Polymer Modified Plaster System(s) assemblies shall be designed not to exceed a deflection of L/360.
4. Coordinate the interface of the Polymer Modified Plaster System with other related work as necessary to provide for the proper function of the combined exterior wall system components.
5. 2 coat finish on liquid bonding agent over concrete masonry.
6. Plaster accessories as required.

B. Related Work Not In This Section:

1. Wood studding, furring, and support framing for plaster.
2. Calk and sealant.
3. Painting and Coatings

1.02 QUALITY ASSURANCE:

A. Reference Specifications:

1. ASTM: C1063 – Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement Based Plaster. C 926 – Application of Portland Cement Based Plaster.
2. NAAMM – ML/SFA 920 Guide Specification for Metal Lathing and Furring
3. PCA – Portland Cement Plaster (Stucco) Manual
4. ICBO Evaluation Service, Inc. - Evaluation Report Number ER-4617

B. Scaffolds and Equipment: Install and maintain all necessary scaffolds, staging, trestles and planking, in strict conformance with CCR Title 8 and all applicable laws and ordinances.

C. Manufacturer and Distributor Support: The distributor should be capable of providing a local architectural representative to provide consultation.

1. A technical consultant supplied by the local distributor should be contacted to consult the installer for the application of finish on all samples, mockups and during the actual system application.

D. Applicators Qualifications: Engage an experienced installer, who is certified, in writing by Polymer Modified Plaster System as being qualified to install the 3 coat plaster systems. The installer shall have 10 year's experience with the products to be used on this project and have successfully completed the installation of a minimum of 50,000 square feet of the specified product.

E. Pre-installation Meeting: Plan and conduct a pre-installation meeting at the project site prior to the installation of any wall materials (including mock-ups). This meeting is to be attended by the Architect, General Contractor, Applicator of the system and the Technical Consultant, supplied by the local distributor.

F. Mock-Up Installation: Mock-Up Installation: Prior to the installation of the 3 coat plaster system work, provide a 48" x 48" mock-up panel constructed as per the Architects directions using materials specified for final work. The panel must be constructed as per the Architects size and dimension requirements. Demonstrate the proposed range of color, texture and workmanship to be expected in the completed work. Show a cut-away in the panel exposing the weather barrier, metal lath and drainage weep of the system on a perimeter edge of the panel. Obtain Architect's acceptance of visual qualities of the sample panel. Maintain sample panel throughout the construction process and dispose of when project is completed.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Preliminary Samples: Submit the following:

1. Exterior plaster texture and finish, 18" square.
2. Each type and size of plaster trim and accessory.

B. Product Data: for each component of the Polymer Modified Plaster System 3 coat plaster system.

C. Qualification: data for firms and persons specified in "Quality Assurance" Section to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses and any other information specified.

D. Installer Certificates: signed by a Polymer Modified Plaster System. Technical representative certifying that installers comply with requirements under "Quality Assurance" Section.

E. Provide the following submittals for acceptance: First submittals and re-submittals shall be complete and in the required form. Re-submittals shall include requested corrections and shall respond to previous comments. Each sheet that is revised shall bear a revision date, number and revised detail included. Failure of a submittal to be complete, in the proper form, responsive to comments and identifying revisions shall, at the reviewer's discretion, be cause for disapproval

and return of document without review, with the Contractor bearing full responsibility for any resultant delay. Failure to review comments or to note a noncompliance with plans and specifications shall not relieve the Contractor from his obligation to comply. Allow sufficient time for preparation and processing of re-submittals to avoid conflicts with schedule.

1. Submit Polymer Modified Plaster System(s) product data and specifications for any materials, or fabrication techniques used in the 3 coat plaster system work. Include instructions and or recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where test methods are indicated.

1.05 PROJECT CONDITIONS

A. **Installer must examine surfaces:** to receive the Polymer Modified Plaster System and shall notify the contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

B. **Protect adjacent surfaces:** from damage during installation of the Polymer Modified Plaster System, 3 coat plaster system.

C. **The Polymer Modified** Plaster System 3 coat plaster system: must be applied at an ambient air temperature from 40 degrees F to 110 degrees.

D. **Maintain temperature:** for a minimum of 24 hours after application to allow proper curing.

E. **Do not apply:** to frozen surfaces or surfaces containing frost.

F. **The Plywood Sheathing:** used beneath the coat plaster system; must be a minimum 1/2” exterior grade plywood sheathing, conforming to UBC Section 2303, Standard 23-2, 23-3 and 23-4. It must also meet ASTM D 3737 and AITC 200.

1. In accordance with UBC Section 2320 panels shall be gapped a minimum of 1/8th of an inch and nails shall not be spaced less than 3/8th of an inch from edges and ends of sheathing.
2. If the plywood is not properly gapped, any abutting joints must be saw cut to the minimum 1/8th of an inch requirement, prior to the application of any other component of the plaster system.

PART 2 - PRODUCTS

2.01 METAL LATH AND ACCESSORY MATERIALS: Each bundle of lath shall be sealed with a metal tag bearing the lath designation, weight and manufacturer's name.

A. **Weather Resistive Barrier:** Fortifiber Building Systems Group, Reno, NV (775/333-6400 or 800/773-4777).

A. **Acceptable Manufacturers:** None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

B. **Primary Barrier:** Super Jumbo-Tex manufactured by Fortifiber Building Systems Group, water-resistant Grade D building paper, laminated, vapor-permeable, reinforced kraft-type paper with asphalt-treated core, complying with UBC Standard 14-1.

C. **Secondary Barriers:** Provide waterproofing membrane for sealing of vertical and non-roofing horizontal conditions, such as at parapets, projections from plaster wall finish and at openings in plaster finish such as sills, pans, shelves, through-wall penetrations and gaps. All surfaces 30 degrees or more inclined from vertical shall be considered horizontal planes.

1. Flashing sheet (indicated as "flexible flashing"): FortiFlash® manufactured by Fortifiber Building Systems Group, self-adhesive, self-sealing SBS modified asphalt core laminated to cross-laminated, high-density polyethylene film reinforcement with a siliconized paper release sheet. Flashing sheet shall be 25 mil thick minimum at vertical conditions and 40 mil thick at sloped and horizontal conditions.

E. **Lathing Accessories:** All galvanized metal moldings shall be 26 gauge thick, installed in full ten foot min. lengths wherever possible. Moulding shall be standard products as specified, meeting ASTM A525-81 and A527-80.

1. Specified Manufacturers:
   a. CEMCO (California Expanded Metal Company)
   b. Delta Star, Inc., Superior Metal Trim
   c. Stockton Products
2. Exterior Galvanized Plaster Corneraid: Stockton # Wire-BN
3. Bull Nosed Arch Aid: Stock # Wire-BNAA
4. Plastic Nose Arch Bead: # Wire-DCB
5. Exterior Galvanized Casing Beads: Stockton # Metal-J B
6. Exterior Galvanized Foundation Sill (Weep) Screed, designed for use at sill plate line to form plaster stop and prevent plaster from contacting damp earth: Stockton # Metal-W S
7. Exterior Galvanized Control Joints:
   a. Pointed Base Screed: Stockton # Metal-PBS
   b. Narrow V Screed: Stockton # Metal-NVS
   C. Soffit Vent/Reveal Screed: Stockton # Metal-SVR
8. Fasteners: Provide “Grabber” 1-1/4 to 1-5/8 inch long wafer head tech screw, as manufactured by John Wagner Associates Inc.

F. **Expanded Metal Lath:** Expanded diamond mesh lath, weighing 3.4 lb/square yard, made from uncoated or zinc-coated (Galvanized) steel sheet to produce lath complying with ASTM C 847, with uncoated steel sheet painted after fabrication.

1. Acceptable Manufacturers:
   a. Amico-West Inc., Fontana, CA.
   b. CEMCO (California Expanded Metal Company), Industry, CA.

c. Western Metal Lath Co., Riverside, CA.

2. Separate application of paper and lath is required.
3. No paper backed lath is allowed.
4. The Polymer Modified Plaster System 3 Cost Plaster System to be set from face of lath: 7/8 inch total minimum:

G. Corner and Strip Reinforcing Lath: Radius, flat or shaped reinforcing units as indicated or required, metal or galvanized wire lath types, no less than 2.5 pounds per square yard, outstanding legs minimum of 2" for wire lath and 3" for metal lath when formed for angle reinforcing. Use galvanized type for use with galvanized metal lath.

2.02 PLASTER MATERIALS

D. Specified Manufacturer: Parex USA, Inc., (714/778-2266).

E. Acceptable Manufacturers: Equivalent products of other manufacturers, including Omega Products International, Inc., (909/737-7447 or 800/600-6634) will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

F. Scratch and Brown Coat Materials: Comply with referenced ASTM standards and Western Wall and Ceiling Contractors Association (WWCCA) - Lathing and Plastering Reference Specifications.

G. Basecoat Material: Fiber-47, manufactured by Parex USA, Inc., for scratch and brown coat plaster mix of three-coat plaster systems, factory-blended mixture consisting of portland cement, alkali-resistant fiberglass, acrylic fibers and proprietary ingredients, with jobsite-added sand. Plaster mix shall comply with manufacturer's instructions and recommendations, ASTM C 926, California Building Code (CBC) Section 2512 and ICC Evaluation Service, Inc. (ICC ES) ER-4226.

H. Sand: ASTM C 897. Gradations shall comply with plaster manufacturer's instructions and recommendations. Sand compliance certificates shall be presented with each load of sand. Independent third party testing of sand will be required if directed by Architect.

I. Admixture: Parex Adacryl, 100 percent acrylic emulsion additive for portland cement-based products, to enhance curing, adhesion, freeze-thaw resistance and workability.

J. Bonding Agent: For preparation of concrete and masonry surfaces prior to application of plaster, Parex Bonding Agent, acrylic polymer-based agent to increase shear bond adhesion.

K. Water: Clean, fresh, potable and free of mineral or organic matter which can affect plaster.

I. Leveling and Reinforcing Coat: Parex Base Coat & Adhesive 121D, copolymer-based factory blend of cement and proprietary ingredients, for filling, smoothing and leveling of substrate.

J. **Reinforcing Mesh:** Parex Standard Mesh 355, alkali-resistant fiberglass mesh, 4.5 oz/sy (153 g/m^2).

K. **Primer for Finish Coat:** Parex Primer 310, factory-blended 100 percent acrylic-based coating, to prepare substrate to receive finish coats.

L. **Finish Coat:** Image Smooth Finish, 100 percent acrylic-based, factory-mixed formulation of polymer emulsion binder, mineral aggregate fillers and proprietary additives for non-textured coating, integrally colored and with non-gloss finish.

1. Coating shall be trowelable to dense, smooth finish.
2. Color shall be as directed by Architect, to approximate finish paint color.
3. Coating shall be trowelable to a smooth finish.
4. Refer to Section 09900 - Field Painting for primer and paint applied to acrylic plaster.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. **All work shall be performed** by skilled workmen, especially trained and experienced in this type of work. If the Contractor chooses to sub-contract the installation of work, the proposed sub-contractors qualifications shall be approved in advance by the Architect and General Contractor.

B. **Bench marks for elevation** and building line offset marks for alignment shall be established on each floor level by the General Contractor, who shall be responsible for their accuracy. Should any error be found in their location, the Contractor shall so notify the General Contractor in writing, and installation work shall not proceed in the affected area until the errors have been corrected.

C. **After lines and grades have** been established, and before beginning installation in any area, the Contractor shall examine all parts of the structure on which the wall is to be placed in that area. Should any conditions be found which, in his opinion will prevent the proper execution of his work, he shall report such condition in writing to the Architect and the General Contractor. Installation work shall not proceed in that area until such conditions are corrected or adjusted to the satisfaction of the Architect and the Contractor. Commencement of work shall constitute acceptance of surrounding conditions.

3.02 INSTALLATION OF METAL LATH AND PLASTER ACCESSORIES: Conform to requirements of listed Reference Specifications in this Section, except as exceeded by requirements of Building Code or requirements specified herein.

A. **Weather Resistive Barrier:** Apply weather barrier paper to sheathing by stapling. In all cases install the weather barrier paper “shingle” fashion with long edges lapped at least 2 inches and ends 6 inches and over supports. Extend paper continuous behind joints and properly interface with flashings. Weather barrier lath may be temporarily secured in place providing the lath is attached to supports through the paper immediately after the weather barrier installation. Any tears and holes in the weather barrier shall be patched and repaired prior to

plastering. Install 9 inch wide strips of “peel and stick” type rubberized asphalt moisture barrier continuous behind joints. Paper is not required between lath and supports on ceilings and soffits.

B. **Black Paper:** At all vertical and horizontal surfaces shall be covered with 2 sheets of type D building paper free from holes and breaks other than those created by fasteners and construction system due to attaching of the building paper. The building paper shall be applied horizontally, with the upper layer lapped over the lower layer not less than 2 inches. Where vertical joints occur, building paper shall be lapped not less than 6 inches. The installation of the building paper must be applied separate to that of the metal lath.

C. **Lathing Accessories:** Provide shop drawings for Architects approval for all type(s) required before installation. Set metal accessories plumb, level and true and shim where necessary. Miter accessories at corners and accurately and tightly fit exposed joints. Install sections in longest practicable length with minimum splicing.

1. Exterior Corner Reinforcing: Install for full length of external angles of portland cement plastering.
2. Casing Beads and Plaster Stops: Install at free edges of plaster, wherever plaster abuts against other finish material, and elsewhere as indicated.
3. Stress Relief Joints: Install types as shown and approved, joints and connections coped and shingled to prevent entry of water. Where directed or necessary, seal connections with sealant conforming to Section 07900, at no extra cost to Owner. Where not shown, provide stress relief joints for smooth troweled texture(s) exterior plaster at maximum 10 to 12 feet apart vertically and horizontally, located as directed.
4. Weep and Vent Screeds: Install at top and bottom of exterior walls.
5. Drip Screeds and Soffit Vents: Install where shown, approved type for each location.

D. **Lathing:** Conform to ASTM C1063, as applicable, and to requirements herein. Use galvanized expanded metal lath over paper backing for horizontal plaster. Use expanded metal lath with paper backing for exterior vertical or sloping exterior plaster.

1. Metal Lath: Apply lath with long dimension across bearings. Lap sides 1/2" and ends 1". Break lath continuity at expansion screeds. Wire tie lath to all supports at 6" centers. Tie each lap with 18-gage wire midway between supports at sides and 6" intervals on ends.
2. Expanded Metal Lath. Install 3.4 lb. per sq. yd. Expanded metal lath over supports 16” o.c. or less. Where support spacing exceeds 16 inches but is not over 24 inches use 3/8-inch riblath. Wherever possible lath attachment shall be with wire ties. Lath applied over sheathing or weather barrier paper shall be with wide shouldered, corrosion resistant self-drilling screws long enough to penetrate through metal supports at least 3 full threads. At vertical stress relief joints lath shall be cut and supplemental supports provided to attach ends of lath and separate flanges of stress relief joints.

3. Ceiling and Soffit Lath: On wood supports, provide an additional 11 gage wire ties at 24" along all supports.

3.03 APPLICATION OF PORTLAND CEMENT PLASTER: Apply plaster on metal lath to minimum 7/8" to 1" total thickness measured from face of studs.

A. Measuring and Mixing Plaster: Machine mixing, measuring, and proportions shall conform to ASTM C926 and PCA Portland Cement Plaster Stucco Manual, refer to Reference Specification(s) to in this specification. Apply Polymer Modified Plaster System for scratch and brown coats with a mixture ratio of 5.5-6.5 gallons of water and 220-360lbs of sand that meets ASTM C897 to each bag of Polymer Modified Plaster System. Use Polymer Modified Plaster System Dry Base Coat/Grey Smooth finish for finish coat. Apply plaster within 1/2 hour of mixing. Do not retemper or use material that has partially set, or is caked or lumpy.

1. Plaster Mixing: Machine mix all plaster in the proportions specified with only sufficient water to attain proper consistency for application. Clean mixers and tools and keep free of hardened plaster materials. If plaster base coats are machine applied, take samples of plaster from nozzle of the plastering machine hose and perform slump tests using a 2" by 4" by 6" cone; mix plaster to maximum slumps of 3" for gypsum plaster and 2-1/2" for portland cement plaster.

B. Exterior (3 Coat System) Plaster: Scratch and brown coat of portland cement plaster or portland cement-lime plaster and acrylic finish coat.

1. Application of Base Coats on Lath:
   a. Scratch Coat: Apply scratch coat not less than 3/8" thick from face of supports to crest of scores, completely embedding and forming good key on metal lath. Thoroughly scratch in one direction only and keep at optimum moisture content with fog spray for 48 hours minimum before second coat is applied.
   b. Brown Coat: Reconsolidate brown coat by only lightly floating after hydration of the cement has commenced and sufficient moisture has evaporated, so that surface sheen has disappeared, but before the base/brown coat has become to rigid to be moved under float.
   c. Using a (Conventional) steel trowel cut back around trim edges approximately 1/16th of an inch, this will allow the finish to level off flush to the trim edges.
   d. Leave the face of the base coat only slightly rough using a steel trowel to receive finish.
   e. Maintain the brown coat moist for 48 hours, and allow to air cure for 7 days before applying acrylic skim coat.
2. Application of reinforcing mesh on all exterior surfaces and on exterior corners:
   a. Apply first coat of Polymer Modified Plaster System Dry embedment coat approximately 1/8th of an inch on all surfaces and at all exterior corners and at heads of windows and doors. Apply enough material to embed 9 ½ inch x 19 inch 4 oz. Detail Mesh both vertically and horizontally so as to create an overlap at

all exterior corners. Once mesh is embedded trowel material out in a uniform manner without leaving directional lines (See drawings for specific locations).

3. PB Grey Base/Skim/Smooth Application:
   a. Apply Polymer Modified Plaster System Dry approximately 1/8th of an inch over existing brown coat using a steel trowel, allow for the first coat to begin its set, then double back with a second coat using a steel trowel. Apply the second coat approximately 1/16th of an inch and allow for the material to achieve a slight set, then trowel without leaving directional lines
4. Smooth Finish Application: Image Smooth Finish, 100 percent acrylic-based, factory-mixed formulation of polymer emulsion binder, mineral aggregate fillers and proprietary additives for non-textured coating, integrally colored and with non-gloss finish.
   a. Coating shall be trowelable to dense, smooth finish.
   b. Color shall be as directed by Architect, to approximate finish paint color.
   c. Coating shall be trowelable to a smooth finish.
   g. Refer to Section 09900 - Field Painting for primer and paint applied to acrylic plaster.

3.04 2 COAT PLASTER FINISH ON CONCRETE MASONRY: Apply leveling coat of scratch coat portland cement plaster as required to correct irregularities in concrete surfaces; keep damp for 48 hours and allow to dry for 5 days. Leave surface to match that desired for the brown coat in 3 coat plaster application. Apply finish coat as described in paragraph 3.03 D(2) and match approved sample in Architect's office.

3.05 PLASTER PATCHING: Plaster containing cracks, blemishes, blisters, pits, checks, discolorations or other defects is not acceptable. Remove defective plaster and replace with conforming modified plaster as approved. Restore surfaces damaged, stained, or defaced by plastering as directed, at no extra cost to Owner.

END OF SECTION

SECTION 09250

GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide gypsum wallboard complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Gypsum wallboard finish on walls and ceilings.
2. Interior tile backer board.
3. Joint, edge, corner, and fastener finishing.
4. Integration of Display Reveal (hanging display system).
4. Sound insulation in gypsum wallboard partitions.
5. Sound and airsealing Work of this Section.
6. Finish coat where scheduled.

B. Related Work Not In This Section:

1. Wood stud support framing.
2. Thermal insulation.
3. Painting.

1.02 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: Submit covering wallboard installations, including accessories, finishing, sealing, and manufacturer's written installation instructions with copies of Code approvals for each wall, ceiling, and shear wall system.

B. Samples: Submit such Samples as Owner and/or Architect may request.

1.03 JOB CONDITIONS: Make a detailed inspection of areas and surfaces to be enclosed or covered by gypsum drywall and arrange for correction of defective workmanship or materials. Ascertain that other Work enclosed by drywall has been inspected and approved before starting installation; otherwise, uncover as directed at no extra cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Gypsum Wallboard: ASTM C1396, provide 5/8" Type X or Type C gypsum board, or any other type of drywall that may be required by fire rated assemblies shown on drawings, tapered edges for exposed surfaces, regular grade by the Code. For walls in bathrooms and showers, and where indicated, provide Dens Glass Gold only in thicknesses as indicated or required. Gypsum wallboard manufacturer and type shall match description of rated fire assemblies. Assemblies may be proprietary.

B. **Abuse (Impact) - Resistant Gypboard:** For Gymnasium interior.

1. Specified Manufacturer: U.S. Gypsum Company (USG), Chicago, IL. (800/874-4968; local representative, Ontario, CA (800/964-4874).

2. Abuse-Resistant Gypsum Board: USG Fiberock Brand VHI Panels, consisting of face layers of fiberglass scrim embedded in a high-density layer of gypsum and cellulose fibers with perlite core producing panels with high resistance to abrasion, indention and penetration.

3. Fire Resistance: Abuse-resistant gypsum board shall be comparable to Type X gypsum panels when tested according to ASTM E 119 and shall have the following fire performance characteristics when tested according to ASTM E 84:

    a. Flame Spread: 5
    b. Smoke developed: 0

C. **Interior Tile Backer Board**: For walls in toilets and where indicated on drawings or required, provide DensShield Tile Backerboard or Durock or WonderBoard Tile Backer Board. Install per manufacturer's recommendations.

D. **Screws**: ASTM C954, corrosion-resistant self-tapping bugle-head spiral threaded type, minimum 1" long except 1-5/8" for double layer walls or longer where RC channels are used, lengths to penetrate all supporting metal at least 3/8". Furnish specially hardened type screws where required by code for support.

E. **Drywall Nails**: ASTM C514, supplied or recommended by the wallboard manufacturer, No. 13 gage 1-5/8" long, 19/64" head, Dry Tite, acid etched or No. 098 gage, 1-3/8' long annular ringed 6d, cooler nails.

F. **Metal Trim and Corner Beads**: Of electrogalvanized steel with taping flanges, as manufactured or recommended by drywall manufacturer, corner beads at all outside corners and "J" shaped trim members where abutting other materials. Provide "bullnose" corner beads at public areas.

G. **Finishing Materials**: ASTM C475, joint tape, joint bedding compound, finishing cement, and adhesive, and laminating compounds supplied or recommended by wallboard manufacturer.

H. **Calking Compound**: Permanently non-hardening type as supplied or recommended by wallboard manufacturer.

I. **Sound Insulation**: Sound Reduction fiberglass batts to be used at interior locations noted on the drawings for interior sound control friction fit fibrous batts, nominal 2.80 pcf density are required for fire rated assembly meeting the required 2.80 pcf density as stated above.

J. **Resilient (RC) Furring**: Provide resilient channel per ASTM C645 RC-1 Deluxe

Channel by Dietrich Industries as indicated or required, designed for sound reduction by gypsum wallboard manufacturer.

K. **Acoustical Sealant**: Provided at wall to floor or wall to ceiling joints. Hold wallboard 1/4” from floor sheathing or ceiling finish and fill with permanently flexible low VOC acoustical sealant approved for rated assemblies, USG Sheetrock brand Acoustical Sealant.

L. **Hanging Display System:** Provide integrated display reveal by AS Hanging Display Systems, A1025 at locations shown on Gallery Walls.

M. **Gypsum Soffit Board (Exterior Ceiling Board):**

1. Specified manufacturer: US Gypsum Company (USG), Chicago, IL (800/874-4968; local representative, Ontario, CA, 800/964-4874).
2. Acceptable Manufacturers: Equivalent products of National Gypsum Company, Charlotte, NC (704/365-7300 or 800/628-4662; West region office 800/824-4227) will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision.
3. Provide gypsum soffit board at locations indicated on the Drawings for "moisture-resistant" or "water-resistant" gypsum board finish, including exposed gypsum board at walls and ceilings of toilet rooms to receive painted finish.

PART 3 - EXECUTION

3.01 INSTALLATION OF GYPSUM WALLBOARD:

A. **General**: Perform wallboard installation and finishing according to ASTM C840 and the gypsum wallboard manufacturer's instructions, outside drywall corners to be lapped to provide solid backing for all metal edges. Do not install wallboard until building is weathertight. Conform to fire-rating requirements, Building Code approvals, and requirements herein.

B. **Temperature**: The temperature within building shall be maintained per ASTM C 840 requirements during the installation and finishing of the gypsum wallboard. Furnish ventilation to eliminate excessive moisture is typically the responsibility of the General Contractor.

C. **Fasteners**: Install screws so heads are below wallboard surface without breaking the face paper or stripping metal framing member around the screw. Space screws according to Code approvals or ASTM C840.

D. **Openings**: Accurately cut and fit the wallboard at openings. At door and other openings, cut wallboard to continue across area above opening head; do not cut board to both jambs and fill in area over openings with separate pieces. Make the dimension from joint overhead of an opening to jamb of openings 6" minimum. Stagger joints on opposite side of partition. Maximum opening around electrical outlets 1/8" calked.

E. **Single Layer Walls**: Place wallboard horizontally with long dimension across the studs or in one-piece vertical heights, vertical joints centered on supports and staggered on walls so as not to occur on opposite sides of same stud. Secure to each stud and tack with screws keeping screws 3/8" from edges.

F. **Multi-Layer Walls**: Apply first layer same as for single layer walls, all joints in subsequent layers staggered with respect to first layer.

G. **Ceilings**: Apply wallboard with long dimension at right angles to the framing, end joints staggered and centered over framing. Use boards of maximum practical length to minimize end joints and properly support around cutouts and openings. Secure with screws or nails.

H. **Hanging Display System:** Install display reveal for hanging display system prior to installation of wallboard as per manufacturer's recommendation.

3.02 GYPSUM BOARD FINISHING AND DECORATING

A. **Reference Standards:** Comply with ASTM C 840, GA-216, GA-214, and as follows.

B. **Concealed Locations:** GA-214, Level 1. Provide this level of finish at locations such as plenum areas above ceilings, in attics, in areas where assembly would generally be concealed. Commonly, finish is called "fire-taping."

1. Joints and interior angles: Tape embedded in joint compound.
2. Surface: Free of excess joint compound. Tool marks and ridges will be acceptable.

C. **Semi-Exposed Locations:** GA-214, Level 2. Provide this level of finish at locations such as service spaces like the fire riser room..

1. Joints and interior angles: Tape embedded in joint compound. One separate coat of joint compound shall be applied over all joints, angles, fastener heads and accessories.
2. Surface: Free of excess joint compound. Tool marks and ridges will be acceptable.

D. **Locations to Receive Paneling or Wall Coverings:** GA-214, Level 3. Provide this level of finish at locations under wall coverings, FRP panels and acoustical surface treatment.

1. Joints and interior angles: Tape embedded in joint compound. Two separate coats of joint compound shall be applied over all joints, angles, fastener heads and accessories.
2. Surface: Smooth and free of tool marks and ridges.
3. Primer/sealer: Apply where wallcovering will be adhered to gypsum board.

E. **Exposed Locations with Paint Finish on Smooth Surface:** GA-214, Level 4. Provide this level of finish at locations with gypsum board surfaces to receive flat, eggshell and semi-gloss paint finishes such storage rooms, janitor rooms and IT/ audio visual equipment room.

1. Joints and interior angles: Tape embedded in joint compound. Three separate coats of joint compound shall be applied over all joints, angles, fastener heads and accessories.
2. Surface: Smooth and free of tool marks and ridges.

F. **Exposed Locations with Paint Finish on Smooth Surface:** GA-214, Level 5. Provide this level of finish at locations with gypsum board surfaces to receive flat, eggshell and semi-gloss paint finishes such as public circulation spaces, administrative offices, public assembly spaces like the Teen Room, Fitness Rooms, Entry Lobby, Reception and Main Gallery and Hallway, Break Room, Restrooms and Administrative Offices.

1. Joints and interior angles: Tape embedded in joint compound. Three separate coats of joint compound shall be applied over all joints, angles, fastener heads and accessories.
2. Surface: Smooth and free of tool marks and ridges.

3.03 JOINT TREATMENT AND FINISHING: Apply tape bedding compound, tape, and at least three coats of finishing cement on exposed joints, and other joints as required for sound insulating or fire-rated construction. Apply joint cement and two or more layers of finishing cement over screw or nail heads. Treat all inside corners with joint cement, tape, and finishing cement. Treat all outside corners with corner beads and finishing cement. Provide metal-casing beads at all edges of gypsum wallboard, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Make all exposed joints, trims, and attachments non-apparent following application of paint or other finishes; if the joints and fasteners are apparent, correct defects as directed with no extra cost to Owner. Seal the raw edges of plumbing openings and of boards that have been cut to fit with manufacturer's recommended sealant brushed on. When entire installation is completed and prior to installation of finish materials by other trades, correct and repair broken, dented, scratched, or otherwise damaged wallboard surfaces.

Level 5:

All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer’s recommendations, shall be applied to the entire surface. The surface shall be smooth and tree of tool marks and ridges.

3.04 AIR SEALING: Seal connections between shaft walls, ducts, plenums, and building structure airtight with specified calking compound or tape and cement, including vertical shafts.

3.05 SOUND INSULATED PARTITIONS: Install sound insulation continuously between studs from finish floor to top of wall at all interior partitions unless noted otherwise. Where cutouts are made for J-boxes, conduit, piping, and like items, back wall insulation with insulation so that one additional layer of insulation at least 24" wide and high is placed in back of cutout. Snugly fit in place free of gaps or holes. Caulk between the wallboard edges and floors, walls, and at structures above other than acoustical ceilings with calking compound, forming a complete perimeter seal. Caulk around outlet boxes and other penetrations in same manner. Where resilient channels occur a separate fastener will attach the RC channel to the framing member. The gypsum wallboard will be attached to the RC channel and will at no time fasten directly to a framing member.

3.06 FINISH COAT: Provide where scheduled, apply USG Product that will produce a "Smooth" or Knockdown or "Orange peel" texture to a Level 5 finish as approved by Owner and/or Architect. Apply after taping and screw head finishing is dry and sanded to produce surfaces free of trowel marks or other defects.

END OF SECTION

SECTION 09300

TILE MASONRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Porcelain tile**, for interior floors and walls and exterior walls.

B. **Trim Pieces for** vertical and horizontal exposed edges

C. **Marble** thresholds.

D. **Anti-fracture** membrane under floor tile.

E. **Setting mortar** and grout.

1.02 RELATED SECTIONS

A. **Section 03300 - Cast in Place Concrete:** Requirements for finishing of concrete slab on grade to receive ceramic tile.

B. **Section 07900 - Joint Sealants:** Tile perimeter and expansion joint fillers.

C. **Section 09250 - Tile Backing Board:** Tile backer board for thinset tile at walls.

1.03 REFERENCES

A. **Tile Council of North America (TNCA):** TNCA Specifications and Handbook for Ceramic Tile Installation (referenced as TCNA Handbook).

1.04 SUBMITTALS

A. **Product Data:** Submit materials list and manufacturers specifications and other data for ceramic tile, crack isolation membrane and setting and grouting materials.

B. **Tile Samples:** Submit three each size, color, shape and texture to demonstrate maximum range of sizes and colors, textures, and flatness, trim shapes and base.

C. **Grout Samples:** Submit three each of full range of manufacturer's grout colors.

D. **Combined Tile and Grout Samples:** Submit plywood panels four tiles by four tiles in size with each color of preliminary floor and wall tile selections with joints grouted with preliminary grout selection. Final tile and grout selections will be made from these samples.

E. Certificates:

1. Submit manufacturer's certification that grout materials being provided are suitable for intended use, meet or exceed referenced ANSI standards, and are listed on Ceramic Tile Institute (CTI) - Tested Materials list.
2. Prior to shipment of tile to jobsite, deliver Master Grade Certificates to Architect, complying with ANSI A137.1 or CTI 69.5 for special purpose tiles.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver all products to project site in manufacturer's unopened containers, with grade seals unbroken and labels intact. Comply with ANSI A137.1 for labeling sealed tile packages.

B. Storage: Store tile products indoors in a protected area.

C. Handling: Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.06 EXTRA STOCK

A. Extra Stock: Prior to Substantial Completion review, deliver to Owner additional tile and trim shapes of each type, color, pattern, and size used in Work, for Owner's use in replacement and maintenance.

B. Quantity: Provide a minimum of 1 percent of field tile and 5 percent of trim and shapes.

C. Packaging: Pack extra stock in undamaged original packing cartons, with additional protective materials added inside to prevent damage, with contents clearly labeled with Project name, Project identification number, supplier's name, address and telephone number, and product identification.

PART 2 – PRODUCTS

2.01 INTERIOR PORCELAIN FLOOR AND WALL TILE AT COMMUNITY CENTER RESTROOMS AND TOT RESTROOM FLOOR

A. Specified Manufacturers: Fiandre and Royal Marble as distributed by ICG Italia, 1360 Vernon Street, Anaheim, CA 92805 (626-622-2512), contact Robert Hong (rhong@icgmail.com).

B. Acceptable Manufacturers: No known equals.

C. Porcelain Floor and Wall Tile:

1. Sizes: As scheduled or indicated on drawings.
2. Colors: As scheduled or indicated on drawings.

3. Slip resistance at floor tile: Coefficient of Friction shall be equal to or exceeding 0.6 when tested according to ASTM C 1028 and shall be acceptable as meeting the intent of California Building Code (CBC) Section 1124B / ADAAG 4.5.1.

D. Trim and Shapes: Where required, provide stainless steel schluter trim as shown on the drawings.

2.02 EXTERIOR PORCELAIN WALL TILE AT ENTRY

A. Specified Manufacturers: Crossville Architectural Sales (contact Monica Farley, 714-501-7693 or email: monica.farley@ahfproducts.com)

B. Acceptable Manufacturers: No known equals.

C. Porcelain Wall Tile:

1. Sizes: As scheduled or indicated on drawings.
2. Colors: As scheduled or indicated on drawings.

D. Trim and Shapes: Where required, provide stainless steel schluter trim as shown on the drawings.

2.03 INTERIOR GLAZED CERAMIC WALL TILE AT DRINKING FOUNTAIN BACKWALL

A. Specified Manufacturer: Color Wheel Linear as distributed by Dal-Tile International Corp.

B. Acceptable Manufacturers: No known equals.

C. Wall Tile:

1. Sizes: As scheduled or indicated on drawings.
2. Colors: As scheduled or indicated on drawings.

D. Trim and Shapes: Where required, provide stainless steel schluter trim as shown on the drawings.

2.05 MORTAR SETTING BED MATERIALS

A. Mortar Setting Bed for Floor Tile: Portland cement, hydrated lime and damp sand, gaged with proprietary admixture and not water, complying with ANSI A108.1B, with the following minimum properties:

1. Compressive Strength: 2000 psi, minimum.
2. Bond Strength: 500 psi.
3. Water Absorption: 4.0 percent max.

4. Smoke Contribution: 0.
5. Flame Contribution: 0.

B. Proprietary Additive: Manufacturer's standard acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

C. Cleavage Membrane:

1. Specified Manufacturer: Permalon Division, Reef Industries, Inc. (800/231-2417).
2. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.
3. Cleavage Membrane Under Tile Setting Beds: Black or white high-density polyethylene, cross-laminated, approximately 5.1 mils thick, Permalon X-100.

D. Mortar Setting Bed Reinforcement: 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 A 185 and ASTM A 82 except for minimum wire size.

2.06 ACCESSORY MATERIALS

A. Dividing and Edge Strips and Trim: SS Schluter Systems, Inc. (800/361-4086) or equivalent product of another manufacturer in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Provide stainless steel edge of types and sizes as indicated on Drawings, or selected by Architect, or if not indicated, as recommended by manufacturer for edges, corners and flooring material transitions.

B. Marble Thresholds: Georgia Marble Company, Vermont Marble Company, or equal, ASTM C 503, Group A, tight-grained, sound grey marble with little or no veining, beveled edges, fine sand rubbed finish, size and shape as indicated on Drawings. If not indicated, then match the width of door jamb by 3/4-inch thick, length to suit door opening.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish.
2. Limit height of bevel to 1/2-inch (12.7 mm) or less, and finish bevel to match face of threshold.

C. Wallboard Backing for Tile: Cementitious backer units and accessories specified in Section 09250 - Tile Backing Board.

D. Water: Clear, fresh, potable and free of mineral or organic matter which can affect underlayment, priming and patching products.

2.07 ANTI-FRACTURE MEMBRANE

A. Specified Manufacturer: Custom Building Products (800/282-8786).

B. Acceptable Manufacturer: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Product Requirements.

C. Elastomeric Anti-Fracture Membrane: Fracture-Free™ Crack Prevention Membrane, manufactured by Custom Building Products, factory-mixed, elastomeric crack prevention membrane to accommodate substrate movement up to 1/8-inch without cracking tile, suitable for interior and exterior installation. Membrane shall be anti-microbial to resist growth of mold and mildew.

2.08 TILE SETTING MORTARS

A. Specified Manufacturer: Custom Building Products (800/282-8786).

B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Requirements.

1. Bostik Construction Products (800/726-7845).
2. Laticrete International, Inc. (800/243-4788).
3. TEC Specialty Products, Inc., (847/358-9500 or 800/323-7407).

C. Tile Setting Mortar, Thinset: Latex portland cement mortar complying with ANSI A118.4, FlexBond® Premium Flexible Thin-Set Bonding Mortar, manufactured by Custom Building Products.

D. Tile Setting Mortar, Medium-Bed: Medium Bed Mortar manufactured by Custom Building Products, factory-blended prepackaged latex-portland cement mortar with additives, not requiring field-blended additives, complying with ANSI A118.4.

2.09 TILE GROUT

A. Specified Manufacturer: As indicated on the Drawings. Manufacturer indicated on the Drawings is for color only. Specified manufacturer for tile grout is Custom Building Products (310/598-8808; 800/282-8786).

B. Acceptable Manufacturers: Products of the manufacturers listed below will be acceptable. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Requirements.

1. Bostik Construction Products (800/726-7845).
2. Custom Building Products (310/598-8808; 800/282-8786).

3. Laticrete International, Inc. (800/243-4788).
4. TEC Specialty Products, Inc., an H.B. Fuller company (847/358-9500 or 800/323-7407).

C. Wall Tile Grout: Custom Building Products Polyblend® Non-Sanded Colored Tile Grout for joints up to 1/8" (3mm), suitable for joints up to 1/8" (3 mm), polymer-enhanced grout, complying with ANSI A118.7, commercially prepared mixture, integral color to match grout indicated on the Drawings or, if not indicated, as selected by Architect. Allow for custom color.

D. Floor Tile Grout: Custom Building Products Polyblend® Sanded Colored Tile Grout, suitable for joints 1/8" (3 mm) to 1/2" (13 mm), sanded, polymer-enhanced grout, complying with ANSI A118.7, commercially prepared mixture, integral color to match grout indicated on the Drawings or, if not indicated, as selected by Architect. Allow for custom color.

2.10 JOINT SEALERS

A. Wall and Fixture Joint Sealant: Mildew-resistant silicone sealant, white or clear as selected by Architect, as specified in Section 07900 - Joint Sealants.

B. Floor Expansion Joint Sealant, Non-Traffic Areas: Single-component, non-sag, as specified in Section 07900 - Joint Sealants.

C. Floor Expansion Joint Sealant, Traffic Areas: Two-component, self-leveling, Shore A hardness greater than 35, as specified in Section 07900 - Joint Sealants.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examination:

1. Verify that surfaces to receive tile setting materials and tile are firm, dry, clean, and free from oily or waxy films and curing compounds.
2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind tile have been installed before proceeding with installation of tile.
3. Examine floor substrates to receive tile and tile accessories before installation begins, to ensure that substrates are level or uniformly sloped to drain within 1/8-inch in 10 feet for thin set mortar methods.

B. Tolerances of Substrates:

1. Vertical surfaces: Plumb and true within 1/8-inch in 8 feet.
2. Horizontals surfaces: Flat within 1/8-inch in 10 feet, properly sloped to drain.

C. Temperature: Observe manufacturer's recommendations for ambient temperature when installing membranes, setting mortar and ceramic tile.

3.02 INTERIOR FLOOR SUBSTRATE PREPARATION FOR TILE

A. **Cleaning:** Remove protrusions from concrete surface. Clean surface of curing compounds, other contaminants, dust and debris detrimental to proper bonding of patching and leveling underlayment and membranes.

B. **Temperature Conditioning:** Condition spaces for application of crack isolation and waterproofing membranes to temperature range required by membrane manufacturer.

C. **Control Joints:** Provide a control joint directly over construction/control joint in building structure; wherever tile abuts restraining surfaces such as perimeter walls, curbs and columns; wherever backing material changes. Construct in accordance with TNCA Handbook for Ceramic Tile Installation recommendations.

D. **Interior Slab on Grade Preparation:**

1. Floor leveling: Apply self-leveling, cementitious floor underlayment according to manufacturer's instructions and recommendations.
2. Cleaning: Clean substrate surface according to instructions of membrane and tile setting materials manufacturers.

3.03 SETTING BED INSTALLATION

A. **Setting Bed, General:** Conform to ANSI A108.1A and referenced TNCA setting method.

B. **Cleavage Membrane:** Place cleavage membrane in prepared concrete floor slab depression.

C. **Mixing:** Mix mortars using suitable measuring equipment in approved containers to ensure that proportions of materials will be controlled and accurately maintained during progress of the work; mixing with shovels shall not be permitted.

1. Unless otherwise specified or directed, mix mortar in proportions by volume, in approved mixing machines or mortar boxes.
2. Control quantities of water accurately and uniformly.

D. **Setting Bed Reinforcement:** Place reinforcement, taking care not to damage waterproofing and cleavage membranes.

E. **Setting Bed Placement and Finishing:** Place mortar maintaining minimum and maximum thickness as required by referenced TCNA Handbook setting method. Finish setting bed to tolerances required for tile installation method and with uniform slopes to drain.

F. **Setting Bed Curing:** Moist cure setting bed before proceeding with tile installation.

3.04 INSTALLATION OF ANTI-FRACTURE MEMBRANE

A. Installation of Anti-Fracture Membrane: Install membrane according to manufacturer's instructions and recommendations for substrate, tile setting method and Project conditions, to produce membrane of uniform thickness bonded securely to substrate.

1. Substrate, including mortar setting bed, shall be fully-cured and shall accept water penetration. If substrate condition does not conform to membrane manufacturer's requirements, discontinue installation and perform remedial measures to correct unsatisfactory conditions.
2. Coordinate membrane installation with installation of tile and adapt specified tile installation methods to suit use of anti-fracture membrane, in compliance with requirements of tile setting materials manufacturer.
3. Cover entire floor area with anti-fracture membrane.
4. Turn membrane up at walls and curbs, as detailed on Drawings and in accordance with membrane manufacturer's standard details, to provide containment of water at toilet rooms and other spaces with plumbing fixtures.
5. Seal membrane to floor drains and other penetrations in accordance with membrane manufacturer's instructions and recommendations. Coordinate installation with floor drain specified in Division 15 - Mechanical.

B. Membrane Protection: Protect membrane from mechanical damage and ultraviolet (sunlight) exposure. If membrane is not covered with wearing surface immediately, provide protection as recommended by membrane manufacturer.

3.05 INTERIOR WALL SUBSTRATE PREPARATION FOR TILE

A. Interior Stud Walls Substrate Preparation for Tile: Install tile backing board as specified in Section 09250 - Tile Backing Board, including preparation of joints.

3.06 TILE INSTALLATION, GENERAL

A. Tile Installation, General:

1. Comply with applicable requirements series of tile installation standards included under of ANSI 108 - American National Standard Specifications for the Installation of Ceramic Tile, for type of setting and grouting materials and methods specified.
2. Comply with Tile Council of North America (TNCA) - Handbook for Ceramic Tile Installation for specified installation method.
3. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.
4. Mix and use proprietary materials in accordance with manufacturers' printed instructions and recommendations.

B. Metal Trim Installation: Install metal edge, corner and transition trim in accordance with manufacturer's instructions and recommendations.

1. Coordinate installation with adjacent flooring materials installation.
2. Apply cementitious underlayment, troweling underlayment to thicknesses necessary for sloping to drain and to accommodate abutting finish flooring.

C. Mortar Mix: Proportion and mix in accordance with ANSI A108.6 and manufacturer's instructions and recommendations. Include admixture in mortar in accordance with manufacturer's instructions and recommendations. Admixture shall directly replace equivalent quantity of water in mortar mix.

D. Tile Setting: Prepare surfaces, cut, fit and set tile. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

1. Cut and drill tile for penetrating elements, without marring the tile. Rub cuts smooth with a fine abrasive stone.
2. Set no cut edge against fixtures, cabinets, or other tile without a joint at least 1/16-inch wide. Whenever possible, turn edges away from adjoining wall.
3. Fit tile around electric outlets, plumbing pipe, fixtures and fittings close enough to permit standard plates and collars to overlap the tile.

E. Joint Pattern: Lay tile in grid pattern unless otherwise indicated on Drawings or directed by Architect. Lay out tile pattern and center tile fields both directions in each space or on each wall area. Provide uniform joint widths.

F. Expansion Joints: Provide expansion joints at locations and spacings as recommended by TCNA Handbook and as indicated on Drawings.

G. Slope: Slope floor tile installation for positive drainage to floor drains.

3.07 FLOOR TILE INSTALLATION

A. Floor Tile Installation: Similar to TCNA Handbook Method F111, over anti-fracture and waterproof membranes on cured mortar setting bed, using medium-bed latex portland cement mortar.

B. Tile Joints:

1. Field tile joint widths: Match Architect's sample.
2. Trim and accessories joint width: Match adjoining tile units.

C. Expansion Joints: Comply with TCNA Handbook Method EJ171.

1. Provide expansion joints throughout where tile work abuts restraining surfaces.
2. Provide expansion joints directly over joints in slab on grade, including construction joints or cold joints. Provide expansion joints at 20-feet maximum on center each way.

3.08 WALL TILE INSTALLATION FOR GLAZED CERAMIC TILE

A. Glazed Ceramic Wall Tile Installation: Thinset over portland cement tile backer board, using latex-portland cement setting mortar, TCNA Handbook Method W244C. See Section 09250 - Tile Backing Board for tile backer board.

B. Tile Joints:

1. Field tile width: 1/8-inch, unless otherwise directed.
2. Trim and accessories joint width: Match adjoining tile units.

3.09 GROUTING

A. Grouting, General:

1. Do not begin grouting until tiles are firmly set and specified minimum curing time has elapsed.
2. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
3. When using proprietary grout, comply with manufacturer's instructions and recommendations unless otherwise more stringent requirements are specified.
4. Force maximum amount of approved grout into joints in accordance with pertinent recommendations contained in ANSI A108.10.
5. Fill joints of cushion-edge tile to depth of cushion; fill joints of square-edge tile flush with tile surface.
6. Fill all gaps and skips.
7. Do not permit mortar or mounting mesh to show through grouted joints.
8. Provide hard finished grout which is uniform in color, smooth, and without voids, pin holes, or low spots.
9. Leave tile clean.

B. Wall Tile Grouting:

1. Joints up to 1/8-inch: ANSI A108.10, unsanded portland cement grout.
2. Joints greater than 1/8-inch: ANSI A108.10, sanded portland cement grout.

C. Floor Tile Grouting: ANSI A108.10, sanded portland cement grout.

3.10 CURING

A. Curing after Setting: Moist cure 72 hours minimum.

B. Curing after Grouting: Moist cure 72 hours minimum.

3.11 JOINT SEALING

A. Joint Sealing: Apply sealant after tile is grouted, grout is cured and tile field is thoroughly clean and dry.

1. Seal between tile and all penetrating elements.
2. Seal perimeter of tile field where tile base is not provided.

B. Sealant Locations: Include the following.

1. Around plumbing fixtures.
2. Around plumbing piping penetrations.
3. Around door frames and other items set in wall.

C. Refer to Section 07900 - Joint Sealants for additional requirements.

3.12 PATCHING

A. Patching:

1. Sound tile after setting. Replace hollow sounding units.
2. Remove cracked, broken or damaged tiles. Replace with new tiles. Immediately repair faulty grouting.
3. Repair damage caused by subsequent Work at no change in Contract Time and Contract Sum.

3.13 CLEANING AND PROTECTION

A. Cleaning: After completion of setting and grouting, perform initial cleaning, leaving floor and wall tile clean and polish tile.

1. Do not use acid or acid cleaners to clean tile.
2. When tile is thoroughly clean and dry, buff tile with clean dry cloths.

B. Protection, General: Protect tile flooring from damage. Lay reinforced kraft paper runners and provide barricades and signs as necessary to prevent construction traffic on completed installations. Remove and replace defects which develop such as loose or damaged floor tile and base.

C. Protection, Heavy Traffic: Provide plywood runners over kraft paper where wheeled traffic heavy loads will cross completed tile flooring.

D. Final Cleaning: Thoroughly clean wall and floor tile and accessories as part of final cleaning in preparation for Completion review, as specified in Section 01740 - Cleaning Requirements.

END OF SECTION

SECTION 09510

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Suspended exposed** metal ceiling grid systems.

B. **Mineral fiber** acoustical lay-in panels.

C. **Film-faced** mineral fiber lay-in panels.

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1.02 RELATED SECTIONS

A. **Division 15 - Mechanical:** Plumbing, fire protection and HVAC system components that penetrate suspended acoustical ceilings.

B. **Division 16 - Electrical:** Electrical lighting and signal system components that penetrate suspended acoustical ceilings.

1.03 SUBMITTALS

A. **Shop Drawings:** Reflected ceiling plans.

1. Indicate types of units, layout and pattern of units, details of suspension systems, details at changes of level, details of ceiling penetrations and other interruptions, edge treatments and all necessary connections with adjoining Work.
2. Show all lighting fixtures, HVAC grilles and diffusers, access doors and similar products set into ceiling.

B. **Product Samples:** Provide samples of each suspension system and acoustical ceiling tile specified for review and approval by the architect.

1.04 QUALITY ASSURANCE

A. **Regulatory Requirements, Seismic Design:** Conform to California Building Code (CBC) requirements for seismic-resistant design and installation of ceiling suspension system, including UBC Standard 25-2 - Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings and ASCE/SEI 7-05 - Minimum Design Loads for Buildings and Other Structures, with installation according to ASCE 7-05 Section 13.5.6.2.2.

B. **Regulatory Requirements, Fire Characteristics:** California Building Code (CBC), for class as indicated below, as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. Exit ways: Maximum Flame Spread Class A.
   a) Flame Spread: ASTM E 84, 25 or less.
   b) Smoke Density: ASTM E 662, not more than 450.
2. Rooms and other areas: Maximum Flame Spread Class B.
   a) Flame Spread: ASTM E 84, not more than 75.
   b) Smoke Density: ASTM E 662, not more than 450.

C. Sequencing and Scheduling: Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead Work is completed, tested, and approved. Schedule installation of acoustic units after interior wet work is dry.

1.05 EXTRA STOCK

A. Extra Materials: Deliver extra materials to City. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical ceiling units: Furnish quantity of full-size units equal to 2 percent of amount installed.
2. Exposed suspension system components: Furnish quantity of each exposed component equal to 5 percent of installed quantity but not less than 6 each.

PART 2 - PRODUCTS

2.01 SUSPENSION SYSTEM

A. Specified Manufacturer: Armstrong World Industries – Ceiling Solutions

B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Requirements. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01600 - Requirements.

1. USG Interiors, Ceiling Suspension Division (Donn Brand) (877/874-4200).
2. Chicago Metallic Corporation, (708/563-4600 or 800/323-7164).

C. Suspension System Type A: Armstrong “Silhouette XL 9/16” bolt-slot system with 1/4” reveal, exposed grid, electro-galvanized steel, double web, non-rated, direct hung, Intermediate Duty classification, suitable for specified acoustical panels, complying with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report No. ES-1308.

1. Finish, Exposed Surfaces: Factory-finished, standard low gloss white to match ceiling panels.
2. Wall Channel: Shadow molding, 15/16-inch vertical leg, 3/8-inch steps and 9/16-inch bottom flange, hemmed edges, 0.018-inch metal.

D. **Suspension System Type B:** Armstrong Square Tegular exposed T-bar, electro-galvanized steel, 9/16-inch face, double web, non-rated, direct hung, Heavy Duty Duty classification, suitable for specified acoustical panels, complying with ICC Evaluation Service, Inc. (ICC ES) Evaluation Report No. ESR-1308, suitable for specified acoustical panels.

1. Finish, Exposed Surfaces: Factory-finished, standard low gloss black to match ceiling tiles
2. Wall Channel: 7/8-inch flange, hemmed edge, 0.020-inch metal.

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E. **Braces and Supports:** Galvanized steel, size and type to suit application, to rigidly support and secure acoustic ceiling system including support of integral mechanical and electrical components with maximum deflection of 1/360 and to seismically brace ceiling in accordance with applicable Code requirements.

1. Hanger rods: Mild steel, zinc coated, or protected with rust- inhibitive paint.
2. Flat hangers: Mild steel, zinc coated, or protected with rust inhibitive paint.
3. Angle hangers: Angles with legs not less than 7/8-inch wide, formed with 0.0365-inch-thick galvanized steel sheet complying with ASTM A446, Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.

F. **Hangers Wires:** ASTM A641, soft temper, pre-stretched, Class 1 coating, sized so that stress at 3-times hanger design load (ASTM C635, Table 1, Direct Hung), will be less than yield stress of wire, but provide not less than 12 gage (0.1055-inch diameter).

2.02 WET-FORMED MINERAL FIBER ACOUSTICAL CEILING PANELS

A. **Specified Manufacturer:** Armstrong World Industries – Ceiling Solutions

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Requirements.

1. Celotex Building Products, Tampa, FL (813/873-1700).
2. USG Interiors, Inc., Chicago, IL (800/950-3839).

C. **Acoustical Ceiling Panels, General:** Lay-in, mineral fiber panels for exposed-T suspension system, Fed Spec SS-S118B, Type III, Class A.

D. **Wet-Formed Mineral Fiber Acoustical Ceiling Panels (Panels Type 1):** For use with **Suspension System Type A**, installation typically except where otherwise noted.

1. Product: Armstrong Optima Tegular, catalog no. 3290.
2. Material: Wet-formed mineral fiber, white painted face.
3. Nominal Size: 12 x 48 inches, 3/4-inch thick.
4. Face Pattern: Fine texture.

5. Edges: Tegular.
6. CAC: Minimum 35, continuous ceiling.
7. Surface Burning Characteristics: ASTM E 1264, Class A and Flame Spread 25 or under, UL listed and labeled.
8. Treatment: Anti-microbial.
9. Color: White.

E. Wet-Formed Mineral Fiber Acoustical Ceiling Panels (Panels Type 2): For use with **Suspension System Type B**, installation typical except where otherwise noted.

1. Product: Armstrong Calla Tegular Fine Texture, catalog no. 2825.
2. Material: Wet-formed mineral fiber, black painted face.
3. Nominal Size: 24 x 48 inches, 3/4-inch thick.
4. Face Pattern: Fine texture.
5. Edges: Tegular.
6. CAC: Minimum 35, continuous ceiling.
7. Surface Burning Characteristics: ASTM E 1264, Class A and Flame Spread 25 or under, UL listed and labeled.
8. Treatment: Anti-microbial.
9. Color: Black.

F. Wet Formed Mineral Fiber Acoustical Ceiling Panels (Panel Type 3): For use with **Suspension System Type A**, installation typical except where otherwise noted.

6. Product: Armstrong Optima Tegular, catalog no. 3257.
7. Material: Wet-formed mineral fiber, white painted face.
8. Nominal Size: 24 x 48 inches, 3/4-inch thick.
9. Face Pattern: Fine texture.
10. Edges: Tegular.
6. CAC: Minimum 35, continuous ceiling.
7. Surface Burning Characteristics: ASTM E 1264, Class A and Flame Spread 25 or under, UL listed and labeled.
8. Treatment: Anti-microbial.
9. Color: White.

G. Noise-Reduction Coefficient: Noise-Reduction Coefficient (NRC) shall be determined by manufacturer in accordance with ASTM C 423, with materials tested on mounting E-400 unless otherwise noted (ASTM E 795).

H. Ceiling Sound Transmission Class: Ceiling Sound Transmission Class (STC) shall be determined by manufacturer for continuous ceilings tested in accordance with AMA 1-II - Ceiling Sound Transmission Test by Two-Room Method.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examination:

1. 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.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation:

1. Verify that existing conditions are ready to receive acoustical ceiling Work.
2. Verify that layout of hangers will not interfere with other Work.

3.02 SUSPENDED T-BAR CEILING SYSTEM INSTALLATION

A. Suspended T-Bar Ceiling System Installation, General: Install system according to manufacturer's instructions and recommendations, ASTM C636 for heavy duty classification, requirements of California Building Code (CBC) and the following:

1. Install system capable of supporting imposed loads to a deflection of L/360 maximum.
2. Install system after major above-ceiling Work is complete. Coordinate locations of hangers with related Work.
3. Suspend system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
4. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
5. Locate system on room axis according to reflected ceiling plan. Unless otherwise indicated or directed, adjust layout so that cut panels are not less than 1/2 panel width.
6. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6-inches of each corner or support components independently with hanger wires at each corner of component.
7. Do not eccentrically load system, or produce rotation of runners.

B. Ceiling Hangers Installation: Suspend ceiling hangers from building's structural members.

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. 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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
3. Secure wire hangers to supports above with a minimum of four tight turns in 1-1/2 inches.
4. 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. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Seismic Bracing of Ceiling System: Comply with details indicated on the Drawings, requirements of California Building Code (CBC) Section 2504 and Table 25-A.

1. Provide set of 4 splay wires for each 144 sf of ceiling unless other specially designed and detailed bracing is provided. First set of splay wires shall be maximum 6 feet 0 inches from wall. Wires shall be taut without causing ceiling to lift.
2. Fasten hanger wires with not less than 3 tight turns within 1-1/2 inches. Secure splay wires with 4 tight turns within 1-1/2 inches.
3. Separate all ceiling wires and unbraced ducts, pipes and fixtures by at least 6-inches.
4. Install compression members as detailed on the Drawings.

D. Ceiling Trim Installation: Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

E. Acoustical Panel Installation: Comply with manufacturer's instructions and CISCA's "Ceiling Systems Handbook."

1. Install acoustical panels with edges in close contact with metal supports and in true alignment.
2. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings.
3. Scribe and cut panels at borders and penetrations to provide a neat, precise fit. Field cut reveal-edge into cut panels.
4. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

5. 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.

3.03 TOLERANCES, SUSPENDED ACOUSTICAL CEILING SYSTEM

A. Variation from Flat and Level Surface: 1/8-inch in 10 feet.

B. Variation from Plumb of Grid Members: As caused by eccentric loads, two degrees maximum.

END OF SECTION

SECTION 09570

LINEAR WOOD CEILING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Panelized linear wood** slat ceiling system, including backer strip.

B. **Integrated perimeter** and opening trim.

1.02 RELATED SECTIONS

A. **Section 06100 – Rough Carpentry:** Furring attached to building substrate at panelized linear wood ceiling system.

B. **Section 13900 - Fire Protection:** Coordination of location of fire sprinkler heads with layout of ceiling grid and panels.

C. **Division 15 - Mechanical:** HVAC ductwork, diffusers and grilles in integrated ceiling system.

D. **Division 16 - Electrical:** Luminaires (lighting fixtures) penetrating and to integrate with integrated ceiling system.

1.03 SUBMITTALS

A. **Product Data:** Submit manufacturer's product literature for each type of product specified.

B. **Shop Drawings:** Submit reflected ceiling plans.

1. Indicate types of units, layout and pattern of units, details of suspension systems, details at changes of level, details of ceiling penetrations and other interruptions, edge treatments and all necessary connections with adjoining Work.
2. Show all lighting fixtures, HVAC grilles and diffusers, access doors and similar products set into ceiling.

C. **Samples:** For verification purposes of each type of exposed finish required. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

1. Wood samples: 18-inch (450 mm) long samples, complete with specified finish.
2. Panel sample: Minimum 24-inch (750 mm) long by minimum 16-inch (375 mm) wide sample of linear wood ceiling panel system, with specified finish, backer strips and acoustical insulation.

3. Trim: 18 inch (450 mm) long sample of exposed peripheral and penetration trims.

D. Contract Closeout: Submit manufacturer's instructions and recommendations for cleaning and maintaining system components, including precautions against use of methods and materials which may be detrimental to appearance and performance of system.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements, Fire Characteristics: Provide integrated ceiling system with Class I fire rating, including the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or other testing and inspecting agencies acceptable to authorities having jurisdiction.

1. Flame Spread: 25 or less.
2. Smoke Developed: 50 or less.

B. Installer's Qualifications: Not less than 3 years continuous experience with installation of integrated ceiling systems of type and scope of that required. Installer shall be subject to approval by the integrated ceiling system manufacturer.

1.05 PROJECT CONDITIONS

A. Environmental Conditions:

1. Do not install linear wood ceiling system until building is enclosed, sufficient heating, cooling and ventilation is provided, dust generating activities have terminated, and overhead Work is completed, tested, and approved.
2. Provide ambient conditions conforming to integrated ceiling manufacturer's instructions and recommendations, with temperature between 60 and 80 degrees F and with relative humidity not exceeding 70 percent, through the operation of the building HVAC system.

PART 2 - PRODUCTS

2.01 PANELIZED LINEAR WOOD CEILING SYSTEM

A. Specified Manufacturer: 9Wood, Inc., Springfield, OR (888/767-9990).

B. Acceptable Manufacturers: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Ceilings Plus, (323/724-8166 or 800/822-3411).
2. Rulon Company, (904/584-1400 or 800/227-8566).
3. Architectural Components Group, Inc. Jared Wills (417) 869-6777

4. Geometric Manufacturing Inc. Ryan Krieg (800) 306-0024

C. Linear Wood Slat Ceiling System: Series 2100 by 9Wood, Inc., direct-mount, panelized linear wood slat ceiling system, incorporating components and features specified below.

1. Components: Wood slats, backer strips and trim shall be integral components of linear wood ceiling system, factory-prefinished and factory-fabricated into panels for field installation. Panel sizes shall be as shown on the reflected ceiling plan with a ¾" joint between sections.
2. Wood Species:
   a) Wood slats: Hemlock, ceiling grade, clear, smooth surfaced, straight/vertical grain with tight texture, kiln dried to maximum 15 percent moisture content.
   b) Backing strips and furring: Softwood as standard with manufacturer, kiln dried to maximum 12 percent moisture content.
3. Member Size, Spacing and Pattern: Series 2100 SKU2114-3.
   a) Wood slats: 3-1/4-inches face width by 3/4-inch deep, square edges, assembled with even spacing between rails with three rails per 12-inch wide panel.
   b) Backing strips: 3/4-inch diameter dowels positioned 5-1/2 inches from panel ends and at intermediate intervals of 12-inches on center.
4. Penetrations: All openings and holes in ceiling system shall be factory pre-cut, including openings for fire sprinkler heads, HVAC grilles, luminaires (lighting fixtures), speakers and other components indicated on the Drawings and specified in other Sections. Verify types and locations of openings before submission of shop drawings.
5. Trim: As indicated on the Drawings, factory manufactured as integral components of system, to match linear wood slats.
6. Fasteners: All fasteners shall be concealed.

D. Wood Finishes:

1. Wood slats: Standard vertical grain Hemlock with sample clear satin sheen finish to match Architect's sample. Finished ceiling system shall comply with fire characteristics specified above through application of pyrolitic surfactant coating.
2. Backer strip: Painted or stained flat black.

E. Anchors: Corrosion-resistant steel screws, for inconspicuous anchorage to building substrate.

2.02 SEMI-RIGID GLASS FIBER INSULATION

A. Specified Manufacturer: Manville Building Insulation, Division of Johns Manville Corp., (303/978-2000 or 800/654-3103).

B. Acceptable Manufacturers: None identified. No substitutions will be considered.

C. **Semi-Rigid Glass Fiber Insulation:** Manville Insul-SHIELD Black, semi-rigid, self-supporting glass fiber insulation board, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101, inorganic glass fiber material with minimum density of 3 pcf.

1. Finish: Matte black, factory finished.
2. Panel size: Minimum size of 24-inches by 48-inches, unless larger sizes are more suitable for the application.
3. Panel thickness: As indicated on the Drawings.

D. **Acoustical Characteristics:** All acoustical measurements shall be performed in accordance with ASTM C 423 and shall be performed in the Acoustical and Board Products Manufacturers Association #6 mounting configuration (ASTM E 795, Type F mounting).

E. **Insulation Adhesive:** Mastic type, compatible with insulation and substrate, with bond strength adequate to secure insulation in place.

PART 3 - EXECUTION

3.01 PREPARATION

A. **Preparation, General:** Comply with reflected ceiling plans and reviewed shop drawings.

1. Measure each ceiling area and establish layout of linear wood ceiling system.
2. Locate panel joints consistently across the ceiling plane, with balanced wood slat lengths and proper support to building structure.
3. Make cut-outs for penetrating elements, finishing off openings with trim provided as components of linear wood ceiling system.
4. Install wood furring to building substrate, as detailed on the Drawings and to suit spacing of backer strips of linear wood ceiling panels. Field paint furring flat black. Comply with additional requirements specified in Section 06100 – Rough Carpentry.

3.02 INSTALLATION OF PANELIZED LINEAR WOOD CEILING SYSTEM

A. **Panelized Linear Wood Ceiling System Installation:** Comply with manufacturer's instructions and recommendations for installation of linear wood ceiling panels, penetrating elements and trim.

1. Attach linear wood ceiling panels directly to wood furring attached to building substrate, allowing space for black acoustical insulation.
2. Use concealed fasteners only.

3.03 ACOUSTICAL BOARD INSULATION INSTALLATION

A. **Acoustical Board Insulation:** Install semi-rigid insulation where indicated on the Drawings, cutting and fitting as necessary to accommodate penetrating elements

such as ceiling suspension wires and braces, HVAC outlets and grilles, luminaires, and sound and fire alarm systems.

1. Butt edges tightly.
2. Ceiling suspension wires may pass through insulation.
3. Allow for openings for light fixtures, speakers, fire sprinkler heads and ductwork, fitting insulation tightly around penetrating elements, except maintain required clearance at light fixtures to allow for heat dissipation.
4. When installed in ceiling cavity, lay semi-rigid insulation over panelized linear wood ceiling system and backing strip, closely butting all joints and providing complete coverage.
5. When installed against solid surface, secure semi-rigid insulation in place using adhesive.

END OF SECTION

SECTION 09625

RESILIENT ATHLETIC FLOORING SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring suitable for indoor athletic surfacing.

B. Accessories required for flooring installation, maintenance and repair.

1.2 RELATED SECTIONS

A. Section 03300 - Cast in Place Concrete: Floor slab and finish at new concrete floors.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product literature for flooring, accessories and adhesives. Include for information only, manufacturer's installation instructions.

B. Shop Drawings: Indicated layout of resilient flooring, including seams, pattern direction and dimensions.

C. Samples: Submit samples for verification of color, texture and finish each type of resilient athletic flooring.

D. Extra Materials: Provide extra stock materials for use in facility operation and maintenance, equal to not less than 5 percent of total area of resilient athletic flooring, of each type, color and dye lot.

1.4 QUALITY ASSURANCE

A. Flooring Installer's Qualifications: Approved by or acceptable to resilient athletic flooring manufacturer, having successfully completed minimum of three projects of similar magnitude and complexity using the products provided. Upon request of Architect, submit list of completed projects and references verifying experience.

B. Marking and Graphics Applicator's Qualifications: Court markings and other graphics shall be applied by firm with minimum of 5 years experience applying gymnasium floor markings, including successful completion of markings and graphics on resilient athletic flooring.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver flooring materials with factory wrappings and containers in unopened condition.

B. Storage: Store flooring materials in an area where temperature can be maintained at approximately 65 degrees F and relative humidity can be kept below 50 percent. Store flooring in the area where it will be installed for at least 3 days immediately prior to installation.

1.6 PROJECT CONDITIONS

A. Floor Slab Condition: Floor slab shall be cured minimum of 30 days prior to start of flooring installation. Floor slab shall be dry and moisture content of concrete shall not exceed maximum level permitted by resilient athletic flooring manufacturer. Refer to moisture testing and remedial procedures specified in Section 07265 - Vapor Emission Reduction System.

B. Ambient Conditions:

1. All wet Work and Work requiring access on top of resilient athletic flooring system shall be completed prior to delivery of flooring products into room. Such Work includes painting and plastering.

2. Permanent HVAC system shall be operational or provide temporary heating, cooling and ventilation to maintain ambient temperature and humidity within range required by resilient athletic flooring manufacturer.

1.7 WARRANTY

A. Manufacturer's Extended Warranty: For resilient athletic flooring, manufacturer's standard 3 year warranty covering materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Specified Manufacturer: Mondo America, Inc., Laval, Quebec, Canada (450/967-5800 or 800/361-3747; Western region office, Mondo USA, Lynnwood, WA, 800/962-5334).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the substitution provision specified in Section 01630 - Product Options and Substitutions.

2.2 RESILIENT ATHLETIC FLOORING

A. Resilient Athletic Flooring: “Sport Impact” manufactured by Mondo America, Inc., prefabricated dual durometer, double-layered vulcanized and calandered rubber flooring with a textured finish,

1. Format: Rolled Sheets to fit dimensions and pattern on drawings

2. Thickness: 0.236-inch (6 mm) (nominal 1/4-inch).

3. Color(s): As indicated on the Drawings.

4. Finish: Sealskin texture.

5. Layers: Shore hardness of top layer shall be greater than that of bottom layer, with shore hardness of layers as recommended by manufacturer for the limits specified and use indicated.

6. Physical Properties:

Physical Property	Standard	Value
Hardness Shore A	ASTM D 2240	80/77
Critical Radiant Flux	ASTM E 648, NFPA 1010	.45W/cm2 (Class1)
Optical Density of Smoke	ASTM E 662	< 450, Class I
Static Load Limit	ASTM F 970	0.002-inch
Fungal Resistance Test	ASTM E 2180	No growth
Coefficient of Friction	ASTM D 2047	>1.2 dry / 0.67 wet
VOC Compliance	ASTM D 5116	Yes
V.O.C. Compliance	ASTM D 5116	Yes

2.3 ACCESSORY PRODUCTS

A. Leveling and Patching Compounds: Latex or cementitious type as recommended by flooring manufacturer and as suitable for substrate conditions.

B. Crack Filler for Floors: As recommended by floor covering manufacturer.

C. Primer for Concrete Floor Surfaces: As recommended by flooring manufacturer.

D. Adhesive: Two-part polyurethane adhesive, as marketed by or approved by resilient flooring system manufacturer, type suitable for substrate conditions. Provide adhesive that complies with VOC limit of 60 g/L according to South Coast Air Quality Management District (SCAQMD) Rule 1168 and maximum VOC requirements specified in Section 01352 - Sustainable Design Requirements.

E. Seaming Materials: As marketed by or approved by resilient flooring system manufacturer and suitable for seaming method specified.

F. Finishing Materials: As marketed by or approved by resilient flooring system manufacturer.

G. Resilient Base and Accessories: As specified in Section 09650 - Resilient Flooring.

PART 3 - EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Floor Slab Finish: Verify suitability of concrete floor slab finish and slab depression.

B. Moisture Test for Concrete Floors: Perform test as specified in Section 07265 - Vapor Emission Reduction System and as recommended by the floor covering manufacturer, to verify that moisture condition is acceptable for proper installation of resilient flooring.

1. Comply with resilient athletic flooring manufacturer's requirements for moisture vapor pressure.

2. Perform corrective actions, if necessary, as specified in Section 07265 - Vapor Emission Reduction System.

C. Alkalinity Test for Concrete Floors: pH level shall be in range of 7 to 8.5. Perform corrective actions if necessary according to flooring manufacturer's instructions and recommendations.

3.2 PREPARATION

A. Preparation of Concrete Surfaces:

1. Grind all ridges and other uneven surfaces smooth.

2. Concrete curing compounds, other than the type that does not adversely affect adhesive, shall be entirely removed from the slabs.

3. Rout out and fill cracks 1/16-inch wide and wider with a crack filler.

4. Apply latex or cementitious underlayment as necessary to fill remaining holes, cracks, and depressions, and for smoothing, leveling, and feather edging concrete surfaces.

B. Cleaning: Remove loose particles, vacuum chalking, dusty surfaces and prime the cleaned surfaces as recommended by the flooring manufacturer. Scour floor and sweep to remove adhered and loose soiling and debris. Prepared surface shall meet requirements and recommendations of both adhesive and flooring manufacturers.

C. Resilient Tile Products Preparation: Acclimate flooring products and accessories to ambient conditions. Lay out sheet, strip and roll goods in advance of installation to relax the products and make ready for installation. Comply with manufacturer's instructions and recommendations.

3.3 RESILIENT TILE ATHLETIC FLOORING SYSTEM INSTALLATION

A. Resilient Tile Athletic Flooring System Installation: Comply with manufacturer's instructions and recommendations.

1. Inspect resilient tile for damage and defects. Reject defective material.

2. Dry-lay the complete surface in an Ashlar pattern (staggered joints).

3. Cut and adjust tiles prior to adhesion.

4. Mix and handle adhesive in accordance with manufacturer's instructions.

5. Lift tiles row by row to apply adhesive.

6. Apply adhesive and lay resilient tile in accordance with manufacturer's instructions and recommendations.

7. Roll tiles in both directions on 45 degree angle with 100 lbs (45 kg) sectional floor roller.

8. Check for air bubbles and continue rolling if needed.

9. Roll tile joints with hand roller and remove excess adhesive that may have come through seam.

10. Allow adhesive to set 72 hrs before the initial cleaning of surface.

B. Initial Cleaning: Comply with manufacturer's instructions and recommendations for cleaning tools, agents and methods.

C. Floor Finish Application: Comply with manufacturer's instructions and recommendations, applying minimum of three coats of floor finish.

3.4 CLEANING AND PROTECTION

A. Cleaning: Clean resilient athletic flooring and adjacent surfaces as instructed by manufacturer, using neutral type cleaners as appropriate to materials.

B. Final Finish Application: Apply floor finish to clean resilient athletic flooring.

C. Protection:

1. Lay reinforced kraft paper runners and provide barricades and signs as necessary to prevent construction traffic on completed installations.

2. Provide temporary plywood and hardboard covering where necessary to protect surface from heavy loads.

3. Remove and replace defects which develop such as damaged or loose sheet flooring and base.

D. Final Cleaning: Thoroughly clean resilient athletic flooring and accessories as part of final cleaning.

END OF SECTION

SECTION 09645

CUSHIONED WOOD FLOORING ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Gymnasium Flooring: Anchored and cushioned wood sports flooring system, providing adjustable performance levels, consisting in general of vapor barrier, pre-manufactured subfloor panels adjusted to specified performance level, anti-squeek collared steel anchors, resilient pads, maple flooring, accessories field finishing with painted court lines and clear varnish.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Forming of slab depression for cushioned wood flooring assembly, depth according to wood flooring manufacturer's instructions for system to be installed.

B. Section 03300 - Cast in Place Concrete: Concrete substrate on which wood flooring system shall be installed, steel troweled and finished smooth to tolerance according to flooring manufacturer's requirements.

C. Section 06200 - Finish Carpentry: General requirements for custom-fabricated wood trim at wood flooring.

D. Section 07260 - Vapor Retarders: Underslab moisture barrier.

E. Section 07265 - Vapor Emission Reduction System: Testing and mitigation of excessive moisture vapor transmission from concrete substrate.

F. Section 08710 - Door Hardware: Metal thresholds at door openings.

G. Section 09900 - Field Painting: Finishing of wood products other than wood flooring system.

H. Section 11485 - Gymnasium Equipment: Sleeves and anchors integrated with wood flooring system.

I. Section 12600 – Telescoping Stands: Interior, telescoping bleachers for installation over cushioned wood flooring system.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical product data and installation instructions for wood flooring system. Include instructions for handling, moisture protection, anchorage, finishing, protection and maintenance.

B. **Shop Drawings:** Submit shop drawings indicating method of construction, relationships to surrounding construction, perimeter venting, base and trim details and other information and components not fully dimensioned or detailed in manufacturer's product data. Include layout, colors, widths and dimensions of game lines and markings.

C. **Samples:** Submit samples of flooring finish together with color chips for game line markings. Indicate full variation of wood coloration.

D. **Qualification Data:** For Installer.

E. **Maintenance Data:** For wood sports-floor assemblies and finish systems to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. **Manufacturer Qualifications:** A qualified manufacturer that is certified for wood sports floor assembles.

B. **Installer's Qualifications:** Approved by or acceptable to flooring system manufacturer, with minimum of three years of experience in installation of wood flooring for recreational projects, MFMA Mill Accredited Installation Company. Upon request of Architect, submit list of completed projects and references verifying experience.

C. **Maple Flooring:** Comply with MFMA grading rules for species, grade, and cut.

1.05 DELIVERY, STORAGE AND HANDLING

A. **Delivery:** Deliver flooring in unopened bundles with grade marking intact.

B. **Storage:** Store flooring materials in an area where temperature can be maintained at approximately 65 degrees F and relative humidity can be kept below 50 percent. Store flooring in the area where it will be installed for at least 3 days immediately prior to installation.

1.06 PRE-INSTALLATION CONFERENCE

A. **Scheduled Date:** Convene a pre-installation conference one week prior to commencing Work specified in this Section.

B. **Attendance:** Require attendance by Contractor's superintendent and other supervisory and quality control personnel having responsibility for wood flooring, supervisory personnel of flooring applicator and, if applicable, representative of flooring products manufacturer. Construction Manager and, if authorized by Construction Manager, Architect will attend.

C. **Agenda:** Review Drawings and Specifications for suitability for installation of wood flooring system. Review installation procedures and coordination required with

related Work. Discuss changes and deviations from Drawings and Specifications, if any, recommended or required.

1.07 PROJECT CONDITIONS

A. Project Conditions: Comply with requirements of wood flooring manufacturer.

1. Moisture generating activities: Install resilient flooring assemblies after other finishing operations, including gypsum board, plaster and painting, have been completed.
2. Overhead Work: Do not proceed with wood flooring installation until overhead construction, including painting, lighting, athletic equipment, HVAC and electrical Work are completed.
3. Temperature and humidity: Do not deliver flooring to the site until concrete, plaster and tile Work are dry. Do not proceed with installation of wood flooring until spaces have been enclosed and are at approximate humidity condition planned for occupancy. Comply with wood flooring manufacturer's criteria.
4. Floor slab tolerances: Ensure that concrete slab substrate is level and flat, within tolerances required by wood flooring manufacturer.
5. Floor slab water vapor pressure: If water vapor transmission exceeds 4.5 pounds per 1,000 square feet (2.20 kg per 100 square meters), conduct water vapor mitigation to reduce pressure to specified maximum. Comply with requirements specified in Section 07265 - Vapor Emission Reduction System.

B. Wood Conditioning: Conditioning period shall begin not less than seven days before sports-floor assembly installation, is continuous through installation, and continues not less than seven days after sports-floor installation.

1. Environmental conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive sports-floor assemblies during the conditioning period.
2. Wood conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
    a) Do not install sports-floor assemblies until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
    b) Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
3. Post-conditioning period: After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

1.08 WARRANTY

A. Extended Warranty: Furnish 3-year warranty signed by manufacturer and installer, agreeing to repair or replace wood flooring which shrinks, warps, cracks, or otherwise deteriorates excessively, or which buckles, delaminates or breaks its

anchorage or bond with substrate, or otherwise fails to perform as required, due to failures of materials or workmanship and not due to unusual exposure to moisture or other abusive forces or elements not anticipated for application.

PART 2 - PRODUCTS

2.01 GYMNASIUM HARDWOOD STRIP FLOORING SYSTEM

A. Specified Manufacturer: Connor Sports Flooring, (906/822-7311 or 800/833-7144).

B. Acceptable Manufacturers: Equivalent products of other manufacturers listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Action Floor Systems, Inc., LLC, Mercer, WI (715/476-3512 or 800/746-3512).
2. Superior Floor Company, Inc., Wausau, WI (715/842-5358).
3. Robbins Sports Surfaces, Cincinnati, OH (513/871-8988 or 800/543-1913).

C. Hardwood Strip Flooring System for Gymnasium: Alliance as manufactured by Connor Sports Flooring, with factory-assembled subfloor panels shall provide nominal 3/4" x 4" x 8' UL plywood nailers with 3/4" Rezill pads attached. Sleeper anchorage struts shall be nominal 1/2" x 4" UL grade plywood with pre-drilled anchor pockets.

D. Maple Flooring: SMARTWOOD hard maple flooring, , 25/32-inch x 2-1/4 inches, Second & Better Grade, Northern Hard Maple Flooring, TGEM, MFMA Grade marked and stamped.

1. Grade 2 Maple Flooring to be placed as indicated on the drawings.

E. Thresholds: 8-inch wide ribbed aluminum, for transition from other flooring to wood.

F. Fasteners:

1. Cushion Support Plates: 1-3/4 inches long steel drive (or length as dictated by site conditions - achieving a minimum 900 lbs pull-out strength) applied with an air driven or low velocity powder actuated tool.
2. Upper Nailer Strips: 7/8-inch coated subfloor staples.
3. Resilient Cushion: 2-inch staples.
4. Subfloor Cover: 2-inch staples.
5. Flooring fasteners: 1-3/4 inch barbed cleats or coated staples.

G. Outlet Box Covers: See Section 11485 - Gymnasium Equipment.

H. Field-Applied Finishes: Paints shall comply with requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113.

1. Sports Floor Sealer: Sport Tone Waterborne Sport Floor Sealer (2 coats) and Defense Waterborne Sport Floor Finish, 2 coats.
2. Markings paint: By Bona (USA) Sport (800) 872-5515 (game line paints). High-gloss enamel compatible with finish and recommended by manufacturers for this purpose. Colors are as follows unless otherwise selected by the Architect.
   a. Base White #1115
   b. Base Green #1114
   c. Base Black #1116
   d. Base Red #1113

2.02 ACCESSORY MATERIALS

A. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by resilient wood flooring assembly manufacturer.

B. Vapor Retarder: Black or white high-density polyethylene, cross-laminated, approximately 6.4 mils thick, Permalon X-100 by Permalon Division, Reef Industries, Inc., Houston, TX (800/231-2417), or equal. Unreinforced polyethylene will not be acceptable.

1. Adhesive tape for vapor retarder sheet joint sealing: Griffolyn Fab Tape, black double-sided asphalt based pressure-sensitive tape, produced by Reef Industries, Inc., Houston, TX (800/231-6074).
2. Adhesive for adhering vapor retarder to concrete perimeter: Spray-applied contact adhesive, compatible with sheet barrier and substrate materials, with excellent water-resistive qualities, Miracle Adhesives Corporation, Bellmore, NY (800/647-2253), Miracle 1330 Spray Adhesive, or equal.

C. Perimeter Base: 3-inches by 4-inches (76 mm by 100 mm) vented black or brown rubber, as selected by Architect.

D. Thresholds: For transition from floating wood flooring assembly to adjoining finish flooring, ribbed aluminum with clear anodized finish.

E. Temporary Protective Covering: Non-staining reinforced kraft paper (polyethylene sheeting shall not be used), overlaid with plywood or particle board sheets at traffic areas.

PART 3 - EXECUTION

3.01 SUBSTRATE CONDITIONS

A. Inspection: Prior to commencing installation, carefully inspect conditions under which wood flooring will be installed and completed adjoining Work. Verify that adjoining Work is complete to the point where installation of wood flooring may properly occur.

B. Moisture Emission: Test concrete slab on grade for water vapor emission and conduct mitigation as necessary to achieve vapor pressure not exceeding maximum allowed by wood flooring manufacturer.

1. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. (2.04 kg of water/92.9 sq. m) in 24 hours.
2. Comply with requirements specified in Section 07265 - Vapor Emission Reduction System, to mitigate excessive moisture vapor emission and achieve specified maximum water vapor pressure.

3.02 PREPARATION

A. Subfloor Cleaning: As necessary, clean subfloor to achieve conditions specified above. Vacuum subfloor surface.

B. Subfloor Filling and Leveling: Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.

1. Apply, trowel and float floor filler as necessary to provide smooth, flat, hard surface.
2. Fill all cracks wider than 1/8-inch.
3. Prohibit traffic until filler is cured.

C. Substrate Cleaning:

1. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
2. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Vapor Retarder Installation:

1. Lay vapor retarder sheet loose over concrete subfloor with edges lapped 6-inches and sealed with tape.
2. Turn up and seal sheet to face of wall adhesive mastic.
3. Apply adhesive to both surfaces, allow approximately 10 minutes to set up and then press together smoothly and evenly, without gaps or fishmouths, for full contact bond.

3.03 GYMNASIUM WOOD STRIP FLOORING INSTALLATION

A. Subfloor Installation: Layout subfloor assembly with sleepers at right angle to finish flooring.

1. Place subfloor panels to maintain spacing between panel edges as provided between pre-assembled sleepers.
2. Lap panel nailer ends onto designated cross struts, providing 1/4-inch end joint spacing and secure with nails or staples and construction adhesive.
3. Align subfloor panels to provide correct stagger of concrete anchors in adjacent rows. Provide 1-1/2" expansion voids at perimeter and at vertical obstructions.
4. Install solid blocking at doorways, under bleachers in stacked position and below portable goals.
5. Secure sleeper struts to concrete with steel anchors inserted into anchor pockets provided. Maintain proper anchor penetration with manufacturer's installation tools and procedures.

B. Gymnasium Wood Strip Flooring System Installation: Comply with manufacturer's installation instructions and recommendations. Make provisions for expansion and contraction.

1. Lay out flooring in directions and patterns as indicated on the Drawings.
2. Install maple flooring parallel to main playing court by power nailing or stapling at all sleeper locations. End joints shall be properly driven up.
3. Size joints between flooring strips to allow for intermediate expansion in accordance with ambient humidity conditions. Provide allowances for humidity from swimming pool in the facility.
4. Provided 1-1/2 inch expansion voids at perimeter and at all vertical obstructions.
5. Completed flooring shall be level, smooth and even.

3.04 FIELD FINISHING

A. Preparation: Prepare surfaces for applied finish in accordance with finish manufacturer's instructions and recommendations, to achieve a smooth, even, uniform surface. Allow installed flooring to acclimate to ambient conditions for at least 10 days before sanding.

B. Sanding: Comply with flooring manufacturer's sanding guidelines for specific products.

1. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups.
2. After sanding with drum sander, buff entire floor using 100 grit screenback or equal grit sandpaper, with a heavy-duty buffing machine.
3. Remove sanding dust by tack or vacuum.
4. Flooring shall present a smooth surface without drum stop marks, gouges, streaks or shiners.

C. Clear Finish Application: Apply seal and finish coats of finish system according to manufacturer's written instructions.

1. Sealer: Two coats.
2. Finish: Not less than two coats.

D. **Preparation for Markings and Sealer:** Prepare surfaces for applied finish in accordance with finish manufacturer's instructions and recommendations, to achieve a smooth, even and uniform finish.

1. Surface scuffing: Screen or steel wool and vacuum and/or tack between each coat, after preceding coat dries.
2. Flooring shall present a smooth surface without drum stop marks, gouges, streaks or shiners.
3. Water-based finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.

E. **Game Lines, Graphics and Markings Application:** As indicated on the Drawings.

1. Apply game-line and markings paint between final seal coat and first finish coat according to paint manufacturer's instructions.

    a. Layout game lines, graphics and markings as indicated on the Drawings.
    b. Provide game line dimensions as indicated on the Drawings.
    c. Provide colors as indicated on the Drawings.

2. Mask flooring to provide sharp edges. Where game lines cross, break minor game line at intersection; do not overlap lines.

F. **Final Clear Finish Coats:** Over game-lines, graphics and markings, not less than two coats.

G. **Finish Appearance:** Smooth, even gloss, without brushstrokes.

H. **Base and Transitions Installation:**

1. Resilient (venting) base: After completion of field finishing, install vented cove base anchored to walls with suitable adhesive. Provide pre-molded outside corners and neatly mitered inside corners.
2. Wood base and transitions: Before field finishing. Use headless nails. Fill and finish nail penetrations.

3.05 PROTECTION AND CLEANING

A. **Initial Protection:** Prevent traffic on finished floor for a minimum of 10 days.

B. **Temporary Covers:** Immediately after wood flooring Work is completed and finish is cured, cover flooring with a protective paper supplemented with clean plywood or wood particleboard, along traffic routes.

C. **Final Cleaning:** For Completion review, remove protective coverings, repair all damage to the flooring and clean and machine buff the entire floor area.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide resilient flooring and base complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Luxury vinyl tile.
2. Sheet vinyl flooring.
3. Rubber base.
4. Reducer strips.

B. Related Work Not In This Section:

1. See Vapor Emission Reduction System Section 07265.
2. See Door Hardware Section 08710 for raised metal thresholds. .

1.02 QUALITY ASSURANCE: Furnish products by the following manufacturers, in colors and textures as noted on the drawings.

Resilient Flooring	Rubber Base
Johnsonite	Johnsonite
Shaw Contract Group	Burke Rubber Company

1.03 SUBMITTALS:

A. Samples: Submit samples as required by the Architect.

B. Data: Submit copies of the flooring manufacturer's recommended standard dryness testing and required test results, and installation instruction for each type of flooring and base.

C. Moisture Testing Results: Submit written reports covering all moisture test results for record purposes only and not for approval.

D. Maintenance Materials: At completion, deliver following maintenance materials to the Owner in unopened factory containers or in sealed cartons with labels identifying the contents, matching installed materials. Include unopened cans of adhesives adequate to install the maintenance materials. The following quantities are to be verified with the Owner.

1. Sheet vinyl flooring, one piece 20-feet long by full roll width.
2. Luxury vinyl tiles, 5 unopened boxes of each color and pattern of tile.
3. Rubber base, at least 100 lineal feet with 10 end stop units, 15 outside corner units, and 15 inside corner units.

1.04 PRODUCT DELIVERY AND STORAGE: Deliver materials to site in the manufacturer's original unopened labeled containers. Store all resilient flooring at minimum 70 degrees F for 48 hours before installing.

1.05 JOB CONDITIONS: Do not start flooring installation until satisfactory moisture testing results are obtained and the Work of all other trades is substantially completed, including painting. Keep the areas of installation and materials at minimum 70 degrees F during and for 10 days after installation is completed. Maintain adequate ventilation for the removal of moisture and fumes. Verify conditions as specified by Owner.

1.06 WARRANTY: Furnish a written warranty to Owner for (5) Five years covering defects in materials or workmanship. Include trimming, relaying, or replacement as necessary, at no cost to Owner.

PART 2 - PRODUCTS

2.01 MATERIALS: Refer to Design drawings for selections.

Luxury vinyl tile:	Provide tile by “Shaw Contract Group” in colors and pattern as indicated on drawings and as selected by Architect.
Sheet vinyl:	Flooring by Johnsonite in colors and patterns as scheduled and as selected by Architect.
Rubber base:	Coved top-set and straight carpet types, 4" high base unless otherwise indicated, colors as selected, non-shrinking, 1/8" thick, with matching molded inside and outside corners and end stops.
Setting materials:	Provide Low VOC and Formaldehyde Free adhesives, compounds, adhesives, primers, and fillers of type and composition recommended by materials manufacturers, cut-back or equal types not containing water, factory labeled as to substrates on which application is approved by the manufacturer.
Reducer strips:	Extruded aluminum, edge-butting (not lapping) type.

PART 3 - EXECUTION

3.01 INSTALLATION: Conform to flooring manufacturer's recommended moisture testing and installation procedures and to requirements herein.

A. **Preparation**: Clean substrates of all deleterious substances and foreign matter. Fill cracks or depressions with latex leveling compound of the type recommended by flooring manufacturer for specific job conditions. Prior to laying flooring, test concrete for adequate dryness using the testing procedure conforming to flooring manufacturer's directions. Prime concrete floor slabs on grade; or other slabs if so recommended by flooring manufacturer.

B. **Luxury Vinyl Tile Installation**: Mix sufficient quantity of tiles to complete each area before laying to avoid color variations. Install flooring with tight joints, pattern direction as approved. Lay flooring square with axis of rooms, starting on center lines with tile joint or tile center so that border tiles are not less than 4" wide, accurately aligned. Install reducer strips at exposed edges of flooring and where shown. Cut flooring mechanically to produce square true edges. Closely

trim to pipes, jambs, outlets, and like conditions. Extend flooring under all cabinets and casework.

C. **Sheet Vinyl Flooring**: Fully bed in waterproof latex adhesive, all seams lapped and out in a manner that produces tight joints and preserves flooring pattern. Heat weld all seams and joints according to manufacturer's directions, free of gaps. Closely trim to pipes, jambs, outlets, and like conditions. Form with integral cove base over plastic fillets, finished at top with the approved metal trim.

D. **Base and Transition/Reducer Strip Installation**: Securely cement to backing in long lengths, minimum 18" long filler pieces, top and toe continuously contacting wall and floor, all joints tight. Provide factory-made internal and external corners, and end stops where cove base ends at jambs and offsets.

3.02 CLEANING, WAXING, AND COMPLETION: Keep all flooring and base surfaces clean as installation progresses. Clean flooring and base when sufficiently seated and remove foreign substances. Immediately prior to Owner's acceptance of building, apply wax on resilient tile flooring in accordance with manufacturer's instructions. Clean adjacent surfaces of adhesive or other defacement. Replace all damaged or defective Work to the original specified condition.

END OF SECTION

SECTION 09690

CARPET TILE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Carpet tile.

B. Accessories.

1.02 RELATED SECTIONS

A. Section 03300 - Cast in Place Concrete: Concrete substrate on which carpet tile shall be installed, steel troweled and finished smooth to tolerance according to carpet tile manufacturer's requirements.

B. Section 03310 - Under-Slab Vapor Barrier/Retarder: Vapor barrier, seam tape, and mastic for installation under concrete slabs.

C. Section 07265 - Vapor Emission Reduction System: Concrete slab-on-grade testing at carpet locations for moisture vapor emission, concrete surface preparation and application of water vapor control coating system.

D. Section 09650 - Resilient Flooring: Edge and transition strips at carpet tile; resilient base at carpet tile.

1.03 SUBMITTALS

A. Product Data: Each type of carpet tile material and installation accessory required. Include written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.

B. Shop Drawings: Indicate layout and placement of cut tiles. Indicate pile or pattern direction, start points, and locations and types of edge strips. Indicate columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tile. Show installation details at special conditions.

C. Samples: For verification purposes, in manufacturer's standard size, showing full range of colors, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Submit the following:

1. Full-size carpet tile: Each type required.
2. 12-inch-long samples: Each type exposed edge stripping and accessory item.

1.04 QUALITY ASSURANCE

A. **Carpet Tile Surface Burning Characteristics:** Provide carpet tile identical to that tested for the following fire performance characteristics, per test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify carpet tile with appropriate markings of applicable testing and inspecting organization.

1. Test Method: DOC FF 1-70.
2. Rating: Pass.

1.05 DELIVERY, STORAGE, AND HANDLING

A. **Delivery:** Deliver materials to project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

B. **Storage:** Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 deg F at least three days prior to and during installation in area where materials are stored.

1.06 PROJECT CONDITIONS

A. **Substrate Conditions:** No condensation on underside of 4-foot by 4-foot polyethylene sheet within 48 hours, fully taped at perimeter to substrate.

B. **Substrate Conditions:** pH of 9 or less when substrate wetted with potable water and pHydrion paper applied.

1.07 EXTRA MATERIALS

A. **Extra Materials:** Deliver extra materials as directed by City through Construction Manager. See Section 01770 - Contract Closeout Procedures for general requirements for extra materials.

1. Furnish extra materials matching products installed, packaged with protective covering for storage and identified with labels describing contents.
2. Furnish full-size carpet tile units equal in quantity to 10 percent of amount each type and color/pattern installed.

1.08 WARRANTY

A. **Extended Warranty:** Manufacturer's wear guarantee, 10 years from date established in Notice of Completion.

PART 2 - PRODUCTS

2.01 CARPET TILE

A. Specified Manufacturer: Shaw Contract Group, (706/278-3812 or 800/441-7429).

B. Acceptable Manufacturers: None identified. Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements if determined by Architect to be acceptable in color, pattern, performance characteristics and recycled materials considerations.

C. Carpet Tile, General: Modular carpet tile of tufted or bonded construction, free of visual blemishes, streaks, poorly dyed areas and manufacturing defects. Carpet materials and treatments shall be non-toxic, reasonably non-allergenic, and free of other recognized health hazards.

D. Carpet Tile Type C-1

1. Manufacturer: Shaw
2. Collection: Connected Threads
3. Style: Hand Stitch Tile 5T516
4. Color: RePurpose Teal 16554
5. Size: 9 x 36 inches
6. Installation pattern: Ashlar-See Finish Plan, Sheet A5.1
7. Construction: Multi-Level Pattern Loop
8. Fiber: Eco-Solution Q100 Nylon
9. Dye Method: 100% solution dyed
10. Pile thickness: 0.081 in.
11. Pile Density: 8,444 oz/yd3
12. Backing System: Synthetic/Eco-Worx Tile

E. Carpet Tile Type C-2

1. Manufacturer: Shaw
2. Collection: Connected Threads
3. Style: Quilted Tile 5T518
4. Color: RePurpose Teal 16554
5. Size: 9 x 36 inches
6. Installation pattern: Ashlar-See Finish Plan, Sheet A5.1
7. Construction: Multi-Level Pattern Loop
8. Fiber: Eco-Solution Q100 Nylon
9. Dye Method: 100% solution dyed
10. Pile thickness: 0.0128 in.
11. Pile Density: 5,344 oz/yd3
12. Backing System: Synthetic/Eco-Worx Tile

2.02 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by carpet manufacturer. Coordinate with concrete floor slab patching, filling and leveling products.

B. Carpet Edge Guard: Extruded or molded heavy-duty vinyl or rubber of size and profile indicated and as specified in Section 09650 - Resilient Flooring.

1. Size: Minimum 2-inch-wide anchorage flange.
2. Color: As selected by the Architect from manufacturer's premium colors.

C. Installation Adhesive: Water-resistant and non-staining, as recommended by carpet tile manufacturer and complying with flammability requirements for installed carpet tile.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Substrate Examination:

1. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8-inch in 10 feet and are ready to receive carpet.
2. Beginning of installation shall be interpreted to mean acceptance of substrate and project conditions for proper carpet installation.

B. Floor Slab Moisture Testing and Surface Sealing: Refer to Section 07265 - Vapor Emission Reduction System.

1. At locations to receive carpet tile flooring, perform anhydrous calcium chloride test, ASTM F 1869 to determine water vapor emission from concrete. Perform other tests as required by flooring manufacturer.
2. Prepare concrete surface and apply water vapor control coating system as specified in Section 07265 - Vapor Emission Reduction System.
3. Perform anhydrous calcium chloride test after concrete surface preparation to determine water vapor emission from concrete is acceptable for flooring installation.
4. If test yields unacceptable result, repeat concrete surface preparation, re-apply water vapor control system and retest until satisfactory results are achieved.

C. Alkalinity and Adhesion Testing: At locations to receive resilient flooring and carpet tile, perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing. Acceptable readings shall be as recommended by flooring manufacturer.

3.02 PREPARATION

A. Preparation: Clear away debris and scrape up cementitious deposits from concrete surfaces to receive carpet tile; apply sealer to prevent dusting.

B. Patching and Leveling Concrete Substrate: Patch holes and level to a smooth surface. If previous finish was chemically stripped, reseal concrete. Seal powdery or porous surfaces with sealer recommended by carpet tile manufacturer. Level and patch concrete using product as recommended by carpet tile manufacturer.

3.03 INSTALLATION

A. Carpet Tile Installation: Comply with manufacturer's recommendations for installation of carpet tile; maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.

1. Extend carpet tile under removable flanges and furnishings and into alcoves and closets of each space.
2. Install carpet edge guard where edge of carpet tile is exposed; anchor guards to substrate.
3. Install with pattern parallel to walls and borders. Perimeter modules shall be half-size or larger. Quarter turn unless noted to be monolithic.
4. Dry-fit sections of carpet tile prior to application of adhesive.

B. Adhesive Application: Apply adhesive uniformly to substrate in accordance with manufacturer's instructions. Butt edges tight to form seams without gaps.

C. Perimeter and Partial Tiles: Adhere perimeter tiles and partial tiles with a full spread of adhesive. Dry-fit cut tiles and apply adhesive to tile back after tile has been cut. In corridor areas, use full tiles down the center and cut perimeter tile borders.

3.04 CLEANING AND PROTECTION

A. Clean Up:

1. Remove and dispose of debris and unusable scraps. Comply with requirements specified in Section 01352 - Construction Waste Management and Disposal.
2. Vacuum carpet tile for initial cleaning using commercial machine with face-beater element. Remove soil. Remove protruding face yarn.
3. Remove adhesive from carpet tile surface with manufacturer's recommended cleaning agent.
4. Replace carpet tiles where soiling, adhesive and staining cannot be removed.

B. Periodic Cleaning: Vacuum carpet tile periodically to prevent accumulation of dust and soiling.

C. **Protection:** Comply with CRI 104, Section 15: Protection of Indoor Installation. Cover carpet during construction period with reinforce kraft paper when construction traffic is required to cross carpeted areas.

D. **Remedial Work:** Remove and replace damaged or improperly installed carpet.

E. **Final Cleaning:** Remove protective coverings and vacuum and remove all stains from carpet to like-new condition. Perform final cleaning prior to Completion review.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide and perform painting, complete.

A. Work In This Section: Principal items include:

1. Submittals.
2. Preparation of surfaces.
3. Painting of interior surfaces, except as otherwise specified.
4. Painting of exterior surfaces, except as otherwise specified.
5. Back priming of all wood trim.

B. Related Work Not In This Section:

1. Shop prime coats and factory finishes.
2. Painting specified as Work of other Sections.
3. Calking and sealants.

C. Surfaces Not To Be Painted:

1. Non-ferrous metal work (other than zinc-coated surfaces) and plated metal, unless particular items are specified to be painted.
2. Tile masonry.
3. Exterior surfaces that are factory finished.
4. Surfaces concealed in walls and above solid ceilings.
5. Non-metallic walking surfaces unless specifically shown or specified to be painted.
6. Factory finished surfaces.
7. Ceramic tile and plastic surfaces.
8. Resilient flooring and base.
9. Surfaces indicated not to be painted.
10. Surfaces specified to be finish painted under other Sections.

1.02 SUBMITTALS: Refer to Section 01300 for procedures.

A. List of Paint Materials: Prior to submittal of Samples, submit a complete list of proposed paint materials, identifying each material by manufacturer's name, product name and number, including primers, thinners, and coloring agents, together with manufacturers' catalog data fully describing each material as to contents, recommended usage, and preparation and application methods and all manufacturers warranties. Identify surfaces to receive various paint materials. Do not deviate from approved list.

B. Color Samples: Provide colors as noted on drawings. Using materials from approved list, prepare and submit 8-1/2" by 11" Samples of each complete opaque paint finish.

C. **Natural or Stain Finish Samples**: Prepare Samples on 12" squares of the same species and appearance of wood as used in the Work.

1.03 JOB CONDITIONS:

A. **Protection**: Protect all painting while in progress and cover and protect adjoining surfaces and property of others from damage. Exercise care to prevent paint from contacting surfaces not to be painted. During painting of exterior work, cover windows, doors, concrete, and other surfaces not to be painted.

B. **Examination of Surfaces**: Examine surfaces to be painted or finished under this Section and verify satisfactory condition; as specified in Section 01400, notify General Contractor and/or Owner and/or Architect in writing of unsatisfactory surfaces. Application of first coat of any finishing system constitutes acceptance of the surface by Painting Subcontractor. This does not relieve the Sub-Contractor from proper preparation of surfaces.

C. **Weather Conditions**: Apply paint to clean, dry, prepared surfaces. Do not apply exterior paint during rainy, damp, foggy, or excessively hot and/or windy weather. Arrange for temporary heat and ventilation required for interior painting.

D. **Precaution**: Place oily rags and waste in self-closing metal containers, removed from site at the end of each day. Do not let rags and waste accumulate.

1.04 WARRANTY: Refer to Section 01740. Furnish a written warranty against defects in labor for 1 year and 5 years for materials covering all loss of deterioration, color changes and other defects.

PART 2 - PRODUCTS

2.01 MATERIALS: Use the paint products of only one paint manufacturer unless otherwise specified or approved. In any case, primers, intermediate, and finish coats in each painting system must be products of same manufacturer, including thinners and coloring agents, except materials furnished with prime coat by other trades. To the maximum extent feasible, factory mix each paint material to correct color, gloss, and consistency for application. Dunn-Edwards Paint Company (No-VOC or Low VOC)) products specified designate intended types and qualities. Furnish paints from one of the following manufacturers; refer to Section 01600 regarding substitutions:

Dunn Edwards Benjamin Moore Frazee Sherwin Williams

PART 3 - EXECUTION

3.01 WORKMANSHIP: Apply painting materials in accordance with manufacturer’s instructions by brush or roller; spray painting is not allowed without specific approval in each case. Apply each coat at the proper consistency, free of brush or roller marks, sags, runs, or other evidence of poor workmanship. Do not lap paint on glass, hardware, and other surfaces not to be painted; apply masking as required. Sand between enamel coats.

3.02 PREPARATION: Properly prepare surfaces to receive finishes.

A. **Concrete**: Fill cracks, holes, and other blemishes with portland cement patching plaster or a stiff paste mixed of finish paint and fine sand, finished to match adjoining surface. Remove glaze by sanding, wire brushing, or light brush-off sandblasting. Neutralize alkali conditions according to paint manufacturer's directions. Dry the surfaces to receive breathing type latex paints at least two weeks, free of visible moisture. Dry the surfaces to receive oil, alkyd, or epoxy based paint until moisture content does not exceed 8% when tested with an electronic moisture-measuring instrument.

B. **Exterior Plaster**: Fill hairline cracks with portland cement patching material; report larger cracks to Architect for correction. Test and ensure plaster is sufficiently dry to receive the paint finish.

C. **Gypsum Wallboard**: Touch-up minor defects with spackle, sanded smooth and flush. Report other defects as specified.

D. **Shop Coated Metal**: Degrease and clean of foreign matter. Clean and spot paint field connections, welds, soldered joints, burned, or abraded portions with same material used in shop coats. After complete hardening, sand entire surfaces for coat to follow.

E. **Uncoated Ferrous Metal**: Degrease and clean of dirt, rust, mill scale, and other foreign matter using rotary brushes, solvent, or sandblasting. Remove pits and welding slag, and clean surfaces to bright metal before priming. Apply metal primer not more than three hours after preparation.

F. **Galvanized and Non-Ferrous Metal**: Degrease and clean of foreign matter. Apply specified pretreatment, and immediately apply primer paint.

G. **Enameled Woodwork**: Sand smooth with grain and dust clean. After priming, putty all nail holes, cracks, or other defects with putty matching color of finish paint. Cover knots and sappy areas with shellac or approved knot sealer. Sand each base coat smooth when dry. Back prime exposed exterior wood or wood type products.

H. **Transparent Finished Woodwork**: All exposed structural glulams and ceiling wood members are to be sanded smooth (removing all blemishes) with the grain and dust clean prior to staining Repair all defects with filler tinted to match stain or wood color, as required, after first coat of sanding sealer and remove all smears.

I. **Fixtures, Equipment, and Hardware Items**: Cooperate with other trades and coordinate removal of fixtures, equipment, and hardware as required to perform painting. Items to be removed include, without limitation: signs and graphics; switch and receptacle plates; escutcheons and like plates; all surface-mounted equipment; free-standing equipment blocking access; grilles and louvers at ducts opening into finished spaces; and other items as required and directed.

J. **Reveals**: In gypsum board, plaster and other surfaces reveals are to be painted to match adjacent color and finish, unless otherwise indicated or selected by the Owner. Obtain approval of the Architect prior to commencing work.

K. **Back Priming**: Refer to Section 06200 for requirements. Unexposed backside of all exterior siding, wood trim or other wood products shall be back primed and/or finished per manufacturer's recommendations.

L. **Surfaces Not Mentioned**: Prepare surfaces according to recommendations of the paint manufacturer's and as approved.

3.03 COATS AND COLORS: The number of paint coats specified to be applied are minimum. Ensure acceptable paint finishes or uniform color, free from cloudy or mottled areas and evident thinness on arises. "Spot" or undercoat surfaces as necessary to produce such results. Tint each coat a slightly different shade of finish color to permit identification. Conform to approved Samples. Obtain approval of each coat before applying next coat; otherwise apply an additional coat over entire surface involved at no additional cost to Owner.

3.04 EXTERIOR PAINTING:

A. **Concrete and Acrylic Plaster**:

1st Coat:	W6315 Flex-Prime
or	ESPR00 Eff-Stop Premium
2nd Coat:	SSHL10 Spartashield Acrylic Flat Paint
3nd Coat:	SSHL10 Spartashield Acrylic Flat Paint

B. **Metal - Ferrous**: Refer to one or both of the following Sections for coating requirements

1. Coating systems for exterior/interior metals in Section 09920.
2. Galvanized finishes on steel in Section 05081.

C. **Metal - Galvanized**: Refer to one or both of the following Sections for coating requirements

1. Coating systems for exterior metals in Section 09920.
2. Galvanized finishes on steel in Section 05081.

D. **Wood - Opaque Paint**:

1st Coat:	42-9 Apex
2nd Coat:	W 901 Permasheen
3rd Coat:	W 901 Permasheen

E. Exterior/Interior Structural Wood Framing, Trim and Ceiling - Semi-Transparent Stain Finish: (Glulams, ceiling and sunshade elements) Match Architect's Sample. All exposed wood members to be sanded smooth prior to staining, see 3.02 H in this section.

1st Coat:	#638 Arborcoat from Benjamin Moore
2nd Coat:	#638 Arborcoat from Benjamin Moore
3rd Coat: (If Required)	#638 Arborcoat from Benjamin Moore

3.05 INTERIOR PAINTING: Provide finishes as scheduled on Drawings or directed, gloss of finishes as scheduled or, where not scheduled, as designated by the Architect. Enamel for finish shall be of the following glosses:

Gloss Enamel	-	W7600V Spartagloss Gloss Enamel
Semi-Gloss Enamel	-	ENSO50 Enso Semi-Gloss (Zero VOC) Enamel
	Or	SPMA50 Suprema Semi-Gloss Enamel
Eggshell Enamel		ENSO30 Enso Egg-Shell (Zero VOC) Enamel
	Or	SPMA30 Suprema Egg-Shell Enamel

A. Flat - Drywall:

1st Coat:		VNPR00 Vinylastic Premium Sealer
2nd Coat:		ENSO10 Enso Flat (Zero VOC)
	Or	W420V Walltone Flat paint

B. Enamel - Drywall:

1st Coat:		IKPR00 Inter-Kote Premium
2nd Coat:		ENSO50 Enso Semi-Gloss (Zero VOC) Enamel
	Or	SPMA50 Suprema Semi-Gloss Enamel
3rd Coat:		ENSO50 Enso Semi-Gloss (Zero VOC) Enamel
	Or	SPMA50 Suprema Semi-Gloss Enamel

C. Enamel - Wood:

1st Coat:		IKPR00 Inter-Kote Premium
2nd Coat:		ENSO50 Enso Semi-Gloss (Zero VOC) Enamel
	Or	SPMA50 Suprema Semi-Gloss Enamel

D. Stain – Wood: Refer to paragraph above 3.04 (E) for material and application requirements

F. Oil Rubbed Finish: Apply Watco-Dennis Corp. "Danish Oil Finish" in strict accordance with manufacturer's published specifications with regard to surface preparation, staining or dye toning, application, number of coats, and liquid carnauba wax finish.

G. **Flat - Metal**: Treat galvanized metal with Krud Kutter, Clean and Etch.

1st Coat:		UGPR00 Ultra-Grip (for galvanized metal)
	Or	BRPR00-1-WH Bloc-Rust White (for ferrous metal)
	Or	BRPR00-1-RO Bloc-Rust Red Oxide (for ferrous metal)
2nd Coat:		SPMA10 Suprema Flat
3rd Coat:		SPMA10 Suprema Flat

H. **Enamel - Metal**: Treat galvanized metal with Krud Kutter, Clean and Etch.

1st Coat:		UGPR00 Ultra-Grip (for galvanized metal)
	Or	BRPR00-1-WH Bloc-Rust White (for ferrous metal)
	Or	BRPR00-1-RO Bloc-Rust Red Oxide (for ferrous metal)
2nd Coat:		Enamel, gloss as scheduled or designated
3rd Coat:		Enamel, gloss as scheduled or designated

Exception: On exposed surfaces of steel stairs and steel pipe or steel tubing railings, metal doors and frames apply 2 coats of W9 Syn-Lustro Semi-Gloss or W10 Syn-Lustro Gloss in lieu of the 2nd and 3rd Coats above.

3.06 MISCELLANEOUS PAINTING:

A. **Duct Interiors**: Paint with flat black fire-retardant paint to extent visible through grilles and registers in finished rooms and spaces.

B. **Weatherstripping or Sound Seals**: Paint exposed metal surfaces to match the door frame, whether or not unfinished, furnished with factory prime coat, or factory treated for paint adhesion.

C. **Mechanical and Electrical Work**: Carefully review Divisions 15 and 16 of the Specifications regarding painting performed thereunder and other painting required to be performed under this Section. Perform all painting of mechanical and electrical equipment and materials that are not expressly specified to be painted under Division 15 or 16, including required identification and color code painting, stenciling, and banding.

D. **Miscellaneous**: For any items not specifically shown or specified that require a paint finish, Contractor shall confer with Owner to determine if any additional painting is required, apply 3 coats of paint as directed.

3.07 CLEANING AND TOUCH-UP WORK: Make a detailed inspection of paint finishes after all painting is completed, remove spatterings of paint from adjoining surfaces, and make good all damage that may be caused by such cleaning operations. Carefully touch-up all abraded, stained, or otherwise disfigured painting, as approved, and leave entire painting in first-class condition.

END OF SECTION

SECTION 09920

COATING SYSTEMS FOR EXTERIOR METALS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. **Drawings and general provisions** of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, and related documents, apply to this section.

1.02 RELATED DOCUMENTS

A. **This Section includes shop** and field surface preparation and shop and field painting of all steel substrates, interior and exterior structural steel, miscellaneous support steel structures, non-passivated galvanized doors, door frames and non-passivated galvanized sheet metal flashing exposed to exterior conditions, including exposed materials inside Building 1 Boat Bays.

B. **Surface preparation, including** in the shop and applications of metal primer, and field applications of primers and finishes are specified in this Section.

C. **Drawings and general provisions** of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. **This Section includes surface** preparation and application of high-performance coating systems on steel, interior and exterior.

B. **Related Sections include the following:**

1. Section 09900 - Painting and Coating.

1.04 REFERENCES

A. **ASTM B 117**—Standard Practice for Operating Salt Spray (Fog) Apparatus

B. **ASTM D 3363**—Standard Test Method for Film Hardness by Pencil Test

C. **ASTM D 4060**—Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

D. **ASTM D 4141**—Standard Practice for Conducting Black Box and Solar Concentrating Exposures of Coatings

E. **ASTM D 4541**—Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

F. **ASTM D 4585**—Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation

G. **ASTM D 4587**—Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings

H. **ASTM D 5590**—Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

I. **ASTM D 4213** –Standard test Method for Scrub Resistance of Paints by Abrasion Weight Loss

J. **SSPC-SP-1** Solvent Cleaning

K. **SSPC-SP-2** Hand Tool Cleaning

L. **SSPC-SP-3** Power Tool Cleaning

M. **SSPC-SP-11** Hand and Power Tool Clean to Bare Metal

N. **SSPC-SP 6/NACE 3**—Commercial Blast Cleaning.

O. **ASTM D D6386**---Surface Preparation for Galvanized Surfaces

P. **SSPC-QP-1** Certified- Field Application to Complex Industrial and Marine Structures

Q. **SSPC-QP-3** Certified- Shop Painting Certification

1.05 SUBMITTALS

A. **See Section 01300** Submittals for submittal procedures.

B. **Provide manufacturer's data sheets on each product to be used, including:**

1. Preparation instructions and recommendations
2. Storage and handling requirements and recommendations
3. Installation methods
4. Operation and maintenance data
5. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.
6. Manufacturer’s certified test reports showing the substitute product(s) performance as outlined in Paragraph 2.3 shall be submitted.
7. Submit manufacturer’s Material Safety Data Sheets (MSDS) and other safety requirements.

C. **Shop Drawings:**

1. Submit a complete list of products proposed for use, including identifying product names and catalog numbers.

a) Arrange in same format as Schedule of Paint Finishes below.
b) Include applicable manufacturer's data and recommendations.

D. **Selection Samples:** For finish products specified, one complete set of color chips representing manufacturer's full range of available colors.

E. **Verification Samples:** For each finish product specified, two samples, minimum size 3 X 4 inch square, and representing actual product color.

F. **Manufacturer's Certificates:** Certify products meet or exceed specified requirements.

G. **Submit SSPC-QP1** Certification for Field Painting Contractor.

1.06 QUALITY ASSURANCE

A. **The work of this section shall** be provided in accordance with Section 01400 – Quality Assurance.

B. **Manufacturer's Quality Assurance:** Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.

C. **Applicator's Quality Assurance:**

1. Submit list of a minimum of 5 completed projects of similar size and complexity to this Work. Include for each project:
   a) Project name and location
   b) Name of owner
   c) Name of contractor
   d) Name of architect
   e) Name of coating manufacturer
   f) Approximate area of coatings applied
   g) Date of completion
      1) Applicator must be SSPC-QP-1 Certified- Field Application to Complex Industrial and Marine Structures.

D. **Mock-Up:** Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Prepare 10 foot by 10 foot mock-up for each coating system specified using same materials, tools, equipment, and procedures intended for actual surface preparation and application.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.
4. Retain mock-ups to establish intended standards by which coating systems will be judged.

E. **Pre-application Meeting:** Convene a pre-application meeting before start of application of coating systems. Require attendance of parties directly affecting

work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review the following:

1. Environmental requirements
2. Protection of surfaces not scheduled to be coated
3. Surface preparation
4. Application methods
5. Repair
6. Field quality control
7. Cleaning
8. Protection of coating systems
9. One-year inspection
10. Coordination with other work

1.07 DELIVERY, STORAGE, AND HANDLING

A. **Delivery:** Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:

1. Coating or material name
2. Manufacturer
3. Color name and number
4. Batch or lot number
5. Date of manufacture
6. Mixing and thinning instructions

B. **Storage:**

1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Do not use materials beyond manufacturer's shelf life limits.

C. **Handling:** Protect materials during handling and application to prevent damage or contamination.

D. **Store and dispose of solvent**-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 PROJECT CONDITIONS

A. **Maintain environmental conditions** (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. **Weather:**

1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.

2. Surface Temperature: Minimum of 5ºF (3 ºC) above dew point.
3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
5. Wind: Do not spray coatings if wind velocity is above manufacturer's recommended limit.

C. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with manufacturer's instructions.

D. Dust and Contaminants:

1. Schedule coating work to avoid excessive dust and airborne contaminants.
2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Products specified are manufactured by Tnemec Company Incorporated, 417 East Weber Avenue, Compton, CA 90222.Tel # 310-637-2363, local Contact: Tony Hobbs (310-804-3073), www.tnemec.com/tpc , and are specified as a standard of quality.

B. Materials specified herein shall not preclude consideration of equivalent or superior materials. Suggested equivalent materials or other substitutions shall be submitted to specifier for consideration in compliance with substitution procedures in Section 01600 of this Project Manual and include the following.

1. Submittals shall be provided no later than ten (10) days after Owner/Owner's Agent letter of Notice to Proceed.
2. Requests for substitution shall include evidence of satisfactory past performance in similar environment.
3. Substitutions will not be considered that change the number of coats or do not meet specified dry film thicknesses.
4. Manufacturer's certified test reports showing the substitute product(s) performance as outlined in Paragraph 2.03 shall be submitted.
5. After second submittal, Architect/Engineer/ Owner or Owner's Agent hourly rates will be charged to review further submittals.

C. Bidders desiring to use coatings other than those specified shall submit those with their proposal based on the specified materials, together with the information required in Paragraph 1.5 above, should alternate materials be accepted.

2.02 HIGH PERFORMANCE COATINGS GENERAL

A. Materials Compatibility: Provide shop and field primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.03 COATING SYSTEMS FOR STEEL

A. System: Steel/Zinc-Rich Urethane Primer/Epoxy/Fluoropolymer

1. Urethane Shop Primer, Zinc-Rich
   a) Tnemec Series 90-97 Tnemec-Zinc.
      1) Generic Type: Aromatic Urethane, Zinc-Rich
      2) Solids by Volume: 62%
      3) Zinc Dust Content: 83% by weight in dried film
      4) Volatile Organic Compounds, Unthinned: 2.68 lbs/gallon (321 grams/liter)
      5) Curing Time at 75ºF (24ºC)
         (a) To Handle: 1 hour
         (b) To Recoat: 4 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)
      6) Fielded Touch-Up Primer Urethane Primer, Zinc-Rich
         (a) Tnemec Series 94-H20 Hydro-Zinc
            (1) Generic Type: Aromatic Urethane, Zinc-Rich
            (2) Solids by Volume: 63%
            (3) Zinc Dust Content: 83% by weight in dried film
            (4) Volatile Organic Compounds, Unthinned: .8 lbs/gallon (96 grams/liter)
            (5) Curing Time at 75ºF (24ºC)
            (6) To Handle: 2 hour
            (7) To Recoat: 8 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)
      7) Epoxy, Pigmented Field Applied Intermediate Coat
         (a) Tnemec Series L69 Hi-Build Epoxoline II.
            (1) Generic Type: Polyamidoamine Epoxy
            (2) Finish: Satin
            (3) Solids by Volume: 67%
            (4) Volatile Organic Compounds, Unthinned: 0.82 lbs/gallon (98 grams/liter)
            (5) Curing Time at 70ºF (21ºC)
            (6) To Handle: 7 hours
            (7) To Recoat: 10 hours (For faster curing and low-temperature applications, add Series 44-700 Epoxy Accelerator.)
      8) Fluoropolymer, Field Applied Pigmented Topcoat
         (a) Tnemec Series 1071V Fluoronar.

(1) Generic Type: Advanced Thermoset Solution Fluoropolymer
(2) Finish: Semi-Gloss
(3) Solids by Volume:
(4) Volatile Organic Compounds, Unthinned: 0.81 lbs/gallon (97 grams/liter)
(5) Curing Time at 70ºF (21ºC)
(6) To Handle: 30 minutes
(7) To Recoat: 6–8 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)

B. System: Steel/Zinc Thermal sprayed metalized Finish/Epoxy/Fluoropolymer

1. Shop Primer- Zinc Thermal sprayed metalized finish
2. Field Touch-Up Primer Urethane Primer, Zinc-Rich
   a. Tnemec Series 94-H20 Hydro-Zinc
      1) Generic Type: Aromatic Urethane, Zinc-Rich
      2) Solids by Volume: 63%
      3) Zinc Dust Content: 83% by weight in dried film
      4) Volatile Organic Compounds, Unthinned: .8 lbs/gallon (96 grams/liter)
      5) Curing Time at 75ºF (24ºC)
         (a) To Handle: 2 hour
         (b) To Recoat: 8 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)
      6) Epoxy, Pigmented Field Applied Intermediate Coat
         (a) Tnemec Series L69 Hi-Build Epoxoline II.
            (1) Generic Type: Polyamidoamine Epoxy
            (2) Finish: Satin
            (3) Solids by Volume: 67%
            (4) Volatile Organic Compounds, Unthinned: 0.82 lbs/gallon (98 grams/liter)
            (5) Curing Time at 70ºF (21ºC)
            (6) To Handle: 7 hours
            (7) To Recoat: 10 hours (For faster curing and low-temperature applications, add Series 44-700 Epoxy Accelerator.)
      7) Fluoropolymer, Field Applied Pigmented Topcoat
         (a) Tnemec Series 1071V Fluoronar.
            (1) Generic Type: Advanced Thermoset Solution Fluoropolymer
            (2) Finish: Semi-Gloss
            (3) Solids by Volume:
            (4) Volatile Organic Compounds, Unthinned: 0.81 lbs/gallon (97 grams/liter)
            (5) Curing Time at 70ºF (21ºC)
            (6) To Handle: 30 minutes

(7) To Recoat: 6–8 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)

C. System: Galvanized Miscellaneous Steel/Touch –up Zinc Rich Urethane Primer/Self Crosslinking Hydrophobic Acrylic/HDP Acrylic Polymer

1. Field applied Urethane Touch-Up Primer, Zinc-Rich
   a. Tnemec Series 94-H20 Hydro-Zinc for field use/touch up
      1) Generic Type: Aromatic Urethane, Zinc-Rich
      2) Solids by Volume: 62%
      3) Zinc Dust Content: 83% by weight in dried film
      4) Volatile Organic Compounds, Unthinned: 0.8 lbs/gallon (96 grams/liter)
      5) Curing Time at 75ºF (24ºC)
         (a) To Handle: 2 hour
         (b) To Recoat: 8 hours (For faster curing and low-temperature applications, add Series 44-710 Urethane Accelerator.)
      6) Field applied Intermediate coat Self Crosslinking Hydrophobic Acrylic/, Pigmented Primer Coat
         (a) Tnemec Series 115 Uni Bond DF.
            (1) Generic Type: Self Crosslinking Hydrophobic Acrylic
            (2) Finish: Eggshell
            (3) Solids by Volume: 44%
            (4) Volatile Organic Compounds, Unthinned: 1.17 lbs/gallon (140 grams/liter)
            (5) Curing Time at 75ºF (24ºC)
            (6) To Handle: 3 hours
            (7) To Recoat: 4 hours
      7) Field applied HDP Acrylic Polymer, Pigmented Topcoat.
         (a) Tnemec Series 1029 Enduratone
            (1) Generic Type: HDP Acrylic Polymer
            (2) Finish: Low Semi-Gloss
            (3) Solids by Volume: 40%
            (4) Volatile Organic Compounds, Unthinned: 0.79 lbs/gallon (94 grams/liter)
            (5) Curing Time at 75ºF (24ºC)
            (6) To Touch: 30 minutes
            (7) To Recoat: 2 hours

2.04 PERFORMANCE CRITERIA

A. Fluoropolymer Performance Criteria:

1. Abrasion
   a. Method: ASTM D 4060, (CS-17 Wheel, 1,000 grams load)
   b. System: One coat thermoset fluoropolymer cured 30 days at 75ºF (24ºC)
   c. Requirement: No more than 103 mg loss after 1,000 cycles.

1) Exterior Exposure
   (a) Method: South Florida marine exposure
      (1) System: One coat polyamide epoxy and one coat thermoset fluoropolymer applied to SSPC-SP1 Solvent Cleaned aluminum and cured 30 days at 75°F (24°C).
      (2) Requirement: No blistering, cracking or delamination of film. No less than 82% gloss retention, no more than 15 units gloss loss and no more than 0.53 DE00 color change 36 months exposure, average of five colors.
   (b) Exterior Exposure
      (1) Method: ASTM D 4141, Method C (EMMAQUA)
      (2) System: One coat polyamide epoxy and one coat thermoset fluoropolymer (white) applied to SSPC-SP1 Solvent Cleaned aluminum and cured 30 days at 75°F (24°C).
      (3) Requirement: No blistering, cracking or chalking. No less than 84% gloss retention, no more than 13 units gloss loss and 0.41 DE Hunter color change after 3,500 M/J m2 EMMAQUA exposure.
   (c) Graffiti Resistance
      (1) Method: Following graffiti material applied to coating and allowed to dry for seven days.
      (2) System: One coat polyamide epoxy and one coat thermoset fluoropolymer applied to SSPC-SP7 Brush-Off Blast Cleaned steel and cured 30 days at 75°F (24°C).
      (3) Reagent: Xylene MEK
      (4) Acrylic Spray Paint Removal
      (5) Epoxy Spray Paint Removal
      (6) Markette Marker Removal
      (7) Ball Point Ink Removal
      (8) Crayon Removal
      (9) Lipstick Removal
      (10) Note: Some slight loss of gloss and/or softening may occur depending on the amount of effort required for removal of the graffiti and length of exposure of the underlying coating to the cleaning solvent.
   (d) Hardness
      (1) Method: ASTM D3363
      (2) System: One coat polyamide epoxy and one coat thermoset fluoropolymer applied to SSPC-SP7 Brush-Off Blast Cleaned steel and cured 30 days at 75°F (24°C).
      (3) Requirement: No gouging with an 8H or less pencil.

(e) Humidity
(1) Method: ASTM D 4585
(2) System: One coat polyamide epoxy and one coat thermoset fluoropolymer applied to SSPC-SP10 Near-White Metal Blast Cleaned steel and cured 7 days at 75ºF (24ºC).
(3) Requirement: No blistering, cracking, rusting or delamination of film after 3,000 hours exposure.

(f) QUV
(1) Method: ASTM D 4587 (UVA-340 Bulbs, Cycle 4:8 hours UV/4 hours condensation)
(2) System: One coat thermoset fluoropolymer (white) applied to SSPC-SP1 Solvent Cleaned aluminum and cured 30 days at 75ºF (24ºC).
(3) Requirement: No blistering, cracking, or chalking. No less than 61% gloss retention (31.4 units gloss change) and 1.89 DEFMC2 color change after 25,000 hours exposure.

(g) Salt Spray (Fog)
(1) Method: ASTM B 117
(2) System: One coat aromatic urethane zinc-rich, one coat polyamide epoxy and one coat thermoset solution fluoropolymer applied to SSPC-SP10/NACE 2 Near-White Metal Blast Cleaned steel and cured 7 days at 75ºF (24ºC).
(3) Requirement: No blistering, cracking, rusting or delamination of film.

No more than 1/32 inch rust creepage at scribe after 10,000 hours exposure.

2. HDP Acrylic Polymer-Performance Criteria
a. Abrasion
1) Method: ASTM D 4060, (CS-17 Wheel, 1,000 grams load)
2) System: Two coats of HDP Acrylic Polymer cured 30 days at 75ºF (24ºC)
3) Requirement: No more than 142 mg loss after 1,000 cycles.

(a) QUV
(1) Method: ASTM D 4587 (UVA-340 Bulbs, Cycle 4:8 hours UV/4 hours condensation)
(2) System: One coat HDP Acrylic Polymer, cured 8 days at 75ºF (24ºC).
(3) Requirement: No blistering, cracking, or elimination of film. No less than 100% gloss retention and no more than 0.45 DEFMC2 color change after 3,000 hours exposure.

(b) Salt Spray (Fog)

(1) Method: ASTM B 117
(2) System: One coat polyamide epoxy and two coats HDP Acrylic Polymer applied to SSPC-SP 6/NACE 3 Commercial Blast Cleaned steel and cured 30 days at 75ºF (24ºC).
(3) Requirement: No blistering, cracking, rusting or delamination of film.

No more than 1/8 inch rust creepage at scribe after 3,500 hours exposure.

(c) Scrubbability
(1) Method: ASTM D 4213
(2) System: One coat HDP Acrylic Polymer, cured 30 days at 75ºF (24ºC).
(3) Requirement: No more than 71 mg loss after 1,000 cycles.

(d) Algal resistance:
(1) Method: ASTM D 5590
(2) System: Two coats HDP Acrylic Polymer applied to glass fiber filter paper and cured 30 days at 75ºF (24ºC). Algal Suspensions: (1) Chlorella vulgaris (ATTC 14468), (2) Trentepholia (UTEX 429) and (3) Pscillatoria sp (ATTC 29135)
(3) Requirement: No more than traces of fungal growth (less than 10%) after three weeks continuous exposure.

(e) Fungal resistance:
(1) Method: ASTM D 5590
(2) System: Two coats HDP Acrylic Polymer applied to glass fiber filter paper and cured 30 days at 75ºF (24ºC). Spore Suspensions: (1) Aspergillus niger (ATTC 6275) and penicilium funculoseum (ATTC 11797) and (2) Aureobasidium pullutans (ATTC 9348)
(3) Requirement: No more than traces of fungal growth (less than 10%) after four weeks continuous exposure.

2.05 SURFACE PREPARATION

A. Bare Steel Shop Surface Preparation:

1. Clean surfaces as follows immediately prior to priming.
   a. SSPC-SP6 Commercial Blast Cleaning Surfaces to be coated shall be clean, dry, smooth and free from dust and foreign matter which will adversely affect adhesion or appearance. Provide a minimum surface profile of 1.5 mils angular anchor pattern.
   b. Prior to application of primer, steel surfaces shall be prepared as stated above to receive coating system or in compliance with

manufacturer's recommendations and specifications of Steel Structures Painting Council.

B. Non-Passivated, Galvanized Sheet metal flashing, Miscellaneous Galvanized steel, Galvanized Door frames and doors:

1. Clean surfaces as follows immediately prior to priming.
2. Prepare Non-Passivated galvanized steel and nonferrous metal surfaces in accordance with ASTM D 6386-Surface Preparation of Galvanized Surfaces and manufacturer's instructions.
   a. Ensure surfaces are dry.
      1) Remove visible oil, grease, dirt, dust, protective mill coatings, and other soluble contaminants in accordance with SSPC-SP 1 or manufacturer's instructions as specified for coating system. Follow initial cleaning in the Field with one of the following Method:
      2) Chemically Treat with one of the following products to etch the Non-Passivated galvanized surface to be coated: Krud Kutter ME or Clean & Etch by Great Lakes Laboratory. Reference ASTM D 6386-99 (2005) Section 5.4.2.
      3) Note: is imperative to follow the above Manufacturers' recommendations in order to provide an effectual preparation.

2.06 SPOT REPAIR OF BARE AREAS, WELDS, DAMAGED ZINC RICH PRIMER OR GALVANIZED STEEL SURFACES

A. Spot prepare areas in accordance with SSPC-SP-11 Power Tool Clean to Bare Metal.

2.07 ACCESSORIES

A. Coating Application Accessories:

1. Accessories required for application of specified coatings: Provide in accordance with coating manufacturer's instructions, including thinners.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.

B. **Immediately remove coatings** that fall on surrounding areas and surfaces not scheduled to be coated.

3.03 SURFACE PREPARATION OF STEEL

A. **Prepare steel surfaces in** accordance with manufacturer's instructions.

B. **Fabrication Defects:**

1. Correct steel and fabrication defects revealed by surface preparation.
2. Remove weld spatter and slag.
3. Round sharp edges and corners of welds to a smooth contour.
4. Smooth weld undercuts and recesses.
5. Grind down porous welds to pinhole-free metal.
6. Remove weld flux from surface.

C. **Ensure surfaces** are dry.

D. **Remove visible oil**, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.

E. **Abrasive Blast-Cleaned Surfaces:** Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.

F. **Shop Primer:** Prepare shop primer to receive field coat in accordance with manufacturer's instructions.

3.04 APPLICATION

A. **Apply coatings in accordance** with manufacturer's instructions.

B. **Mix and thin coatings,** including multi-component materials, in accordance with manufacturer's instructions.

C. **Keep containers closed** when not in use to avoid contamination.

D. **Uniformly apply coatings** at spreading rate required to achieve specified DFT.

E. **Apply coatings to be** free of film characteristics or defects that would adversely affect performance or appearance of coating systems.

F. **Stripe paint with brush** critical locations on steel such as welds, corners, and edges using specified primer.

3.05 FIELD QUALITY CONTROL

A. **Inspector's Services:**

1. Verify coatings and other materials are as specified.

2. Verify surface preparation and application are as specified.
3. Verify DFT of each coat and total DFT of each coating system specified using wet film and dry film gauges.
4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
5. Report:
   a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
   b. Report nonconforming work not corrected.
   c. Submit copies of report to Architect and Contractor.

B. Manufacturer's Technical Services: Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.

3.06 CLEANING

A. Remove temporary coverings and protection of surrounding areas and surfaces.

B. Remove overspray and splatter, if any.

3.07 PROTECTION OF COATING SYSTEMS

A. Protect surfaces of coating systems from damage during construction.

B. Touch-up, or repair damaged products before Substantial Completion.

3.08 ONE-YEAR INSPECTION

A. Owner will set date for one-year inspection of coating systems.

B. Inspection shall be attended by Owner, Contractor, Architect, and manufacturer's representative.

C. Repair deficiencies in coating systems as determined by Architect in accordance with manufacturer’s instructions.

3.09 SCHEDULES

A. Exterior and Interior Exposed Steel, Semi-Gloss Fluoropolymer Finish

1. Surface Preparation (Shop): SSPC-SP6/NACE 3 Commercial Blast Cleaning.
2. Shop Primer: Tnemec Series 90-97 Tneme-Zinc at 2.5 to 3.5 mils DFT.
3. Field Spot Touch-up Surface preparation: SSPC-SP-11 Power Tool Clean to Bare metal
4. Field Spot Touch Up Primer: Tnemec Series 94-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.
5. Intermediate Coat (Field): Tnemec Series L69 Hi-Build Epoxoline II at 2.0 to 4.0 mils DFT.

6. Finish Coat (Field): Tnemec Series 1071V Fluoronar at 2.0 to 3.0 mils DFT.
7. Total Dry Film Thickness: 6.5 to 10.5 mils

B. Exterior and Interior Fabricated Steel, Semi-Gloss Fluoropolymer Finish

1. Surface Preparation (Shop): In accordance with Manufacturer's recommendation.
2. Shop Primer: Zinc Thermal Sprayed metalized primer.
3. Field Spot Touch-up Surface preparation: SSPC-SP-11 Power Tool Clean to Bare metal
4. Field Spot Touch Up Primer: Tnemec Series 94-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.
5. Intermediate Coat (Field): Tnemec Series L69 Hi-Build Epoxoline II at 2.0 to 4.0 mils DFT.
6. Finish Coat (Field): Tnemec Series 1071V Fluoronar at 2.0 to 3.0 mils DFT.
7. Total Dry Film Thickness: 6.5 to 10.5 mils
8. Non-Passivated,Galvanized Miscellaneous steel such as handrails, Galvanized Doors, Door Casing and Sheet Metal Flashing, Semi-Gloss Finish:
9. Surface Preparation: Prepare in accordance with ASTM D 6386 and manufacturer's recommendations for Chemical treating.
10. Field Spot Touch-up Surface preparation: SSPC-SP-11 Power Tool Clean to Bare metal
11. Field Spot Touch Up Primer: Tnemec Series 94-H2O Hydro-Zinc at 2.5 to 3.5 mils DFT.
    a. Field Primer: Tnemec Series 115 Uni Bond DF at 2.0 to 3.0 mils DFT.
        1) Field Finish Coat: Tnemec Series 1029 Enduratone at 2.0 to 4.0 mils DFT.
        2) Total Dry Film Thickness: 4.0 to 7.0 mils.

END OF SECTION

SECTION 09951

WALL COVERINGS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide vinyl fabric wall covering as indicated, specified, and required.

A. Work in this Section:

1. Vinyl fabric wall coverings.

B. Related Work Not in This Section

1. Acoustical wall panels.

1.02 SUBMITTALS: Refer to Section 01300 for procedures.

A. **Samples**: Submit for preliminary selection of colors, textures, patterns, and finishes. Label with name of manufacturer, identification, and room or space in which to be used.

B. **Job Samples**: Prior to installation, submit three 5" by 7" swatches from each approved wall covering material to be installed.

C. **Certificate**: Submit a written certificate that coverings installed are the same as those in the approved submittals.

1.03 PRODUCT DELIVERY: Deliver materials to the site in unopened factory packages labeled with manufacturer's name and identification of contents.

PART 2 - PRODUCTS

2.01 VINYL WALL COVERING: Provide vinyl wall coverings colors and styles as noted on drawings or as selected by Architect, meeting or exceeding requirements of the Architect, all fabrics shall be labeled flame spread rating of Class I (0 to 25) per ASTM E84, all conforming to Code.

A. **Weight**: Provide weight fabric, ounces per square yard, as scheduled on drawings or selected by Architect.

B. **Primers and Adhesives**: As supplied or recommended by the covering manufacturer, fungus and mildew resistant type.

C. **Fabric Sealer**: Provide fabric wall covering sealer as approved by the Architect. Sealer must comply with flame spread guidelines as indicated in Code.

PART 3 - EXECUTION

3.01 PREPARATION: Verify surface conditions as specified in Section 01400. Use an electronic instrument to check backing surface moisture, which shall not exceed manufacturers' limits. Report all surface defects which will show through wall covering to Architect for correction. Prime surfaces with adhesive or other primer according to covering manufacturer's directions.

3.02 INSTALLATION: By the best practices known to the trade, performed by skilled and experienced mechanics, conforming to manufacturers' recommendations.

A. **Cutting**: Mark both ends of fabric as it is cut from the roll to indicate the pattern direction. Apply in the same sequence as cut from the roll so pattern direction is correct.

B. **Sizes**: Apply wall covering material in full roll widths except as required to suit job conditions. Install the material full height in one piece. Horizontal seams are not permitted.

C. **Seams**: Lap and double cut all seams, jointing straight and plumb, using a sheet metal backing strip during cutting to prevent scoring of backing. Extend wall covering around angles and corners 12" minimum. Factory edge seams or corner seams are not acceptable. Remove excess adhesive as installation progresses.

D. **Reveals**: Secure fabric into reveals with full adhesion of contact cement.

E. **Finished Surfaces**: Free of blisters or loose areas, wrinkles, open or ridged seams, color or pattern variation, and other defects.

3.03 FIELD QUALITY CONTROL: Notify the Architect when all installation is complete. Architect will make a detailed inspection of the finished surfaces with special attention to seams. Remove and replace materials found to be improperly applied as directed, at no extra cost to Owner.

3.04 CLEANING: Thoroughly clean the surfaces and remove all visible adhesive.

END OF SECTION

SECTION 09955

FIBERGLASS REINFORCED POLYESTER PANELS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide fiberglass reinforced polyester panels (FRP) complete as indicated, specified and required.

1.02 SUBMITTALS:

A. **Samples**: Submit to Architect for approval 12" x 12" sample of FRP board and 12" length of trim cap. Submit in accordance with Section 01300 Submittals.

1.03 PRODUCT HANDLING: Deliver product to jobsite with all finish surfaces protected against scratches, stains and all damage. Lay panels and trim flat in original containers raised off floor away from moisture.

PART 2 - PRODUCTS

2.01 FIBERGLASS REINFORCED POLYESTER (F.R.P.) PANELS: Panels shall be 4’ x 8', 9’ or 10' X 3/32" or as indicated on drawings, fiberglass reinforced polyester panels and color as scheduled on drawings. FRP panels shall be installed with 8' or 10' with harmonizing moldings, adhesive and sealant as supplied by Marlite or approved equal by Kemlite or Nudo. Material must be applied strictly in accordance with the printed installation instructions provided. Surface texture to be smooth with finish color to be white or as indicated on drawings or selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION: Install per manufacturer's instructions, including sealant in moldings. Prepare all surfaces for proper installation against clean untextured smooth sanded taped gypsum board. Room temperature during installation must by 60 degrees or above. Place FRP board before vinyl base is installed. Panels shall be flush, level and plumb. All trim and joints shall be level, plumb and true. Use large 4 x 10 or 4 x 8 panels so as to create no seams in small rooms. (10'-0" dimension or less). In larger rooms, coordinate panels seams with Architect.

3.02 CLEAN-UP: Clean panels and trim for final acceptance with products as recommended by manufacturer. Protect from damage until construction is complete. Remove all scrap, debris and packaging from site.

END OF SECTION

SECTION 10162

TOILET PARTITIONS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide (HDPE) high density polyurethane product toilet partitions complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Floor mounted overhead braced toilet partitions.
2. Wall-mounted urinal screens.

B. Related Work Not In This Section:

1. Toilet accessories.
2. Concealed backing or blocking in walls.

1.02 SUBMITTALS: Refer to Section 01300 for procedures.

A. Shop Drawings: Submit Shop Drawings showing dimensioned layouts, the required location of backing in walls, connections to ceiling supports, preparation and reinforcing of panels to receive various toilet accessories and grab bars, and erection diagrams.

B. Product Data: Submit catalog data for each hardware item and fitting.

C. Samples: Submit Samples of finish in designated colors as scheduled on drawings or as selected by Architect for approval prior to fabrication.

D. Certificate: Submit manufacturer's certificate attesting that, treatment, and finish provided conform to requirements specified and ADA requirements.

PART 2 - PRODUCTS

2.01 TOILET COMPARTMENTS: Scranton Products, (www.scrantonproducts.com) Floor Mounted Overhead Braced Series solid HDPE compartments (Hiny Hiders) or approved equal, compartment finish color(s) as scheduled on drawings and as selected by the Architect.

A. Construction: As standard with manufacturer, modified as necessary to suit the installation requirements, 1" finished thickness for doors, stiles, wall posts, and panels, with no hardware exposed on exterior compartments. Provide reinforced cutouts in partitions where required for toilet accessories. Provide concealed reinforcements for grab bar connections to panels, designed for at least 300 pound shear load. Provide a stainless steel continuous anti-grip profile channel to cap over top of pilasters.

B. **Hardware**: Provide stainless steel commercial hardware as selected by the Architect with the compartment manufacturer. Equip doors with continuous hinges, coat hook and bumper, latch bolt, and combination stop and keeper. Assemble compartments with continuous wall stainless steel brackets matching hardware. Use theft-proof fasteners of matching materials. Provide U-shaped or loop type hardware at accessible stalls. Toilet stalls for disabled persons shall have slide bolt door latch, wire pulls both sides of the door and self closing hinges. Door hardware shall be mounted at 30” to 44” above finished floor. Disabled doors at front entry stalls shall have 32”, and side entry stalls shall have 34” minimum clear width when the door is open 90 degrees. Door pulls are stainless steel.

C. **Urinal Screens**: Same construction, thickness, and finish as partitions, 18" by 42" size unless otherwise indicated, installed with continuous stainless steel brackets secured with matching machine screws into concealed backing.

PART 3 - EXECUTION

3.01 INSTALLATION: Form and assemble work plumb, square, and in true plane without warp or wind, connections made tight and secure. Remove punctured or scratched material and provide conforming material. Leave the entire installation clean and free of oil, grease, handmarks, or other foreign matter, and with hardware adjusted for correct operation.

END OF SECTION

SECTION 10200

LOUVERS AND VENTS

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide louvers and vents complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Extruded aluminum louvers.
2. Formed sheet metal louvers.
3. Formed sheet metal door louvers.

B. Related Work Not In This Section:

1. Caulking and sealants.
2. Paint or metal finishes, factory applied
3. Air-handling louvers connected to ductwork.
4. Blank-off plates for air-handling louvers.
4. Louvers in hollow metal doors and frames.

1.02 QUALITY ASSURANCE:

A. Performance: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500.

B. AMCA Certification: Where indicated, provide louvers with AMCA Certified Ratings Seal evidencing that product complies with above requirements.

1. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

C. Field Measurements: Verify size, location and placement of louver units prior to fabrication, wherever possible.

D. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.03 SUBMITTALS: Refer to Section 01300 for procedures.

A. Product Data: If requested by Owner submit manufacturer’s specifications; certified test data, where applicable; and installation instructions for required products, including finishes.

B. **Shop Drawings**: If requested by Owner and/or Architect submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. **Samples**: Submit six-inch square of each required aluminum finish. Prepare samples on metal of the same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two or more units in each sample showing the limits of such variations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. **Available Manufacturers**: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Airline Products Company
The Airolite Company
Air Louvers, Inc.
Construction Specialties, Inc.
Industrial Louvers, Inc.
Ruskin Manufacturing Company

2.02 MATERIALS:

A. **Galvanized Sheet Steel**: ASTM A526 and A527, with ASTM A525, G90 zinc coating, mill phosphatized.

B. **Cold-rolled Sheet Steel**: ASTM A366, Class 1, matte finish.

C. **Aluminum Sheet**: ASTM B209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to provide required finish.

D. **Aluminum Extrusions**: ASTM B221, Alloy 6063-T52.

E. **Fastenings**: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gauges and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

F. **Anchors and Inserts**: Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

G. **Bituminous Paint**: SSPC-Paint 12 (cold-applied asphalt mastic).

2.03 FABRICATION, GENERAL:

A. **Provide** louvers and accessories of design, materials, sizes, depth, arrangement and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage, where applicable (for adjustable units, if any); strength; durability; and uniform appearance.

B. **Fabricate** frames including integral sills to suit adjacent construction with tolerances for installation including application of sealants in joints between louvers and adjoining work, where applicable.

C. **Include** supports, anchorages, and accessories required to achieve a complete assembly.

D. **Provide** vertical mullions of type and at spacings indicated but not further apart than recommended by manufacturer of seventy-two inch on center whichever is less. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

E. **Provide** sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

F. **Join** frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

2.04 STATIONARY EXTRUDED ALUMINUM WALL LOUVERS:

A. **Horizontal Drainable Blade Louvers**: Units designed to collect and drain water to exterior at sill by means of gutters in front edges of blades, and channels in jambs and mullions. Furnish units with extrusions not less than 0.081-inch thick, of depth and sizes indicated, complying with following performance requirements.

1. Free Area: Not less than 50 percent for a 48" x 48" size.
2. Static Pressure Loss: Not more than 0.15-inch of water gauge at airflow of 1050 fpm free area velocity in intake direction.
3. Water Penetration: Note more than 0.052 ounces per square foot of area at an airflow of 1000 fpm free area velocity.
4. AMCA Certification: Furnish units bearing AMCA Certified Ratings Seal.
5. Furnish units complying with following performance requirements.

2.05 STATIONARY FORMED SHEET METAL LOUVERS:

A. **Horizontal Drainable Blade Louvers**: Unit designed to collect and drain water to exterior at sill by means of gutters on front edges of louver blades and channels in jambs and mullions; of depth and sizes indicated, fabricated from the following metal:

1. Aluminum: Not less than 14 gauge.

B. Door Louvers: Refer to Section 08110 Steel Doors and Frames

2.06 ADJUSTABLE LOUVERS:

A. Operation: Provide adjustable blade louvers (AdjLvr) at locations and of type indicated; with manufacturer's recommended bearings and operating mechanisms to suit louver size and method of operation.

1. Hand operation with spring, chain, wall bracket, and 160 degree F (71 degrees C) fusible link.

2.07 LOUVER SCREENS: Provide removable screens for exterior louvers where indicated. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated. Provide rewireable frames consisting of formed or extruded metal with a driven spline or insert for securing screen mesh. Use insect screen where indicated, of the following:

A. Locate Screens on inside face of louvers, unless otherwise indicated. Secure screens to louver frames with machine screws, spaced at each corner and at twelve inch on center between.

1. Insect mesh, 0.063-inch aluminum wire.

2.08 FIRE RATED LOUVERS: If required by Code provide tightly fitted spring loaded automatic closing louvers with operable blades equipped with smoke activated closing device.

2.10 METAL FINISHES: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are assembled. Protect finishes on exposed surfaces with protective covering, prior to shipment. Remove scratches and blemishes from exposed surfaces which will be visible after completing finishing process. Provide colors or color matches as indicated, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

A. Aluminum Finishes:

1. Color Anodized Finish: AA-C22A42 (medium matte etched finish with 0.7 mil minimum thick integrally colored anodize coating). Apply protective coating of clear acrylic lacquer, not less than 0.50 mill dry film thickness.
2. Fluorocarbon Paint Finish: Apply in accordance with Section 05900 and manufacturers specifications for each application.

B. Ferrous Metal Finishes:

1. Preparation: Clean surfaces of dirt, grease and loose rust or mill scale, including items fabricated from galvanized steel, if any. Apply finish to

surfaces of fabricated and assembled units, whether exposed or concealed when installed, after pretreating with a conversion coating suited to organic coating applied over it.

2. Factory-Primed Finish: Where painting after installation is indicated (not work of this section), apply air-dried primer immediately following cleaning and pretreatment.

PART 3 - EXECUTION

3.01 PREPARATION: Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION: Locate and place louver units plumb, level and in proper alignment with adjacent work.

A. **Use Concealed Anchorages** wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.

B. **Form Tight Joints** with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers, as indicated.

C. **Repair Finishes** damaged by cutting, welding, soldering and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in the field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

D. **Protect** galvanized and non-ferrous metal surfaces from corrosion of galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

E. **Provide** concealed gaskets, flashings, joint fillers, and insulation, and install as work progresses to make the installations weathertight. Louvers install in exterior plaster walls will be installed with moiststop or equivalent products window installation fashion as detailed on drawings.

F. **Refer to Section 07900** for sealants in connection with installation of louvers.

END OF SECTION

SECTION 10240

LOUVERED SUNSHADES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Louvered sunshade** Angular bar grilles.

1.02 RELATED SECTIONS

A. **Section 05090 - Anchors and Fasteners:** General requirements for anchors and fasteners to building substrates.

B. **Section 05900 – Metal Finishes:** Factory-applied paint finish on louvered sunshade grilles.

C. **Section 05120 - Structural Steel:** Supporting structure.

1.03 PERFORMANCE REQUIREMENTS

A. **Structural Performance:** Provide exterior louvered sunshade grilles capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of grille components including blades, frames, and supports; noise or metal fatigue caused by louvered sunshade grille component rattle or flutter; or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward or outward.
2. Thermal Movements: Provide louvered sunshade grilles 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, and other detrimental effects:
   a) Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.04 SUBMITTALS

A. **Product Data:** Submit manufacturer's specifications, technical data, and installation instructions for required products, including finishes.

B. **Shop Drawings:** For louvered sunshade grille units and accessories. Include plans; elevations; sections; and details showing profiles, angles, and spacing of elements. Show unit dimensions related to wall openings and adjacent construction; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

1. For installed louvered sunshade grilles indicated to comply with design loadings, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: Of each type of metal finish required, prepared on Samples of same thickness and material indicated for final Work. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.05 QUALITY ASSURANCE

A. Welding Standards:

1. Comply with AWS D1.2, "Structural Welding Code--Aluminum."
2. Comply with AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

C. Field Measurements: Verify size, location and placement of screen units prior to fabrication, wherever possible.

D. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, mechanical attachment and field assembly of units. Pre-assemble units in ship to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

E. Extended Warranty: Provide written warranty to City covering paint finish for period of 20 years from date established by Notice of Completion.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify supports and adjoining construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. **Specified Manufacturer:** The Airolite Company, OH (local representative, Specialty Building Components, Pico Rivera, CA; 562/821-0170).

B. **Acceptable Manufacturers:** Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements. Slight manufacturing variances will be accepted if general appearance, materials, finishes, weathering and air flow characteristics are equivalent to those specified.

1. Construction Specialties, Inc. (C/S), (800/447-1983).
2. Industrial Louvers Inc., (763/972-2981).

2.02 MATERIALS

A. **Aluminum Extrusions:** ASTM B 221 (ASTM B 221M), alloy 6063-T5 or T-52.

B. **Aluminum Sheet:** ASTM B 209 (ASTM B 209M), alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. **Aluminum Castings:** ASTM B 26/B 26M, alloy 319.

D. **Clip Angles:** Structural grade aluminum.

E. **Fasteners:** Same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

F. **Anchors and Inserts:** Type, size, and material required for loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as needed for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

G. **Bituminous Paint:** Cold-applied asphalt mastic complying with SSPC-Paint 12 but containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.03 FABRICATION, GENERAL

A. Fabrication, General: Assemble grilles and screens in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1. Where height of grille and screen units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates and without interrupting grille or screen pattern.
2. Maintain equal blade or bar spacing, including separation between blades and frames at head, sill and jambs, to produce uniform appearance.
3. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining materials' tolerances, and perimeter sealant joints.
4. Include supports, anchorages, and accessories required for complete assembly.
5. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer. At horizontal joints between louver grille units, provide horizontal mullions, unless continuous, uninterrupted vertical appearance are indicated.
6. Join frame members to one another and blade or bar components with fillet welds concealed from view, unless otherwise indicated or size of grille or screen assembly makes concealed bolted connections between frame members necessary.

2.04 LOUVERED SUNSHADE GRILLES

A. Grille Construction: Provide louvered sunshade grilles with extruded-aluminum frames and bars or blades, as indicated on the Drawings and specified below.

B. Louvered Sunshade Angular Bar Grilles: As follows:

1. Frame Surround Material Thickness: 1/4-inch, unless otherwise indicated.
2. Frame Surround Depth: 3 inches, unless otherwise indicated.
4. Horizontal Blade Thickness: 3/16-inch, unless otherwise indicated.
3. Horizontal Blade Spacing: 3 inches o.c., unless otherwise indicated.
4. Horizontal Blade Angle: 30 degrees, unless otherwise indicated.
6. Vertical Stiffener Spacing: 24-30 inches o.c., unless otherwise indicated.
7. Vertical Stiffener Size: 1” wide x 1/8” thick, unless otherwise indicated.

2.05 GRILLE FINISH

A. High-Performance Organic Coating Finish: As specified in Section 05900 – Metal Finishes. Finish louver sunshade grilles after assembly. Color as noted in the drawings.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordination: 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.

3.02 INSTALLATION

A. Installation: Comply with manufacturer's instructions and recommendations.

1. Locate and place louvered sunshade grille units level, plumb, and at indicated alignment with adjacent work.
2. 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.
3. Form closely fitted joints with exposed connections accurately located and secured.
4. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
5. Use isolation tape where aluminum comes in contact with steel, concrete or masonry.

B. Touch-Up: Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

C. Dissimilar Metals: Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

3.03 ADJUSTING, CLEANING AND PROTECTING

A. Cleaning:

1. Periodically clean exposed surfaces of louvered sunshade grilles that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
2. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

B. Protecting: Protect louvered sunshade grilles from damage during construction. Use temporary protective coverings where needed and approved by grille manufacturer. Remove protective covering at the time of Substantial Completion.

C. Restoration: Restore louvered sunshade grilles 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. Clean and 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

SECTION 10350

FLAGPOLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Aluminum groundset flagpoles**, quantity as indicated on the Drawings.

B. **Flagpole fittings** and accessories.

C. **Setting** sleeves.

1.02 RELATED SECTIONS

A. **Section 03300 - Cast in Place Concrete:** Concrete for flagpole foundations.

1.03 PERFORMANCE REQUIREMENTS

A. **Design Criteria**: Provide flagpoles and installations constructed in compliance with California Building Code (CBC), Chapter 16, and NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles." Provide flagpole and anchorage system to comply with the following requirements:

1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
2. Basic Wind Speed: 120 mph, 3-second gust speed at 25 feet aboveground.

B. **Pole Construction**: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug- fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight hairline field joints.

1.04 SUBMITTALS

A. **Product Data**: Submit manufacturer's technical data and installation instructions for each type of flagpole required. Include data for fittings and accessories.

B. **Shop Drawings**: Show general layout of flagpoles and bases. Detail jointing, anchorage, and support systems. Show finishes, and flagpole fittings and accessories.

C. **Structural Calculations**: Submit calculations prepared, signed and sealed by qualified professional engineer licensed in State of California demonstrating compliance with applicable design loadings specified above and in compliance with required criteria of California Building Code (CBC) Chapter 16. Contractor to pull permit from City if required.

D. **Maintenance Data**: Submit for each product specified in this section. Include cleaning and preventive maintenance instructions.

1.05 QUALITY ASSURANCE

A. **Manufacturer's Qualifications**: Firm regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.

B. **Installer's Qualifications**: Firm regularly engaged, for the preceding five years, in the installation of flagpoles of equivalent type and physical characteristics to those required. If requested by Architect, submit verifiable list of not less than five projects of equivalent type successfully completed within the preceding two years.

1.06 DELIVERY, STORAGE, AND HANDLING

A. **Delivery and Handling**: Conform to product manufacturer's special instructions to prevent damage to products.

1. Deliver flagpoles and accessories properly labeled and in original wrappings.
2. Provide suitable protection for each flagpole before shipment.
3. Spiral-wrap pole with heavy kraft paper or polyethylene material and place pole in hard protective tube.

B. **Storage**: Store and handle materials in a manner which will prevent damage prior to installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. **Specified Manufacturer**: American Flagpole, Division of Kearney-National, Inc., Abington, VA (276/628-4188 or 800/368-7171).

B. **Acceptable Manufacturers**: Equivalent products of other manufacturers listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Baartol Company, Inc., (419/673-0753 or 800/537-4143).
2. Concord Industries, Inc., (214/380-8186).
3. EMC Flagpoles, Division of Eder Manufacturing Corporation, 414/355-2010 or 800/558-9620).

C. **Aluminum Flagpole**: American Flagpole Catalog No. ICC30D62-AA, groundset design, with shaft of conical tapered aluminum, for 30 feet exposed height and single internal halyard.

1. Fabricate pole from seamless, extruded aluminum tubing complying with ASTM B 241, alloy 6063, having tensile strength not less than 30,000 psi

with yield point of 25,000 psi, with minimum wall thickness of 3/16-inch (4.8 mm).

2. Heat-treat and age-harden pole after fabrication, in compliance with ASTM B 597, temper T6.
3. Provide cone-tapered flagpoles, per manufacturer's standard rate of taper.
4. Provide 6-inch minimum butt diameter and 0.1875-inch minimum base wall thickness.

D. **Pole (Shaft) Finish**: Fine, directional, medium satin polish (AA-M32); buff complying with AA-M20. Coat aluminum surfaces with clear, hard-coat wax.

E. **Finial Ball**: Manufacturer's standard flush seam ball, size as indicated or, if not indicated, to match pole butt diameter, 0.063-inch (1.6-mm) thick spun aluminum with gold anodized finish.

F. **Halyard**: Internal halyard with cam cleat system, 5/16-inch (8 mm) diameter, braided polypropylene halyard, cam cleat and concealed revolving truck assembly with plastic-coated counterweight and sling.

1. Provide flush access door secured with cylinder lock.
2. Finish truck assembly to match flagpole.

G. **Halyard Flag Snaps**: Provide two bronze swivel snap hooks per halyard. Include neoprene or vinyl covers on snaps.

H. **Flagpole Mounting**: Manufacturer's standard base system for the type of flagpole installation required.

1. Provide fiberglass foundation sleeve, made to fit flagpole, for casting into concrete foundation.
2. Provide grounding protection for flagpole.
3. Provide flashing collar of same material and finish as flagpole.

2.02 ACCESSORY MATERIALS

A. **Pole Base Reinforcement**: As indicated on the Drawings and as specified in Section 03200 - Reinforcing Steel.

B. **Concrete for Pole Foundations**: As specified in Section 03300 - Cast in Place Concrete, with minimum 3000 psi compressive strength at 28 days.

C. **Curing Materials**: Use products and procedures as specified in Section 03300 - Cast in Place Concrete.

D. **Grout**: As recommended by flagpole manufacturer, non-shrink, non-metallic, factory-packaged, non-staining, non-corrosive, non-aseous grout complying with ASTM C 1107 and general requirements specified in Section 05090 - Anchors and Fasteners.

E. **Joint Sealant**: As recommended by flagpole manufacturer, elastomeric joint sealant, complying with requirements specified in Section 07900 - Joint Sealers for Use NT (nontraffic) and for Use M, G, A and, as applicable to joint substrates indicated, for Use O.

2.03 FLAGS

A. **Flags for Flagpoles**: Nylon, provide one each, size 5' by 8', for United States and State of California.

2.04 FABRICATION

A. **Fabrication, General**: Provide each flagpole as a complete unit fabricated by a single manufacturer, including base, anchorage devices, fittings, and accessories as necessary for proper installation.

1. Fabricate flagpoles and ship to site in one piece if feasible. If more than one piece is necessary, provide self-aligning internal sleeve composed of metal compatible with shaft metal.
2. Provide self-aligning internal sleeve composed of metal compatible with shaft metal.
3. Fabricate sleeve and shaft to provide snug-fitting, weathertight, hairline field joint.

B. **Flagpole Diameter and Wall Thickness**: Wall thickness of shaft and ratio of top diameter to butt diameter shall be appropriate for metal or alloy used and for length of flagpole.

C. **Flagpole Length**: Provide flagpole of sufficient overall length to allow setting depth which is not less than 10 percent of exposed length.

D. **Joints and Seams**: Form joints and seams which are inconspicuous. Grind exposed welds smooth. Finish welds to match flagpole shaft.

E. **Bituminous Coating**: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.01 PREPARATION

A. **Protection and Coordination**: Protect surrounding completed Work during excavation of flagpole foundation and placing concrete. Coordinate flagpole location with underground utilities and landscape irrigation system.

B. **Embedded Ground-Set Poles**:

1. Excavation: Provide accurately cut and neatly dimensioned cavity suitable to receive embedding concrete and flagpole foundation sleeve.

a. Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
b. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

2. Bituminous coating: Apply heavy coating of bituminous paint to portion of flagpole which will be installed below grade, if not factory-applied by flagpole manufacturer prior to shipment.
3. Concrete:
   a. Place concrete immediately after mixing. Use methods which prevent segregation of mix.
   b. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness.
   c. Consolidate concrete using internal vibrator.
   d. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.
   e. Moist-cure exposed concrete for not less than 7 days. Cure concrete for a period of at least 14 days before installation of flagpole.

3.02 FLAGPOLE INSTALLATION

A. Flagpole Installation, General: Install flagpoles in accordance with manufacturer's instructions and recommendations and as necessary to comply with requirements of California Building Code (CBC) Chaper 16.

B. Alignment: Align flagpoles to a vertical tolerance of one in 100.

C. Embedded Ground-Set Poles:

1. Install flagpole in foundation tube, seated on bottom plate between steel centering wedges.
2. Plumb flagpole and install hardwood wedges to secure flagpole in place.
3. Place and compact sand in foundation tube and remove hardwood wedges. Tamp each layer before adding next layer.
4. After last sand layer is placed, provide moisture seal over sand by applying sealant of proper thickness.
5. Install flashing collar.

D. Electrical Grounding: Provide positive lightning ground suitable for flagpole and installation conditions.

E. Tolerances: Maximum variation from plumb position (90 degrees from horizontal plane) of 1-inch at top of flagpole.

3.03 ADJUSTING AND CLEANING

A. **Operational Check**: Verify smooth and proper operation of all installed fittings.

B. **Adjustments**: Adjust halyard mechanisms for ease of required operation, as necessary.

C. **Cleaning**: Clean all surfaces of soil, grease, oil and other contaminants.

END OF SECTION

SECTION 10520

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.01 Description: Division 1 applies to this Section. Provide fire protection specialties complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Fire extinguisher cabinets.
2 Fire extinguisher mounting brackets.
3. Fire extinguishers.

B. Related Work Not In This Section:

1. Section 05090 - Anchors and Fasteners: General requirements for anchors and fasteners.
2. Section 06110 - Wood Backing, Blocking and Curbing: Backing requirements and recess framing at wood stud construction.
3. Section 09250 - Gypsum Board: Finish at recess for fire extinguisher cabinet, if fire-rated tub is not provided.
4. Section 09250 - Acoustical Insulation: Acoustical insulation in interior wall cavities at recessed fire extinguisher cabinets.

1.02 REFERENCES

A. California Code of Regulations (CCR):

1. CCR Title 19 - Public Safety.
2. CCR Title 24, Part 9, California Fire Code (CFC): with State of California Amendments.

B. NFPA International (NFPA): NFPA 10 - Portable Fire Extinguishers.

1.03 SUBMITTALS

A. Product Data: Submit for fire extinguisher cabinets, indicating available wall recess depth for each condition and location.

B. Installation Instructions: Submit for fire extinguisher cabinets and indicate compliance with local and State fire regulations for extinguisher mounting heights.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Conform to all requirements of the local and State fire marshals. Conform to all applicable requirements of the California Fire Code (CFC).

B. **Fire Extinguishers Requirements**: Comply with all applicable requirements of California Fire Code (CFC).

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHER CABINETS

A. **Specified Manufacturer**: Samson Products, Inc. (affiliated with JL Industries), City of Commerce, CA (800/544-6077).

B. **Acceptable Manufacturers**: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Larsen's Manufacturing Co., Minneapolis, MN (763/571-1181 or 800/527-7367).
2. Potter-Roemer, Inc., City of Industry, CA (626/855-4890 or 800/366-3473).

C. **Fire Extinguisher Cabinets**: JL Industries Ambassador Series, Model No. 1815W17A, for fully-recessed installation with cold rolled steel tub with baked white acrylic enamel finish. At all locations in stud walls.

1. Body (Tub): Cold-rolled steel, baked white acrylic enamel finish.
2. Door: Type W, Vertical Duo with SAF-T-LOK(tm) lock/latch with baked white acrylic enamel finish
3. Trim: Baked White Acrylic Enamel Finish
4. Door pull: ADAC compliant recessed pull handle (PRH)
5. Door lock: JL SAF-T-LOK(tm) cam lock. Lock shall release when door is pulled sharply while remaining locked under normal conditions to resist vandalism.
6. Lettering: Type LDCVRFE, red vertical text, factory-applied.

D. **Fire Extinguisher Cabinets**: JL Industries Ambassador Series, Model No. 1813W17A (2 ½" - 3" rolled edge), for semi-recessed installation, with cold rolled steel tub with white baked acrylic enamel finish. Installation at CMU walls.

1. Body (Tub): Cold-rolled steel, baked white acrylic enamel finish.
2. Door: Type W, Vertical Duo with SAF-T-LOK(tm) lock/latch with baked white acrylic enamel finish
3. Trim: Baked White Acrylic Enamel Finish
4. Door pull: ADAC compliant recessed pull handle (PRH)
5. Door lock: JL SAF-T-LOK(tm) cam lock. Lock shall release when door is pulled sharply while remaining locked under normal conditions to resist vandalism.
6. Lettering: Type LDCVRFE, red vertical text, factory-applied.

E. **Nominal Sizes, Inside Box**: 24-inches high by 10-1/2 inches wide by 5-1/2 inches deep.

1. Confirm depth of stud wall cavity before constructing wall and ordering cabinet.
2. Adjust stud depth and spacing and provide blocking and backing as necessary to accommodate fire extinguisher cabinet installation.

2.02 FIRE EXTINGUISHERS

A. **Specified Manufacturer**: Samson Products, Inc. (affiliated with JL Industries), (800/544-6077).

B. **Acceptable Manufacturers**: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. Larsen's Manufacturing Co., Minneapolis, MN (763/571-1181 or 800/527-7367).
2. Potter-Roemer, Inc., City of Industry, CA (626/855-4890 or 800/366-3473).

C. **Fire Extinguishers, General**: Provide one extinguisher at each cabinet location and at other locations indicated on the Drawings, of type specified following, fully serviced and tagged.

1. All fire extinguishers shall comply with NFPA 10 - Portable Fire Extinguishers and shall be listed and labeled by Underwriters Laboratories, Inc. (ULI).
2. Fire extinguishers shall comply with requirements of California State Fire Marshal and local Fire Marshal having jurisdiction.
3. Provide fire extinguishers with maximum intervals between testing and recharging, as allowed according to OSHA Occupational Safety and Health Standards in 29 CFR 1910.157.
4. Fire extinguishers shall comply with requirements of California State Fire Marshal and fire authority (local Fire Marshal) having jurisdiction.

D. **Dry Chemical Extinguishers**:

1. Dry chemical extinguishers mounted in cabinets: JL Cosmic 6E, multi-purpose dry chemical, nominal 6 pounds capacity, UL Rating 3A:40B:C.
2. Dry chemical extinguishers mounted on wall brackets: JL Cosmic 10E, multi-purpose dry chemical, nominal 10 pounds capacity, UL Rating 4A:60B:C.

E. **Carbon Dioxide Fire Extinguishers**: For installation on brackets, in electrical and equipment rooms and other locations where indicated on the Drawings, JL Sentinel 10, liquid carbon dioxide under pressure, nominal capacity 10 pounds, UL Rating 10B:C.

F. **Brackets**: Provide bracket by fire extinguisher manufacturer to suit fire extinguisher model.

1. For dry chemical fire extinguishers: JL Mark Bracket MB 808.
2. For carbon dioxide fire extinguishers: JL MB 864.
3. For wet chemical fire extinguishers: As standard with manufacturer.

PART 3 - EXECUTION

3.01 FIRE EXTINGUISHER CABINET INSTALLATION

A. Fire Extinguisher Cabinets Installation: Install cabinets in prepared recesses in walls.

1. Comply with manufacturer's installation instructions and recommendations.
2. Install recessed cabinets in prepared recesses in walls. Coordinate opening size and anchoring provisions. Where applicable, maintain fire resistive rating of partition or wall.
3. Maintain acoustical integrity of walls by filling cavity around box with unfaced fiberglass batt insulation or by applying electrical outlet box acoustical sheeting to the back, top, bottom and sides.
   a. Refer to Section 09250 - Gypsum Board for outlet box acoustical sheeting.
   b. Refer to Section 09250 - Acoustical Insulation for unfaced fiberglass batt insulation
4. Cabinet installation shall conform to requirements of Fire Marshal for location and height of extinguisher. Unless otherwise directed, install cabinet at height so that fire extinguisher handle is 48-inches above finished floor.

3.01 FIRE EXTINGUISHERS INSTALLATION

A. Bracket Installation: Install bracket so that fire extinguisher handle is 48-inches above finished floor. Secure bracket to framing or backing in wall. Comply with anchor requirements specified in Section 05090 - Anchors and Fasteners.

B. Fire Extinguishers Installation:

1. Place extinguishers in cabinets and mount extinguishers on brackets on walls at locations indicated on the Drawings and as directed to comply with requirements of California Fire Code (CFC) and directions of Fire Marshal having jurisdication.
2. Provide dry chemical fire extinguishers typically.
3. Provide carbon dioxide fire exstinguishers in electrical and equipment rooms and other locations where indicated on the Drawings.
4. Place fire extinguishers immediately prior to Completion review or sooner if directed by Fire Marshal having jurisdication.

END OF SECTION

SECTION 10800

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 Description: Division 1 applies to this Section. Provide toilet accessories complete as indicated, specified, and required.

A. Work In This Section: Principal items include:

1. Toilet room accessories: Dispensers, grab bars, mirrors, shelves, electric hand dryers and other accessories as indicated on the Drawings or as selected by the Architect.

B. Related Work Not In This Section:

1. Section 05090 - Anchors and Fasteners: General requirements for anchors and fasteners to building substrates.
2. Section 06100 – Rough Carpentry: Recess framing for toilet accessories at wood frame construction.
3. Section 07900 – Calking and Sealants: Sanitary sealant for use at toilet accessories.
4. Section 08800 - Glass and Glazing: Unframed mirrors; mirror cleaning requirements.
5. Section 09250 - Gypsum Board: Cut-outs for recessed toilet accessories.
6. Section 10162 – Toilet Partitions: Coordination of mounting of accessories on and in partitions; accessories provided with toilet compartments.
7. Division 16 - Electrical: Power provisions to electric hand dryers.

1.02 SUBMITTALS

A. Product Data: If other than specified products by specified manufacturer, submit catalog cuts for all items.

B. Shop Drawings: If other than specified products by specified manufacturer, submit drawings showing cutouts and locations of backing.

C. Samples: If other than specified products by specified manufacturer and if requested by Architect, submit samples of each product. Samples will be returned following review.

D. Installation Instructions: For Project record only, submit instructions showing mounting heights in compliance with applicable accessibility requirements and showing backing, blocking and anchoring requirements appropriate to Project conditions.

1.03 QUALITY ASSURANCE

A. **Coordination**: Verify anchoring requirements for substrate conditions and manufacturer's recommendations. Furnish appropriate fasteners for Project conditions. Furnish backing information and templates for cutouts for proper layout and installation of supporting construction.

B. **Regulatory Requirements**: Installation shall conform to requirements of 2016 California Building Code (CBC) Chapter 11B - Accessibility, including:

1. California Building Code (CBC), Section 1115B, Bathing and Toilet Facilities.
2. California Building Code (CBC), Section 1117B, Other Building Components.
3. California Building Code (CBC), Section 1118B, Space Allowances and Reach Ranges.

PART 2 - PRODUCTS

2.01 TOILET ROOM ACCESSORIES

A. **Specified Manufacturer**: Bobrick Washroom Equipment, Inc., (818/764-1000).

B. **Acceptable Manufacturer**: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. American Specialties, Inc. (ASI), Yonkers, (914/476-9000.
2. Bradley Washroom Accessories Division, (414/354-0100).

C. **Toilet Room Accessories, General**: Embossed, stamped nomenclature or labels on exposed faces of units will not be accepted.

1. Accessories indicated to be provided by Contractor: Bobrick stainless steel accessories as scheduled and noted on the Drawings.
2. Accessories indicated to be Owner-Furnished/Contractor-Installed (OFCI): As indicated on the Drawings. Toilet paper dispenser at accessible toilet stalls shall have 3-inch maximum projection from wall.

D. **Accessibility Compliance**:

1. Limit projection of a surface- or semi-surface mounted accessories from encroaching more than 3-inches from the face of the wall or partition, and no closer than 1-1/2 inches to the tangent point of the grab bar.
2. Toilet paper and feminine napkin disposals located on grab bar side of accessible toilet room or stall shall not project more than the grab bar. Do not mount toilet paper and other dispensers above grab bar.

E. **Finish**: Bright polished stainless steel and chrome plating, unless otherwise noted.

F. **Locks**: Keyed (tumbler lock) accessories shall be keyed alike with the exception of coin receiving boxes on vending equipment.

G. **Manufacturer and Product Identification**: Embossed, stamped nomenclature or labels on exposed faces of units will not be accepted.

H. **Grab Bars**: Bobrick Series as scheduled and noted on the Drawings, 1-1/2-inches o.d., 18 gage Type 304 stainless steel tubing, 1-1/2 inches clear between grab bar and mounting surface, concealed mounting with 3-inch diameter flange secured with 4 set screws.

1. Provide peened, non-slip gripping surface.
2. Provide grab bars in configurations indicated on the Drawings.
3. Grab bars shall provide 1-1/2 inches clearance from tangent point of grab bar and mounting surface.
4. Grab bars shall not project more than 3-inches into the 48-inch minimum clear space in front of water closet, in compliance with California Building Code (CBC) Section 1115B.4.1.3.

I. **Toilet Tissue Dispensers**: Continuous flow type in compliance with California Building Code (CBC) Section 1115B.8.4.

2.02 CUSTODIAL ROOM ACCESSORIES

A. **Specified Manufacturer**: Bobrick Washroom Equipment, Inc., (818/764-1000).

B. **Acceptable Manufacturer**: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. American Specialties, Inc. (ASI), (914/476-9000.
2. Bradley Washroom Accessories Division, (414/354-0100).

C. **Custodial Room Accessories**: Bobrick stainless steel accessories as scheduled and noted on the Drawings.

D. **Finish**: Brushed stainless steel and satin chrome plating, unless otherwise indicated.

2.03 METAL-FRAMED MIRRORS

A. **Specified Manufacturer**: Bobrick Washroom Equipment, Inc., (818/764-1000).

B. **Acceptable Manufacturer**: Equivalent products of the manufacturers listed below will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product Requirements.

1. American Specialties, Inc. (ASI), (914/476-9000.
2. Bradley Washroom Accessories Division, (414/354-0100).

C. **Metal Framed Mirrors**: Bobrick framed mirror and framed mirror/shelf combination, series as scheduled and size as noted on Drawings, stainless steel narrow face frame, factory-assembled mirrors, with galvanized steel wall hanger assembly.

1. Frame corners shall be heliarc welded, ground and polished smooth and shall have continuous, integral stiffeners on all sides. Protect frame corners by friction-absorbing filler strips.
2. Mirror back and hanger: Screw-locking design, formed 20 gage (0.9mm) galvanized steel, incorporating lower support member, forming rigid rectangle which engages lower backplate louvers to keep bottom of mirror against wall. Secure back to locking clips with concealed stainless steel screws.
3. Protect mirror back with full-size, shock-absorbing, water-resistant, non-abrasive 3/16-inch (5mm) thick polyethylene padding.
4. Glass shall be ASTM C 1036, Type I, Class 1 mirror glass with electrolytically copper plated by galvanic process and guaranteed for 10 years against silver spoilage.

2.04 ELECTRIC HAND DRYERS

A. **Electric Hand Dryers**: Bobrick Model B-3725 electric hand dryer, with recess kit, sensor operation, brushed stainless steel finish, UL listed and labeled to suit serving electric power indicated on Electrical Drawings.

B. **Cover Color**: As indicated on Drawings or, if not indicated, as selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

A. **Installation of Toilet Room Accessories**: Install accessories in accordance with manufacturer's instructions and recommendations.

1. Comply with applicable accessibility and use requirements, including California Building Code (CBC) Section 1115B.8, with mounting heights according to Table 1115B-1.
2. Toilet paper and feminine napkin disposals located on grab bar side of accessible toilet room or stall shall not project more than 3-inches from finished wall surface nor be located closer than 1-1/2 inches clear of the tangent point of the grab bar.

B. **Grab Bars Installation**: At concrete or masonry walls, install grab bars, using expansion anchors as specified in Section 05090 - Anchors and Fasteners.

1. Secure to toilet partition using 3-inch diameter stainless steel back plates with studs, couplings and stainless steel machine screws.

2. At wood stud walls, secure to wood blocking using No. 10 full threaded stainless steel wood screws of sufficient length to penetrate blocking 1-1/4 inches minimum.
3. At concrete or masonry walls, install bars, using sheet metal screws and expansion anchors.
4. At plaster or gypsum board walls, provide spacers of same thickness as wall material to prevent crushing of wall material.

C. **Mirrors**: Install mirror on manufacturer supplied concealed wall hanger and secure in place with theft-resistant locking screws.

D. **Fasteners**: Install accessories in areas and at locations indicated, using concealed fasteners wherever possible.

1. Secure accessories to solid masonry and to backing, blocking or framing only.
2. Use lag screws, wood screws or sheet metal screws as appropriate for substrate and as required for anticipated loads. Hollow wall fasteners (toggle bolts and molly fasteners) will not be accepted. Comply with Section 05090 - Anchors and Fasteners, for anchors and fasteners to building substrates.
3. Mount surface mounted fixtures with positive mechanical methods to ensure tamper-resistant anchorage.

E. **Sequence**: Install accessories after room finishes such as plaster, painting and tile Work have been completed. Install recessed elements before finish Work. Secure accessories to substrate with all vertical lines plumb and all horizontal lines level.

3.02 INSTALLATION OF ELECTRIC DRYERS

A. **Installation of Electric Dryers:** Comply with manufacturer's instructions and recommendations. Comply with applicable accessibility and use requirements, including California Building Code (CBC) Section 1118B.

B. **Electrical Connections:** Connect dryers to electric service, in compliance with requirements specified in Division 16 - Electrical.

3.03 CLEANING AND PROTECTION

A. **Cleaning, Initial**: Remove labels and soiling. Clean and polish accessories to bright finish. Clean mirrors as specified in Section 08810 - Glass and Glazing for glass.

B. **Protection**: Protect accessories from damage and soiling. Prohibit use of accessories, unless otherwise directed. Remove and replace damaged or defective accessories.

C. **Cleaning, Final**: Clean mirrors for Completion review, as specified for glass cleaning in Section 08800 - Glass and Glazing.

END OF SECTION

SECTION 11135

AUDIO VISUAL EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish, install and program, place into operation, adjust, test, document and warrant as described herein, hereafter "provide", the following systems. Systems shall include wire, cable, electronic and acoustic components, subassemblies, specialty enclosures, equipment racks and all other incidental items required to provide a complete functional system.

1. Includes all loudspeakers, amplifiers, DSP processors, video displays, and related equipment
2. Includes all cables and control wiring
3. Includes equipment racks
4. Includes control equipment and touch panels
5. Includes programming of all audio system and DSP components to fulfill design requirements. Coordinate with owner.
6. Includes programming of all control system components to fulfill design requirements. Coordinate with owner.
7. Coordinate all work with other trades.
8. Provide all incidental equipment and devices not mentioned herein or shown on the drawings that are required to provide a complete system and to realize a complete stable and safe operation thereof.
9. Provide a Renewable Annual Maintenance Agreement Proposal for all service work beyond the warranty period at the conclusion of the project.

1.2 RELATED WORK

A. Electrical rough in of conduits and standard NEMA boxes and fittings by the Electrical Contractor. AC Power circuits are provided and installed by the Electrical Contractor. Audio Visual Contractor is responsible for all in-rack distribution of AC Power circuits.

B. The Audio Visual Contractor shall furnish any custom floor boxes and ceiling speaker backboxes for rough in installation by the Electrical Contractor according to the drawings.

C. Structural Support. Coordinate with General Contractor the installation of required hardware and fittings for the installation of loudspeaker enclosures and cabinets. Provide all support hardware required to attach loudspeaker assemblies to structural hang points.

D. Furnish all loudspeaker ceiling grilles and mounting hardware to painting contractor for paint before installation. Color to be selected by Architect.

1.3 REFERENCE STANDARDS

A. Perform all work in accordance with standard industry practices for the communications and sound system industries. These standards shall conform to the latest revisions and specifications including but not limited to the following:

1. Audio Engineering Society (AES)
2. Society of Motion Picture and Television Engineers (SMPTE)
3. Underwriters Laboratories (UL)
4. Electronic Industries Association (EIA)
5. National Electric Code (NEC) and California Electric Code (C.E.C.)
6. National Electrical Manufacturer's Association (NEMA)
7. National Association of Broadcasters (NAB)

1.4 PERMITS & CODES

A. Obtain and pay for all required permits and inspections as they relate to the system and are required for the work.

B. Furnish material and installation in accordance with all applicable legal codes and requirements.

C. Perform all tests and adjustments as may be required by local authorities to demonstrate compliance with the specifications or legal codes having jurisdiction.

1.5 DELIVERY AND STORAGE OF MATERIALS AND EQUIPMENT

A. Schedule and store all items required for this work.

B. Deliver all equipment and materials to the jobsite in original manufacturer's containers or in completed shop fabricated assemblies for installation on the site. All containers and assemblies shall be clearly marked as to the item, quantity and model number.

1.6 SAFETY FACTORS AND PROTECTION

A. Provide and maintain suitable barriers, guards or fences as required wherever necessary for the safety of other personnel on site and for the protection of the work, fixtures and building members.

B. Protect all materials and equipment from the entry of adhesion of concrete, plaster, paint or other debris which could cause aesthetic or mechanical damage to the equipment and materials.

C. Clean all system components and devices included in the systems after acceptance and completion of the work.

1.7 ACCEPTANCE OF WORK

A. Upon completion of the work, the owner or architect has the right to verify all test data as part of the acceptance procedure. Provide personnel and equipment as required to complete all tests and adjustments without additional cost to the owner.

B. Failure of any equipment or component to meet the specifications shall require immediate action to correct the defect. In the event that materials or equipment is not readily available, temporary "loaner" equipment shall be provided at no cost to the owner until final acceptance of the work is given.

C. Provide all test equipment required for the specified final adjustments and measurements of system functions and performance parameters. Contractor shall certify ownership and thorough knowledge and experience of the following devices required to perform the final systems tests:

1. Smaart-Pro or Smaart-Live Software and laptop computer with ancillary test equipment setup
2. Dual Trace Oscilloscope (100 MHz minimum bandwidth)
3. Digital and Analog Volt-Ohm-Milliamperes Meter
4. Impedance Bridge (Units which measure at one frequency only will not be acceptable)
5. Sine Wave Generator
6. Pink Noise Generator (NTI MR-Pro hardware or software equivalent)
7. Phase Tester (NTI MR-Pro hardware or software equivalent)

1.8 WARRANTY

A. Provide warranty of the system's installation and components to be free from defects in materials and workmanship for a period of ONE year from date of final acceptance of the system.

B. Maintain regular service personnel and facilities to allow a response time to warranty period service calls of 24 hours upon receipt of notice. Provide all materials and equipment needed to perform all service procedures and repairs. When necessary, provide loaner equipment to ensure minimal downtime to the system under repair.

C. Conduct all system diagnostics and repairs at the jobsite except for component level electronic troubleshooting.

D. Provide all transportation for equipment and services at no cost to the owner during the warranty period. This includes but is not limited to; shipping costs of replacement equipment, transportation of service personnel and storage of devices as required for the service work.

E. Provide warranty service on system components for the period provided by the component manufacturer. For components with warranties extending beyond the one year warranty period, provide extended coverage for that period to include loaner equipment. Contractor may charge normal service call rates for these warranty calls unless covered by an extended warranty period offered elsewhere.

F. Provide owner with exact beginning and end dates of warranty period. Include the name and number to call for service.

1.9 CONTRACTOR QUALIFICATION

A. All work shall be performed by an experienced audio visual systems engineering contractor having at least 10 years direct experience with the components, devices and equipment specified herein and of similar scope.

B. The contractor shall have been a factory authorized engineering contractor for all products specified herein for at least the last 3 years.

C. The contractor shall have an on-staff programmer who is factory certified to create, troubleshoot, and install the programming required for the specified digital signal processing component(s) and control system of this system. Provide certificate if required.

D. The contractor shall be a licensed California contractor holding a C-7 class license. C-61 specialty contractors will not be acceptable for this work.

E. The contractor shall have on staff, an experienced engineer with at least 5 years direct experience with the scope of the system design and shall possess a degree in Electrical Engineering with direct experience in system work at the construction level. In lieu of a formal degree, the engineer must have experience on at least 5 projects of similar scope where an electrical engineer has been required.

F. Installation technicians must have at least 3 years direct experience with systems installations of similar scope. Lead shop technicians and field supervisors must be ICIA CTS certified.

1.10 SUBMITTALS

A. With Bid, submit the following as part of the bid proposal:

1. A list of installations representing similar scope of work successfully completed over the last 2 years. A minimum of 5 installations is required. The bidder shall provide the owner with the contact name, phone number and level of responsibility of contact with relation to the direct involvement of the system's operation.
2. Verification that the contractor is a viable engineering firm engaged in the business of design and installation of sound reinforcement systems for the last 10 years.
3. Verification of personnel as specified above. Include resumes of engineers and field supervisors.
4. A list of product lines that the contractor is factory authorized to install and provide.
5. A lump sum, base bid with all equipment, materials and installation included. A separate breakdown of equipment and labor shall also be a part of the bid proposal.
6. Verification that the contractor has successfully completed at least one project in the last 2 years under the direct supervision of design from a major independent consultant recognized by the industry to be competent in the design of similar systems for similar clients.
7. Renewable Annual Maintenance Agreement, in yearly increments.

B. Post Award; provide 2 copies of the following:

1. Complete bill of materials and equipment including itemized equipment list and cut sheets for every product in the system. Provide all documentation in an editable digital format.
2. Shop drawings showing all custom fabricated devices, receptacle plates, panels, single line and schematic diagrams, scaled rack and panel elevations, grounding scheme schematic, cable run sheets and a key schedule for all systems. All custom electronic assemblies shall include component level drawings. Provide all drawings in an editable digital format.
3. Upon completion of project, provide all as-built drawings and manuals in an editable digital format, including but not limited to the following:

    (a) Complete as-built drawings showing all system single lines, rack and panel elevations, plan of receptacle locations and patch bay elevations.

    (b) Manufacturer's warranties and component owner's manuals.

    (c) Complete parts lists and wire schedules.

    (d) Final bill of quantities including a separate list for portable equipment.
4. At least 2 copies of all key sets for the equipment racks, cover panels or wall switches.
5. Provide two 4 hour training sessions covering the basic set-up and operations of the entire audio and video systems. Provide one additional (maximum 4 hours) training session in conjunction with the first event (or other time/function specified by the owner) to assist in the operation of the system. Be present for the first use of the system to assist in the set-up and operation of the system.

1.11 SYSTEM DESCRIPTION

Gymnasium Audio System

A high-quality audio system will be installed in the Gymnasium (123). The system is designed for speech reinforcement from both wired and wireless microphones. Music and streaming audio sources can also be played back through the loudspeaker system from wired inputs, a Bluetooth interface, a network audio streaming player, and an owner-furnished background music source. The Q-SYS Core digital signal processor (DSP) will be custom programmed to provide all the audio system mixing, routing, level control, and equalization. An integrated Q-SYS TSC touchscreen control system will provide customized user-friendly control of all components. A multichannel amplifier will drive a total of 16 loudspeaker cabinets to cover the entire gym floor and bleacher areas.

- A single floor box with flush brass cover will be provided for the wired connections in the gym. This includes XLR input connections for a Shure SM58 wired desk stand microphone and two line level inputs.

A Bluetooth and Aux input digital interface will provide for both wired and wireless music playback connections. Two floorbox data connections will connect to a RJ45 CAT6 panel at the equipment rack for optional patching into the control or video systems, as desired.

- Two channels of Shure QLXD wireless microphone systems will be provided for speech reinforcement and integrated into the audio system. Two QLXD2/SM58 microphone transmitters will be provided for “handheld” style use. In addition, a single QLXD1 bodypack transmitter and SM31FH “headset-worn” style microphone will be provided and can be used in place of one of the handheld units. Two active directional antennas will be permanently installed in the gym and connected to the receivers through a UA864US active antenna splitter. Three Shure SB900B lithium-ion rechargeable batteries will be provided for the three wireless mic transmitters along with a docking charger station.

- A single QSC Q-SYS Core DSP will provide signal processing and control for the Gym and all the other audio-video spaces from the central equipment rack location. It supports advanced audio routing, audio level control, and processing capabilities for all microphones, playback devices, amplifiers, and room speakers. It also supports touchscreen control of all the video displays in the other systems.

- A Netgear M4250-series managed network switch will provide the digital audio and control communications backbone between all the audio and video devices on the “AV LAN” network.

- A multichannel QSC CX-Q network amplifier will provide the digital audio interface and power the loudspeakers in all of the zones in the Gym system.

- The gym will be equipped with a total of sixteen JBL AWC129 compact two-way coaxial loudspeakers, each featuring a powerful 12" low-frequency driver for full-range, high-output performance. Their weather-resistant construction and wide dispersion make them ideal for providing clear, even coverage throughout the space. Color – Grey.

- All the audio video systems will be controlled from Q-SYS 7” touchscreens located at:
  - IT Room (113) – on front of audio video equipment rack
  - Office (119) - with paging microphone
  - Gym Office (116) - with paging microphone
  - Storage Room (112)

- Storage Room (104)

QSC Axon C1 one-gang digital volume control wallplates for individual zones:

- Office (115)
- Staff Room (118)

- The touchscreen user interfaces will require a password for system control access. Available device functions will include:
    - System Power On/Off
    - Microphone and Music input levels and mutes (along with live audio meter displays)
    - Zone output levels and mutes
    - Video source selection for Video Displays
    - Control of OFE satellite receiver
    - Video Display Power On/Off
    - Bluetooth interface controls
    - Control of Owner-furnished Video Sources
    - Background Music (BGM) source select
- The control system will feature Owner configurable saving of preset “snapshots” – such as powering on groups of video displays and selecting video sources and setting default audio levels
- By default the page microphones will be configured to override the music audio, but the control interface will allow the end user or admins to adjust the page levels and override functions individually for each output zone.
- Provide connection to the owner’s network for DSP control from the owner’s WIFI. This connection shall be made from an Aux port from the DSP.

Zoned Central Paging System

Distributed Audio System

A high-quality distributed audio system will be installed for background music and paging throughout the other lobby, offices, staff room, and restroom areas. The Q-SYS Core digital signal processor (DSP) will be custom programmed to provide all the audio system mixing, routing, level control, and equalization. An integrated Q-SYS TSC touchscreen control system will provide customized user-friendly control of all components.

Wired “Aux” input wallplates with wireless Bluetooth connection will be installed in the Gym Office (116) and Storage (104) locations for two of the background music inputs. These units feature simple Bluetooth pairing capability and will be configured with user-friendly unique naming.

A Sonos Port network streaming interface will be integrated as a background music source installed in the main equipment rack. End users can select and control common audio streaming services through the Sonos app. Coordinate with the owner to provide network connection to this device.

In addition, provision is included in the design for integration of two Owner-provided Cable or Satellite or AM/FM tuners or streaming receivers. The AV Contractor will be responsible for installing the Owner-provided receivers and integrating into the audio/video and control system as part of the AV Contract.

Two multichannel amplifiers will drive a total of 38 ceiling loudspeakers configured in 14 zones. The facility will include in-ceiling speakers, each featuring a 6.5" driver and a sleek zero-bezel design for a clean, modern appearance. These speakers are finished in white to match standard ceiling tiles and offer consistent, high-quality audio coverage for distributed sound zones.

Output zones:

- IT Room (113)
- Office (115)
- Gym Office (116)
- Staff Room (118)
- Office (119)
- Gallery (122)
- Info (121)
- Entry Lobby (101)
- Hallway (109)
- Teen Room (110)
- Fitness (106)
- Restrooms (102/103)

Ceiling loudspeaker layout is subject to coordination and revision with the Architect and Owner, with the primary functional requirement of equal and consistent SPL coverage of the public areas.

Video Distribution

A BrightSign digital signage player, housed in the main equipment rack, will serve as the primary source of content for general facility-wide video messaging. Additionally, the system includes (2) open-source video input slots to accommodate owner-furnished devices such as DirecTV, cable boxes, or Apple TV, offering expanded flexibility for live or scheduled content playback. Touch panel shall allow selection of channel if receiver/tuner has capability. Use RS-232 or IR as needed (provide interface hardware as necessary). These sources will be encoded for network distribution using (3) QSC NV-21-HU 4K60 4:4:4 network video encoders.

Teen Gaming Area Audio/Video System

A high-quality interactive gaming audio/video system will be installed in the Teen Gaming Area (110). The system will consist of one 85” main LCD display with a dedicated set of stereo in-wall speakers, and four smaller 55” LCD displays.

Gaming Display Systems (TVs 1–4)

Four Sony FW55BZ40P 55" 4K commercial-grade displays will be wall-mounted on Chief LTM1U mounts in the designated gaming zones. These displays are connected to the video system using QSC NV-21-HU decoders and receive content from the centralized digital signage system or alternate sources. Each TV will also be locally connected to its own owner-furnished gaming console via a wall-mounted HDMI panel. Control and network connectivity will be handled through dual-data connection panels at each TV location.

Each smaller LCD display can select from any of the sources on the video routing system, or a local HDMI input plate below the display. No audio is intended to be used from the displays. (Note: Internal LCD display speakers will be disabled, but end users can use the built-in headset functions of the gaming consoles if desired.)

Teen Room Main Video System (TV 5 & Sources)

A larger Sony FW85BZ40P 85" 4K display will serve as the focal point in the Teen Room, wall-mounted using a Chief XTM1U bracket. This display is fed by a dedicated QSC NV-21-HU decoder and is supported by a localized media rack of sources (Located in Credenza below TV), including:

- a QSC NV-32-H encoder with three HDMI inputs for multiple simultaneous source feeds
    - Input 1 - Barco Clickshare C-10 for wireless screen sharing from laptops or mobile devices

- Input 2 - Tascam BD-MP4K UHD Blu-ray multimedia player
- Input 3 - Owner-furnished Gaming console

All devices are connected via HDMI cables and networked through a custom wall panel featuring four data ports.

The main display audio will be amplified and sent to a stereo set of Sonance in-wall loudspeakers.

The local Q-SYS touchscreen controller will be integrated into the system for ease of use. The wallplate will perform all the system functions for all displays: LCD Power On/Off, Audio/Video Source switching, and Volume control.

The AV contractor is responsible for interfacing with the Owner and contractor furnishing the Cabinetry to ensure all AV equipment is accommodated and mounted in a professional manner to the Owner's satisfaction

Digital Signage (Shared Video routing)

Lobby Display (TV 6)

The main lobby will include a Sony FW65BZ40P 65" 4K display mounted with a Chief LTM1U wall bracket. This unit will display digital signage or secondary source content via a QSC NV-21-HU decoder and networked using a dual-data wall plate.

- One 65" LCD display will be installed in the Info (121) area.
- By default, the digital signage player will be routed to this display, but the user also has the option to select any of the other sources.
- The signage player will be connected to the network for easy loading and updating of the media files. Using the included Brightsign Author software, the end user can simply create custom video, photo, and audio playback sequences using the built-in templates, or customize as needed. The sequences can be configured to simply loop, or can be scheduled to run by time of day and day of the week. The finished sequences and schedule can then be uploaded to the units over the network.

Fitness Center (106)

Fitness Room Displays (TVs 7–11)

The fitness area features a total of five displays:

- (1) Sony FW65BZ40P 65" display mounted with a Chief LTM1U wall bracket
- (4) Sony FW55BZ40P 55" displays mounted with ceiling mounts

Each TV will receive content from the central rack via its own QSC NV-21-HU decoder, allowing it to display synchronized or independent video content from the signage system or alternative sources. All fitness TVs are networked and controllable via Q-SYS.

- Five 55” LCD displays will be installed in the Fitness Center (106) area.
- All five displays will be controlled from the Q-SYS touchscreen for individual functions: LCD Display Power On/Off, Video Source select

FITNESS ROOM WIRELESS MIC OPTION – Provide Optional Price: To enhance audio support for group classes and presentations in the fitness room, a wireless microphone package by Shure has been included in the system design.

This package features:

- One (1) QLXD1 bodypack transmitter paired with a SM31FH fitness headset condenser microphone, ideal for high-movement environments where clarity and comfort are essential.
- One (1) QLXD2/SM58 handheld transmitter, providing a versatile option for announcements, training sessions, or guest instructors.

To support efficient daily use, the system includes:

- One (1) SBC200US dual docking charger with power supply for recharging transmitters
- Two (2) SB900B lithium-ion rechargeable batteries, providing reliable, long-lasting performance for both the headset and handheld microphones
- This setup provides flexibility for various use cases in the fitness room, while maintaining professional-grade wireless audio quality.

Assistive Listening Systems

- To ensure accessibility for all patrons, the facility will be equipped with a comprehensive assistive listening system from Williams AV. The system centers around a WF T8 D multi-channel Wi-Fi assistive listening server, which allows users to receive high-quality audio directly to personal or provided devices via a local wireless network.

- The system includes:
    - (6) WF R2-00 WAV Pro portable Wi-Fi receivers, available for guest use
    - (6) HED 024 headphones for use with the receivers
    - (2) NKL 008 neck loops to support users with T-coil-enabled hearing aids
    - (1) AC CHG406-00 six-slot charger to manage and recharge the receivers
    - (1) IDP 008 ADA-compliant wall plaque to provide clear signage indicating the availability of assistive listening support
- This system ensures compliance with ADA guidelines while delivering flexible, user-friendly audio access throughout the facility
- Coordinate with the owner to allow the various audio channels to be transmitted from the owner's WIFI.
    - The available ALS Audio Sources include:
        - Gym
        - Teen Room Main Display
        - Fitness Center
        - Video Source 1
        - Video Source 2
        - BGM

Fire/Life Safety/ Code: A "normally closed" contact closure the Life/Safety system will need to be provided to the main AV equipment rack, to silence the systems in case of emergency – along with any other life/safety code requirements. The AV contractor will accommodate any changes required by any and all local codes.

PRODUCTS

1.12 GENERAL

A. Equipment and materials specified have been selected on the basis of maximum quality and performance as well as their cost effectiveness. They have been incorporated into a system design intended for maximum performance within the context of the design. Because of this, equipment substitutions shall be perceived as components not necessarily inferior, superior or more cost effective, but as compromises to the intent and context of the system design. Where applicable, acceptable substitutions have been listed in which their use will not significantly alter

the intent of the design. Unless otherwise stated substitutions must meet all technical specifications provided in the specified manufacture's literature and owners manual.

B. All materials and equipment shall be new and shall bear the manufacturer's latest design or revision with the model name, number and serial ID clearly attached to the device.

C. All electronic equipment shall be solid state in design unless otherwise noted.

D. All equipment shall be dead front type designed for installation into standard EIA equipment racks and enclosures as specified herein, unless otherwise noted.

E. Control panels and custom panels shall be similar in general appearance. All panels shall be at least .125 inch thick aluminum. Provide locking panel covers on all recessed, semi-recessed and surface mounted control panels not located in the equipment racks. Key all panels and racks alike when used within a single system.

F. All equipment rack assemblies shall be mounted so as to not require side access to the terminations. Control and power systems within the racks shall be accessible and all equipment rear panels shall be accessible.

G. Provide all labels for receptacle plates and panels within a rack as specified herein. The labels shall clearly indicate the function of the device and be numbered or lettered to correspond with the function consistent with the Shop Drawings. Identification of fuses and circuit breakers on contractor fabricated device shall also include the protective circuitry, the rating of the protective device and the voltages across open circuited protected devices. Do not construct any engraved panels or tags without approved drawings for same within the submittal package as describe herein.

H. All steel within the system shall be treated with zinc phosphate and finish painted with baked enamel or painted with a thermosetting epoxy paint. All aluminum panels, except operating surfaces, shall be anodized and then painted with a thermosetting epoxy paint. All finish colors shall be as directed by the architect excepting prefinished, manufactured panels and equipment.

1.13 DEFINITIONS, CONVENTIONS & STANDARDS

A. The following levels shall be the standard with regard to all systems specified herein, unless otherwise noted.

1. Microphone Level: Less than -32dbV (0dbv=1.0 Volt)
2. Line Level: -32dbV to +22dbV
3. Speaker Level: Greater that +22dbV
4. Intercommunications: -32dbV to +46dbV

B. Impedance Characteristics:

1. Microphone Circuits: 50 to 250 Ohms, source rated and not less than ten times the source impedance, terminating, electromagnetically and electrostatically balanced to ground.
2. Line Circuits: 600 Ohms, maximum source; 600 Ohms, minimum terminating balance to ground as above.

3. Video Circuits: 75 Ohms to shield and signal ground, 1.4 VSWR maximum.

C. All circuits exterior to the equipment racks or termination enclosures shall be balanced. Connect shield to ground only at the point of lowest signal level.

D. Frequency Response: Maximum acceptable range for any individual active electronic component for audio performance is +/- 3db over the audio spectrum, 20 Hz to 20 KHz.

E. Acoustical coverage deviation between adjacent seating areas within the space shall be a maximum of +/- 3db for the specified bandwidth of 500 Hz to 4 kHz.

1.14 EQUIPMENT & MATERIALS

Base Audio/Video System Equipment List

Audio Equipment

QTY	MODEL	MAKE	DESCRIPTION
	Wireless Mics - Gym		
2	QLXD4	Shure	Single Channel Receiver
1	QLXD1	Shure	Bodypack Transmitter
1	SM31FH	Shure	Fitness Headset Condenser Microphone
2	QLXD2/SM58	Shure	Handheld Transmitter w/ SM58
1	UA844+SWB	Shure	Five-Way Active Antenna Splitter
2	UA864US	Shure	Active Directional Antenna
	Batteries and Charging Docks for Wireless Mics		
1	SBC200US	Shure	Dual Docking Charger w/ Power Supply
1	SBC200	Shure	Dual Docking Charger
3	SB900B	Shure	Lithium-Ion Rechargeable Battery
	Audio Sources		
1	DD-BTN44	RDL	Aux and Bluetooth Audio Interface - Gym Office
1	DD-BTN44	RDL	Aux and Bluetooth Audio Interface - Fitness Center
1	Port	Sonos	Network Audio Streamer (Main Rack)
1	RSH Series	Middle Atlantic	Rack Shelf for Sonos Port
1	TBD	Owner-Furnished	BGM Music Service Source (Main Rack)
1	RSH Series	Middle Atlantic	Rack Shelf for OFE Source
	Gym Mic & Portable Source		
1	SM58	Shure	Handheld Vocal Microphone
1	23320 or equal	K&M	Desk Stand
2	MS-12CE	Atlas	Round Base Mic Stand
1	DDB-BTN44	RDL	Aux and Bluetooth Audio Interface - Gym Floor Box
2	MKQ-15NP	Whirlwind	Canare Mic Cable w/ Neutrik Connectors
1	MKQ-25NP	Whirlwind	Canare Mic Cable w/ Neutrik Connectors
	Processing - Core 24f		
1	Core 24f	QSC	Digital Signal Processor - 8x8x8, 8x8 GPIO
	Network Switches		
1	M4250-26G4F-PoE+	Netgear	24x1G PoE+ 300W 2x1G and 4xSFP Managed Switch
	Amplifiers		
1	CX-Q 8K4	QSC	4 CH. Power Amplifier 2000 watts (Gym)
2	CX-Q 4K8	QSC	8 CH. Power Amplifier 500 watts (Distributed, Teen L/R)
	Gym Speakers		
16	AWC129 -Grey	JBL	Compact 2-Way Coaxial Loudspeaker with 12" LF
16	Include	JBL	U-bracket, zinc-rich extrathick powder coated, steel.
	Distributed Ceiling Speakers		
38	AD-C6T-ZB-WH (white)	QSC	In-Ceiling 6.5" Speaker, Zero Bezel
As req	AD-MR6	QSC	New Construction Bracket - 6 Pieces
	Teen TV Speakers		
2	VX86	Sonance	In-Wall Rectangle 8" Speaker
2	91708	Sonance	Large Rectangle Acoustic Enclosure

	Control System		
2	PS-TSCG3-H	QSC	Q-SYS Touchscreen Page Station; includes TSC-70-G3
3	TSC-70-G3	QSC	Q-Sys Touchscreen Controller - 7" - In-Wall
1	RP-TSC	Custom	Rack Panel Kit for TSC-70-G3
1	Q-SYS Control	QSC	iPad App - QSC
2	Axon C1	QSC	1-gang Remote Control (VC)
	Equipment Rack		
1	BGR-45SA-27	Middle Atlantic	Equipment Rack w/ rear door
1	BGR-552FT-FC	Middle Atlantic	552 CFM Fan Top, with Controller for BGR Series
1	BGR-ISO-Z4	Middle Atlantic	Seismic Brackets for ISO BGR Racks
1	LT-GN-WL	Middle Atlantic	Rack Gooseneck Light
3	BR1	Middle Atlantic	Brush Panel
1	LACE Series	Middle Atlantic	Veritcal Cable Management, As Required
1	LBP Series	Middle Atlantic	Horizontal Cable Management, As Required
1	EB/VT Series	Middle Atlantic	Blank Panels, As Required
	Rack Power		
1	MPR-8A	Middle Atlantic	Modular Raceway (72" Long)
4	M-2X20IGA	Middle Atlantic	Power Module - Dual 20A Duplex (Always On)
1	T-80x6	Middle Atlantic	T Series Tails (6 Pack - 80" Long)
4	MPR-BL8A	Middle Atlantic	Blank Module Cover - Standard Cover
1	RLNK-915R	Middle Atlantic	Select Series PDU with RackLink, 9 Outlet
1	UPS-S2200R	Middle Atlantic	UPS
	Data Patch Panel		
1	4S255-S24	Leviton	Atlas-X1 24-Port 1 RU Panel Unloaded w/ Cable Management
As req	6ASJK-RE6	Leviton	Atlas-X1 CAT6A Shielded Jack BLK
As req	BL-BK	Leviton	Blank Keystone Insert (Black)
1	PSD-C175	AVP	Designation Label Kit
	Floorbox		
1	FL-500P-6-B	FSR	FL-500P Back Box - 6" Deep
1	/CU FL-500P-B 3/4" WF-712571	FSR	Custom Brass Cover (Confirm with FSR)
	Cable		
As req	226GY	West Penn	14AWG Speaker Cable
As req	227GY	West Penn	12AWG Speaker Cable
As req	77291	West Penn	22 AWG Mic/Line Cable
As req	4246 (Gray)	West Penn	CAT 6 Cable
As req	810	West Penn	RG-8 Antenna Cable

Video Equipment

QTY	*MODEL*	*MAKE*	*DESCRIPTION*
	Video Sources		
1	XD236	Brightsign	4K Signage Player
2	TBD	Owner-Furnished	Video Source (Provide QSC IR or RS-232 Interface)
3	RSH Series	Middle Atlantic	Rack Shelf for Video Sources
3	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Encoder)
	Gaming TVs (TV 1-4)		
4	FW55BZ40P	Sony	55" 3840x2160 4K 700nit, 47% Haze, 24/7 display - Black
4	LTM1U	Chief	TV Wall Mount
4	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Decoder)

4	TV Panel	Custom	2 Data
	Gaming TV Console		
4	TBD	Owner-Furnished	Gaming Console
4	HDMI Panel	Custom	Wall Panel w/ HDMI
	Teen Room Main TV (TV 5)		
1	FW85BZ40P	Sony	85" 3840x2160 4K 650nit, 52% Haze, 24/7 display - Black
1	XTM1U	Chief	TV Wall Mount
1	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Decoder)
1	TV Panel	Custom	2 Data
	Teen Room Main TV Sources		
1	NV-32-H	QSC	4K60 4:4:4 Network Video Endpoint (Encoder - 3 Inputs)
1	C-10	Barco	Clickshare Wireless Streaming
1	BD-MP4K	Tascam	4K UHD Blu-Ray Multimedia Player
1	TBD	Owner-Furnished	Gaming Console
1	TV Panel	Custom	4 Data
	Lobby Info TV (TV 6)		
1	FW65BZ40P	Sony	65" 3840x2160 4K 700nit, 47% Haze, 24/7 display - Black
1	LTM1U	Chief	TV Wall Mount
1	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Decoder)
1	TV Panel	Custom	2 Data
	Fitness Room TV (TV 7)		
1	FW65BZ40P	Sony	65" 3840x2160 4K 700nit, 47% Haze, 24/7 display - Black
1	LTM1U	Chief	TV Wall Mount
1	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Decoder)
1	TV Panel	Custom	2 Data
	Fitness Room TV (TV 8-11)		
4	FW55BZ40P	Sony	55" 3840x2160 4K 700nit, 47% Haze, 24/7 display - Black
4	MCM1U	Chief	TV Ceiling Mount (Provide pole and Accessories)
4	NV-21-HU	QSC	4K60 4:4:4 Network Video Endpoint (Decoder)
4	TV Panel	Custom	2 Data
	Network Switch		
1	M4250-40G8XF-PoE++	Netgear	40x1G Ultra90 PoE++ and 8xSFP+ Managed Switch
	Data Patch Panel		
1	4S255-S24	Leviton	Atlas-X1 24-Port 1 RU Panel Unloaded w/ Cable Manage
As req	6ASJK-RE6	Leviton	Atlas-X1 CAT6A Shielded Jack BLK
As req	BL-BK	Leviton	Blank Keystone Insert (Black)
1	PSD-C175	AVP	Designation Label Kit

Multichannel Assistive Listening System

QTY	*MODEL*	*MAKE*	*DESCRIPTION*
	Assistive Listening System		
1	WF T8 D	Williams AV	Multi-channel Wi-Fi assistive listening server
6	WF R2-00	Williams AV	WAV Pro Wi-Fi Receiver
1	AC CHG406-00	Williams AV	6 slot charger for use with WAV Pro receiver
6	HED 024	Williams AV	Headphones
2	NKL 008	Williams AV	Neckloop
1	IDP 008	Williams AV	ADA wall plaque

Fitness Room Wireless Mic OPTION Equipment List

QTY	MODEL	MAKE	DESCRIPTION
	Wireless Mics - Fitness Center Option		
1	QLXD4	Shure	Single Channel Receiver
1	QLXD1	Shure	Bodypack Transmitter
1	SM31FH	Shure	Fitness Headset Condenser Microphone
1	QLXD2/SM58	Shure	Handheld Transmitter w/ SM58
	Batteries and Charging Docks for Wireless Mics		
1	SBC200US	Shure	Dual Docking Charger w/ Power Supply
2	SB900B	Shure	Lithium-Ion Rechargeable Battery

1.15 Cables and Connectors

A. Panel Mount Connectors

1. Male XLR - Neutrik NC3MD-L-B-1
2. Female XLR - NC3FD-L-B-1
3. Female XLR/ ¼" - Neutrik NCJ6FI-S
4. Female ¼" Phone - Neutrik NJ3FP6C-BAG
5. Speakon - Neutrik NL4-MPXX-UC
6. Female BNC – Neutrik NBB75DFIX

B. Cable Mount Connectors

1. Male XLR - Neutrik NC3MXX-B
2. Female XLR - Neutrik NC3FXX-B
3. Male ¼" - Neutrik NP3C
4. Speakon - Neutrik NL4FX
5. BNC – Canare
6. BNC Ant – West Penn or Equivalent

C. Cabling

1. Microphone – West Penn 77291, as required
2. Line Level – West Penn 77291, as required
3. Speaker (Low Impedance) – West Penn 227, as required
4. Speaker (70 Volt) – West Penn 226, as required
5. Video Encoders/ Decoders – West Penn 4246
6. Control System – West Penn 4246
7. CAT6 – West Penn 4246 plenum-rated, as required
8. Antenna – West Penn 810, as required

PART 2 - EXECUTION

1.16 GENERAL

A. Perform this work in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.

B. Furnish and install all materials, devices, components and equipment required for a complete functional, operating system as specified herein.

C. Coordinate all work with other trades as necessary to avoid conflicts. In the event of any conflict, delay or improper preparation by other trades, notify the Architect. The Architect's decision will be binding.

D. Verify all field conditions.

1.17 WIRE AND CABLE INSTALLATION

A. Verify that all conduit has been de-burred and is properly joined, coupled and terminated prior to pulling wire.

B. Provide permanent identification of run origination at all conduit terminations.

C. Apply a chemically inert conduit lubricant to all wire and cable prior to pulling. Do not subject wire and cable to tension greater than recommended by the manufacturer. Do not jerk any cable through conduits.

D. Provide a box loop for all wire and cable routed through junction boxes or distribution panels. Cable loops and bends shall not be bent at a radius beyond that which is recommended by the manufacturer.

E. Identify all wire with permanent labels wrapped about the full wire within one inch of each connection. Indicate the number on the associated run sheet or single line drawing as it applies to the field condition. Provide the same labeling to wires that first enter or exit from conduits,

junctions or distribution points within 6 inches from the entry point. Labels shall be Brady or Thomas & Betts.

F. All hanging and free-standing equipment and cabinets furnished including, but not limited to, racks and loudspeakers, shall be secured to substantial building structure so as to resist seismic acceleration in any direction up to a limit of the greater of 1.0G or the limit prescribed by governing codes.

1.18 EQUIPMENT RACK & CONSOLE INSTALLATION

A. Mount equipment in racks and consoles and fully wire and test before delivery to job site. Notify Consultant when racks have been completed and tested so they can be inspected, if requested.

B. Provide rack power distribution. See drawings for additional details.

C. Provide each equipment rack with a locking rear door including retaining devices and protective plastic covers for run sheets, rack elevations and single line drawings where applicable. Install matching blank panels in all spare spaces.

D. Provide engraved labels on the front of each equipment rack including its designation and function within the system as referenced throughout the project. Also include the circuit breaker number and sub-panel identification for the rack.

E. All wiring and cable shall be continuous and splice-free for the entire length of the run between designated connections or terminations.

F. All shielded cables shall be insulated. Shields shall not come in contact width the conduit or its fittings at any point. Insulate all drain wires with heat shrinkable tubing if necessary.

G. Solder all connections at the receptacle using only 60/40 rosin core solder.

H. Lace, tie or harness wire and cable as required herein and in accordance with accepted standards. Dress all wire to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point. Provide service loops where harnesses or different classes cross or where hinged panels are to be connected.

1.19 GROUNDING

A. Connect all equipment chassis to signal ground by a single green #14 TW stranded wire unless each device is internally connected to ground via the AC receptacle.

B. Shields of shielded cables shall be grounded exclusively to signal ground at one end only, the low potential end of the run, unless otherwise noted.

C. Shields shall not be permitted to carry DC control circuits or signal.

D. There shall be no signal ground current paths, unless otherwise noted.

E. Signal and electrical system grounds shall be isolated except at the local distribution panel or project ground field connection.

F. Signal ground provisions shall realize less than 0.15 ohms to the primary ground connection.

G. All signal circuit conduit and power conduit of the system shall be grounded exclusively to building ground, and then insulated at the entry to the equipment racks. The equipment rack shall be physically isolated from conduit.

1.20 DSP AND CONTROL CUSTOM PROGRAMMING AND GRAPHICAL USER INTERFACE (GUI)

A. Submit touchpanel layouts and programming operation flow description for both Audio DSP and Control for Owner Review and Approval at least 8 weeks prior to system commissioning. It is the Contractor's responsibility to provide all custom software programming. Coordination with the Consultant and Owner is required for the development of this software.

B. Contractor will provide for up to two Owner Review programming updates and revisions after system commissioning and Owner turnover. These are estimated to occur at 3 weeks and 3 months after initial use of the system.

1.21 CLEANUP

A. Maintain the premises in a clean and orderly condition at all times.

B. Clean up each week during construction and remove all packing material and rubbish resulting from this work on the jobsite.

C. Remove all tools and equipment, unused materials and rubbish from each area where work has been completed, unless designated for storage.

1.22 FINAL PROCEDURES

A. Perform any and all remedial work to correct inadequate performance or acoustical conditions as determined by the architect or consultant at no additional cost to the owner.

B. Furnish all portable equipment to the owner along with complete documentation of the materials presented. All portable equipment shall be presented in the original manufacturer's container complete with all included instructions, warranties and other written information.

C. Present and clarify all materials to the Owner and operating personnel and fully demonstrate the operation and maintenance of the systems, equipment and devices as specified herein.

D. Check and inspect and if necessary, adjust all systems components and devices as required at least twice within the warranty period to maintain the system within its specified operating capacity.

END OF SECTION

SECTION 11450

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Residential-grade** kitchen appliances.

1.02 RELATED SECTIONS

A. **Section 06200 – Finish Carpentry**: Provisions to receive residential equipment.

B. **Division 15 - Mechanical**: Plumbing and ventilation services to residential appliances.

C. **Division 16 - Electrical**: Electric service to residential appliances, including disconnects.

1.03 SUBMITTALS

A. **Product Data**: Manufacturer's catalog data, demonstrating compliance with specified requirements.

B. **Operation and Maintenance Data**: Submit for residential appliances, in manuals produced and submitted in compliance with requirements specified in Section 01783 - Operation and Maintenance Data.

1.04 QUALITY ASSURANCE

A. **Regulatory Requirements**:

1. Plumbing connections shall comply with California Plumbing Code (CPC) and all other requirements of authorities having jurisdiction. Refer to Division 15 - Mechanical.
2. Ductwork connections shall comply with California Mechanical Code (CMC) and all other requirements of authorities having jurisdiction. Refer to Division 15 - Mechanical.
3. Electrical connections shall comply with California Electrical Code (CEC). Refer to Division 16 - Electrical.

1.05 WARRANTY

A. **Extended Warranty**: Provide extended product guarantees as standard with appliance manufacturers.

PART 2 - PRODUCTS

2.01 TEACHING KITCHEN EQUIPMENT

A. Specified Manufacturer:

1. As noted on the drawings or listed below.

B. Acceptable Manufacturers: No known equals.

C. Kitchen Equipment for Staff Room 118

Equipment	Make	Model Number	Qty
Refrigerator	Forno Milano Espresso	FFFFD1785-31S	1
	31-Inch Stainless Steel 17.2 cu.ft. Bottom Freezer Refrigerator with Built-In Ice Maker Right Swing Door		
Garbage Disposal	InSinkErator Evolution 100		1

PART 3 - EXECUTION

3.01 INSTALLATION

A. Preparation:

1. Verify installation conditions, dimensions, and ratings.
2. Coordinate cabinet cut-outs and spaces.
3. Coordinate plumbing, mechanical and electrical requirements.

B. Appliance Installation: As instructed and recommended by manufacturer. Provide closures, mounting brackets and anchors as necessary for secure installation and neat appearance.

1. Install appliances in space provided.
2. Make connections, install installation kits.
3. Secure to cabinets as applicable.
4. Ensure all parts are secure or operate smoothly, as designed.
5. Ensure that all appliances are properly grounded.

3.02 CLEANING AND CHECKING

A. Cleaning: Remove protective tape, wedges, coating, covers. Clean all surfaces with non-abrasive cleaners as recommended by manufacturer.

B. **Operational Check and Demonstration**: Operate each appliance one full cycle to ensure proper operation. Demonstrate to Construction Manager the proper operation of each appliance.

C. **Warranty Registration**: Complete warranty cards, listing model number and serial number of each appliance. Deliver to Construction Manager warranty cards, other warranty data, operating instructions, owner's manuals and other information provided by manufacturer.

END OF SECTION

SECTION 11485

GYMNASIUM EQUIPMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Gymnasium sports equipment:

1. Basketball backstops and accessories.
2. Wall Pads.
3. Divider Curtain.
4. Volleyball Equipment.
5. Pickleball Equipment
5. Gymnasium Accessories.

B. Electronic scoreboards and timers.

1.02 RELATED SECTIONS

A. Section 05090 - Anchors and Fasteners: Requirements for anchoring to concrete, masonry and steel construction.

B. Section 05120 - Structural Steel: Structural steel framing to support basketball backstops.

C. Section 05500 - Miscellaneous Metal Fabrications: Requirements for minor structural framing added as necessary for installation of gymnasium equipment.

D. Section 08710 - Door Hardware: Lock cylinder requirements for keyed switches.

E. Section 09645 – Cushioned Wood Flooring Assemblies: Floor through which volleyball and pickleball new posts sockets shall anchor to concrete substrate.

F. Section 12760 – Telescoping Stands: Indoor bleachers for Gymnasium.

E. Division 16 - Electrical: Requirements for electrical connections, including conduit and outlet/junction boxes.

1.03 SUBMITTALS

A. Product Data: All standard production products.

B. Shop Drawings: All products specifically for the Project.

C. Samples: Assembly of wall pad showing corner construction and attachment method.

D. **Contract Closeout Submittals:** Submit operation and maintenance data for each type of folding door. Include manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

1.04 QUALITY ASSURANCE

A. **Regulatory Requirements:** Comply with regulations of governing authority over athletic event, including materials, dimensions, arrangements and colors.

1.05 WARRANTY

A. **Extended Warranty:** All basketball backstop support structures including clamps, fittings and tube to have a minimum warranty of 25 years from date established by Notice of Completion. Warranty for other items shall be as indicated in product specifications.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. **Specified Manufacturers:**

1. Gymnasium equipment, except electronic scoreboards: Gared Performance Sports System, Noblesville, IN; Richard Sivas, Herk Edwards, Inc.; (310)373-0543.
2. Floor plates for volleyball equipment: Gared Performance Sports System, Noblesville, IN; Richard Sivas, Herk Edwards, Inc.; (310)373-0543.
3. Wireless electronic scoreboards: Daktronics, Inc., Brookings, SD (605/697-4300) or 888/325-8766; Bob Fechner, 714/865-6040).

B. **Acceptable Manufacturers:** None identified. No substitutions will be considered.

2.02 BASKETBALL BACKSTOPS

A. **Main Gym Backstops:** Model #3107, ceiling-suspended welded single front folding basketball structure, By Gared Performance Sports Systems, Noblesville, IN.

1. Overhead Structure
   a) Unit shall be supported from 3-1/2” O.D. x 0.120” wall ASTM A-513 horizontal and 2-3/8” O.D. x 14 gauge (0.083”) wall ASTM A-513 vertical structural steel tubing secured to the building with heavy gauge steel stampings or weldments (as required by building conditions). When truss span widths exceed 10’-0”, 3-1/2” O.D. x Schedule 40 (0.216”) wall ASTM A-500 Grade B will be used for the horizontals. Spans over 14’-0” may use welded bridge pipe.

2. Backstop
   a) The backstop shall be of a single post design with a main vertical mast made of 6-5/8" O.D. x 0.120” wall ASTM A-500 Grade B structural steel tubing with 2-1/2” x 1-1/2” x 14 gauge (0.083”) wall ASTM A-513 rectangular steel tube sway braces miter cut and welded in place to a top horizontal 4” x 1-1/2” x 0.18” web ASTM A-36 steel channel. Main mast will be suspended from superstructure with an offset hanger 3" in front of the pivot point. Units with less than 3" offset will not be approved as equal. Backstop shall be manufactured to allow 3" vertical adjustment for plumbing of the backboard. All fittings shall be heavy gauge steel stampings or weldments. A direct goal attachment is used to transfer stress from the goal to the main mast assembly preventing strain on the backboard.
   b) Front brace shall be 1-7/8" O.D. x 14 gauge (0.083”) wall ASTM A-513 steel tubing attached to the main mast 12” to 18” above the backboard. When truss heights are higher than 26’-0”, front brace shall be 2-3/8” O.D. x 14 gauge (0.083”) wall ASTM A-513 steel tubing. Folding brace shall be of a jackknife design with an adjustable hinge for easy installation and field adjustment. Backstop shall be raised and lowered with 1/4" galvanized aircraft cable with a breaking strength of 7000 lbs. Backstop manufactured in accordance with 1994 rule 1, section 8, stating that all parts of the backboard support system shall be at least 6" behind backboard.
   c) White powder coat finish.
   d) Back stop lock (Model 1100).
   e) Motor Data – (model 1194) ¾ HP, 9.5 amp with key switch and receptacle.
   f) Quantity: 6 total (Contractor to verify with Architect).
3. Rectangular Glass Backboards
   a) Model No. AFRG42 Aluminum Framed Rectangular Glass Backboard by Gared Performance Sports Systems.
   b) Backboards shall be 42 inches high by 72 inches wide.
   c) Backboard shall be manufactured from 1/2” tempered glass set in heavy extruded aluminum framing and cushioned by shock absorbing vinyl. Official border and target area permanently fired into glass.
   d) Goal mounting structure shall be a heavy welded formed steel assembly, and directly attached to lower horizontal frame member to minimize stress on glass.
   e) Backboard shall have limited lifetime warranty against defects in material and workmanship, and when used with Gared Performance Sports System’s Direct Goal Attachment feature shall be protected against shatter and breakage of glass. Board must meet NCAA, FIBA and NFSHSA specifications
   f) Pro mold cushion backboard edge. (Model PMCE). Color to be selected by Architect.
   g) Quantity: 16 total (Contractor to verify with Architect).
4. Electric Basketball Backstop Height Adjuster

a) Model No. 1170 Electric Adjust-A-Goal by Gared Performance Sports System.
b) Electric height adjuster shall be manufactured of steel using an electrically operated linear actuator to raise and lower backboard from 8’ to 10’ off of finished floor. Linear actuator shall be powered by a 115 volt single-phase motor and contain built in limit switches to ensure safe operation and positive stopping at 8' and 10' heights. Adjust-A-Goal features a direct goal attachment to transfers load of play directly through backboard to support structure. Adjust-A-Goal shall be operated with a flush mounted single keyed switch (eliminating the need to two keys) or portable power wand.
c) With hard wire kit for electric height adjuster (Model 1158).
d) Quantity: 6 total (Contractor to verify with Architect)

5. Break-Away Goal
   a) Gared Performance Sports System Model No. 2500.
   b) The 2500 goal shall be constructed with an enclosed positive lock mechanism.
   c) Goal shall be designed so that any possible entrapment areas have been eliminated.
   d) Goal shall have official size 18" ring of 5/8" diameter steel with tube tie net attachment and a durable orange powder coated finish. Anti-whip net and hardware shall be included. Universal back plate shall accommodate most 42” and 48” rectangular and fan shape backboards.
   e) Quantity: 6 total (Contractor to verify with Architect).

2.03 WALL PADDING

A. **Model No. 4130** Class “A” Fire Rated Neoprene Foam Wall Padding by Gared Performance Sports Systems, Noblesville, IN.

1. Panels are 2’ wide by 6’ high, with custom sizes available. Panels of 2’’ thick CR Safeguard fire retardant neoprene foam meeting ASTM E84 with Class A rating flame spread index of 25 or less, and smoke development index of 450 or less. Each panel shall be covered with 14 oz. polyester reinforced laminated vinyl and cemented to 7/16’’ OSB exterior grade wood panels with one-inch nailing margins at top and bottom (for securing panels to wall). Available in fifteen (15) standard colors (color to be determined by Architect). All cutouts in panels shall be made in field to fit job conditions.
2. Vinyl flammability rated as self-extinguishing by the California State Fire Code.
3. See Architectural drawings for locations.

2.04 VOLLEYBALL EQUIPMENT

A. **Volleyball Equipment:** Model 6100 Volleyball System by Gared Performance Sports Systems.

1. The model 6100 shall consist of one standard with power winch and one standard with adjustable cable anchor collar. Post shall be telescoping type to meet all FIVB, USVBA, NCAA and NFSHSA requirements for competition. Post shall allow infinite height adjustment from 6' (1.854 m) to 8'4" (2.540 cm) to meet all age group height settings from elementary school use to international competition for both men and women. EVS-01 shall incorporate an internal spring assist mechanism for easy, precise and infinite height adjustments. EVS easily locks in place with a pressure lock hand knob and post is clearly marked at normal competition heights.
2. The 6' (1.890 cm) bottom upright shall be 3 1/2" O.D. (8.890 cm) schedule 80 aluminum tube, with a wall thickness of .300" (.7620 cm). The bottom upright is provided with a special rubber foot to protect finished floors and to provide precise net height adjustment. The upper telescoping adjustable tube shall be 2-7/8" OD (7.303 cm) schedule 80 aluminum tube, with a wall thickness of .276" (.7010 cm) with a 4" (10.16 cm) diameter pulley and oilite bushing. Both post sections have a clear anodized finish.
3. The tensioning winch shall incorporate a heavy-duty, self-locking worm gear mechanism. Winch shall be furnished with a heavy 2" (5 cm) wide high tensile nylon strap with heavy-duty snap hook to eliminate the possibility of hook breaking and guarantee safe connection to net top cable. The power winch is furnished complete with a folding handle for player safety.
4. Systems shall come complete with volleyball net. Net shall be 32' (9.75 M) long x 39" (1 M) high. Netting shall be high quality 4" square #36 black nylon cord with vinyl coated polyester hem double stitched around entire perimeter of net. Top hem of net shall be furnished with a 42'6" long x 1/8" diameter 2000 lb. minimum breaking strength galvanized aircraft cable with a nylon coating (3/16" OD) to protect against fraying. Ends of cable to have loops with heavy swaged type fittings for easy installation. Hems in end of net shall be furnished with a pocket for use with a 1/2" diameter fiberglass dowel rod. Ends of net shall have six 1" wide polypropylene tension straps with buckles for providing additional tightening of net. Bottom of net shall be furnished with a 1/4" diameter braided white nylon rope equipped with a spring loaded, pressure type rope tensioner.
5. System also to include Rope Tensioner and Combination Antenna and Boundary Marker.

B. Outlet Floor Cover Plates:

1. Floor plates shall be solid brass alloy with permanently attached hinged cover, with notch in cover for electrical cords to connect to outlet when cover in closed position. When closed, cover shall proved completely flat surface with no floor obstructions.
2. Floor plate shall be 6-7/16-inches outside diameter by 9/16-inch thick. The diameter of the opening shall be 5-1/8 inches. Floor plate shall be supplied with six #10 x 1-1/2 inch brass flat head wood screws for mounting plate to wood floor.
3. Provide each floor plate assembly cover plate with lock and one cover plate key for access through cover plate.

C. Volleyball Floor Cover Plates: Model 6432 by Gared Performance Sports Systems.

1. Floor plate shall be solid brass alloy with permanently attached hinged cover. Hinge and mounting holes in outer ring shall be completely concealed under the cover when in the closed position, allowing for a completely flat surface with no floor obstructions.
2. Floor plate shall be 7-1/2" outside diameter.

D. Volleyball Floor Sleeves: Model 6400 by Gared Performance Sports Systems.

E. Volleyball Transporter/Storage Cart: Model 6295 by Gared Performance Sports Systems.

1. Heavy-duty transporter/storage cart shall be capable of storing and transporting one referee stand and four volleyball posts.
2. Transporter/Storage Cart is provided with blue vinyl covered bottom shelf and pouch to allow for storage of nets, pads antennas and boundary markers.
3. Frame shall be rectangular steel tubing finished with attractive gloss black powder coat
4. Transporter/Storage Cart rolls 4" x 1-1/4" non-marking swivel casters.

F. Judge's Stand: Model 6446 by Gared Performance Sports Systems.

1. Judges stand shall be designed to attach to a collar by means of a removable, self-locking pin.
2. Collar slides over 3-1/2" O.D. volleyball standard and is rigidly positioned to post with allen-head set screws.
3. Frame shall be constructed of 1-1/2" x 1-1/2", 14-gauge square steel tubing and 1" OD steel tubing, welded together. Legs, steps, platform, and handrails shall all be one solid unit.
4. Judges platform shall consist of 1/2" thick, polyurethane finished Birch plywood, permanently bolted to stand.
5. Handrail/ladder section shall be spaced vertically 16" on center with three (3) ladder steps spaced horizontally of 16" centers.
6. Lower end of ladder tubes shall have 1/2" thick rubber bumper to protect finished floors. Ladder legs shall have 2" O.D. rubber wheels for easy transporting of stand. All metal components of stand shall be finished in black powder coat.
7. Judges stand shall be supplied complete with safety padding for player protection.
    a) Upper section of stand shall have a snapped into place 1-1/2" polyethylene foam padding.
    b) Lower ladder tubes shall have removable, hook and loop attached pads of 1" neoprene foam.
    c) All pads shall be wrapped with 14 oz., polyester reinforced, dark blue vinyl (optional vinyl colors also available). Last two digits indicate pad color. Colors available: 01 White; 02 Marine Blue; 03 Brown; 04 Red; 05 Beige; 06 Orange; 07 Yellow; 08 Grey; 09

Maroon; 10 Dark Blue (standard); 11 Black; 12 Purple; 13 Forest Green.

8. Volleyball Post Padding: Model 6040 by Gared Performance Sports Systems.
   a) Pads shall be hinged at corners to fold neatly around posts and tensioning winch to provide maximum player protection. Pads shall be constructed of 1-1/2" thick polyethylene foam filler covered with polyester reinforced vinyl with three (3) hook and loop fastening straps for quick set-up and take-down, and shall be constructed to accommodate winch, or judges stand when used.
   b) Standard pads are Gray in color unless otherwise specified.
   c) Pads are sold as pair unless otherwise specified.

2.05 GYMNASIUM DIVIDER CURTAINS

A **Model No. 4040XL** Top Roll Divider Curtain by Gared Performance Sports Systems Inc., Noblesville, IN.

1. Lower 2' vinyl section of curtain shall be solid vinyl coated polyester (avg. 18 or 22 oz. per square yard as required). Flammability rated as self-extinguishing by California State Fire Code. All seams to be welded with full 1" contact welds. A padded pocket shall be formed along bottom edge of curtain to accommodate a 1-5/8" diameter batten pipe for curtain support. Available in thirteen (13) standard colors (color to be determined by Architect). Upper section of curtain shall be vinyl coated polyester mesh (avg. 9 oz. per square yard). Flammability rated as self-extinguishing by California State Fire Code. Available in six (6) standard colors (color to be determined by Architect). Color samples provided upon request.
2. The 4040XL is supported from the roof structure by directly attaching to the underneath side of the roof truss or by attaching to 3.5” O.D. horizontal and 2 3/8” O.D. vertical structural tubing. Max. attachment height is 35’. Bridge pipe will be required when truss spans exceed 14’. All structure finish will be baked on white powder coat.
3. Drive shaft shall be supported by a carrier assembly spaced 9’ +/- 2’ O.C. Center support shall consist of a formed bracket with (2) 12” long steel rollers on which the drive shaft shall rotate. Steel rollers, designed to act as a guide for the vinyl, have permanently lubricated bearings for effortless movement of vinyl.
4. Curtain shall be operated by two (2) synchronized internal tubular motors (120 volt, 60 hertz, single phase). Each motor shall have a maximum torque of 352 inch pounds with a speed of 14 rpm, and shall be equipped with integral up and down limit switches with two locking push buttons. Motors shall be maintenance free, permanently lubricated and have overheating protection feature. Motors shall feature electromagnetic disk brakes that allow smooth and accurate stops without slippage and full braking power in event of power failure. Each motor shall feature three-stage planetary gear mechanism for quiet and reliable use. Curtain does not require cables, belts or straps for operation and all electrical components shall be neatly contained in overhead superstructure. Curtains with cables, belts or straps shall not be considered equal.

Curtains with electrical components not contained in overhead superstructure shall not be considered equal.

5. Motors shall utilize a flush mounted single keyed switch to raise and lower the divider curtain (Eliminating the need for two keys). Key switch shall be located so that curtain is in full view of authorized operator at all times. Optional wireless remote control or keypad control operation available.
6. Motors shall have a five (5) year warranty against material defects and workmanship. Curtain motors with less than a five (5) year warranty shall not be considered equal. Vinyl shall have one (1) year warranty against material defects and workmanship.
7. Quantity: 1 total (Contractor to verify) – see Architectural plans for locations.

2.06 ELECTRONIC SCOREBOARDS

A. Scoreboards, General:

1. Scoreboards shall operate with 100 percent solid-state electronics, contained in all-aluminum enclosure.
2. Scoreboards shall be remotely controlled. (Spectrum radio for scoreboard controlled)
3. Scoreboards shall be ETL listed to UL standards 48 and 1433 and tested to CSA standards for outdoor use.

B. Gymnasium Scoreboard System: Daktronics BB-2155 single-sided basketball scoreboard, capable of also scoring volleyball and wrestling, (Remotely Controlled) with scores for HOME and GUEST to 199, period to nine, team FOULS to 99, PLAYER number to 99, player FOUL to 9, T.O.L (time outs left) to 9, possession and bonus indicators, period time display to 59:59 and during the last minute of period, display of time to 1/10 of a second.

1. Size: 6’-0” (1.83 m) high by 10’-0” (3.05 m) wide by 0’-6” (152 mm) deep.
2. Quantity: 2
3. Base weight: 275 lbs.
4. Base Power requirement: 270 W
5. Construction: All aluminum construction.
   a) Scoreboard face and perimeter: 0.063" thick aluminum.
   b) Scoreboard back: 0.050" thick aluminum.
   c) Digit faceplates: 0.090" thick aluminum.
1. Color:
   a) Panel Color ; Black
   b) Striping; White
   c) Caption: White
   d) Digit Color: Mixed with Red and Amber
   e) Caption Style; White Vinyl
2. Digits: PanaView Digits, seven bar segments per digit.
   d) LED digit technology: Diffusant over LEDs to blend light, achieving a uniform look with 140 degree wide viewing angle.
   e) Clock and score digits: 13" (330 mm) high.

f) PERIOD and time outs left digits: 10" (254 mm) high.
g) Clock, colon, period digits and bonus indicators: Amber LEDs.
h) Score digits and possession indicators: Red LEDs.

3. Captions:
   a) HOME and GUEST captions: 6" (152 mm) high.
   b) PERIOD caption: 4" (102 mm) high.
   c) All captions: White vinyl applied directly to scoreboard face.
4. Training: 4 hours minimum, on site training of City's personnel.

C. Horn: Vibrating horn, mounted behind scoreboard face.

5. Horn shall sounds automatically when period clock counts down to zero.
6. Horn shall sound when manually when directed by scoreboard operator.

D. Power Cord: Cord is 11-feet (3353 mm) long, color: white and plugs into standard grounded 120 V AC outlet mounted on ceiling hung backstop.

E. Shot Clocks: Daktronics BB-2114 Basketball Shot Timers, one on each at the Main Court basketball backstops.

1. Size: 1'-7" (483 mm) high by 1'-10" (569 mm) wide by 0'-6" (152 mm) deep.
2. Weight: 15 lbs (7 kg).
3. Power: 120 V AC (40 watt, 0.4 amp)
4. Enclosure: Aluminum alloy 5052 enclosure with custom color paint finish as directed by Architect. Cabinet shall be capable of withstanding high-velocity impact from indoor sports balls without need for protective screens.
5. Digits/indicators: 13-inches (330 mm) high, PanaView Digits, seven bar segments per digit, red LEDs.
6. Display color: Black.
7. Quantity: 2

C. Scoring Console: All Sport 5000 by Daktronics. Scoring Console shall be capable of scoring multiple sports using changeable keyboard inserts.

1. Control console: (2 total)
   a) Electronics shall be housed in a rugged aluminum case.
   b) Scoring console shall have 32-character liquid crystal prompting display to verify entries and recall information currently displayed.
   c) Console face shall be water-resistant due to a sealed membrane keyboard.
   d) Console shall be capable of controlling multiple scoreboards, stats displays and shot clocks, including other All Sport 5000 controlled displays currently owned by the City.
   e) Recalls clock, score and period information if power is lost.
   f) Runs Time of Day and Segment Timer modes.
   g) Console shall have a maximum power requirement of 6 watts.
   h) Console shall include 30-foot (6096 mm) control cable to connect to control receptacle junction box.

2. Control Cable: One pair shielded cable of 22 AWG minimum.
3. Accessories: Provide the following:
   a) A durable hard-side carrying case for console.
   b) Console shall have, 2.4 GHz spread spectrum radio control for wireless scoreboard control.
   c) Hand held switch for main clock start/stop and horn.

2.07 GYMNASIUM ACCESSORIES

A. **Jaypro Sports – Rally Portable Pickleball New System**. RPP-3Port portable pickleball net system with optional center strap (P/N: CS-1 to adjust height to 34". Quantity: 2

B. **Jaypro Sports Totemaster** - Atlas Double Ball Cart.

1. The Atlas Double Ball Cart is from the Jaypro Totemaster line. Constructed of thick wall 1" square steel tube. These units are rugged and strong enough they can even hold an assortment of medicine balls. Heavy duty, non-marking swivel casters for easy transport. Protective powder coating for longer life.
2. Constructed of 1" square steel tubing-Heavy duty.
3. Non marking, swivel casters-Powder-coated-Stores up to 15 balls.
4. Assembles to 51.5" L x 24" W x 36" H
5. Quantity: 4 total (Contractor to verify).

C. **Jaypro Sports Portable** Players Bench (Model PB-15).

1. 10" wide non-skid aluminum planks.
2. 2" x 2" heavy duty galvanized steel legs for superior rust resistance.
3. Planks are supported by a strong, galvanized steel understructure.
4. Player bench without back rest.
5. Seat plank is 19" from ground.
6. Floor protection kit available for indoor use.
7. Quantity: 8 total

D. **Jaypro Sports Scores Tables** (Model ST-8FS) with possession indicator. Quantity: 2

PART 3 – EXECUTION

3.01 PREPARATION

A. **Preparation:**

1. Coordinate support of basketball backstops and gymnasium divider curtains with roof structure to ensure proper distribution of loads and adequacy of attachment points. Ensure that building structure has been designed for loads of specific gymnasium divider shall be provided.

Provide additional structural framing members as required in accordance with Section 05505 - Miscellaneous Metal Fabrications.

2. Coordinate configuration, size, and installation of basketball backstops and gymnasium divider curtains with height, slope, and type of building structure and lighting fixtures, mechanical equipment, ductwork, fire-suppression system, bleachers, athletic equipment, and other potential obstructions.
3. Field-verify dimensions prior to fabrication.
4. Coordinate electrical requirements for motorized operating mechanism to ensure proper power source, conduit, wiring, and boxes for keyed switches. Prior to installation, verify type and location of power supply. See "Electrical Contractor Shall Provide and Install"
5. Coordinate delivery of Volleyball Floor Sleeves and Covers with sub-contractors responsible for installation.
6. For installations made after wood gymnasium flooring is installed, provide protection and exercise care not to damage flooring.

3.02 INSTALLATION

A. Installation, General: Install equipment in accordance with manufacturer's written instructions and shop drawings.

1. Install even, plumb and level.
2. Install control switch such that operator has view of complete basketball backstop during lowering and raising.
3. Adjust limit switches of electric winch to ensure accurate position in both stored and lowered positions.

3.03 TESTING AND DEMONSTRATION

A. Testing and Demonstration: Operate basketball backstops to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.

B. Instruction: Instruct Construction Manager and staff in operation and required maintenance.

END OF SECTION

SECTION 11735

EMERGENCY MEDICAL EQUIPMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. **Wall cabinet for storage** of Owner-furnished automated external defibrillator (AED).

1.02 RELATED SECTIONS

A. **Section 05090 - Anchors and Fasteners**: Requirements for anchors and fasteners to building substrates.

B. **Section 06100 – Rough Carpentry**: Backing and framing provisions for installation of AED cabinet, including coordination of placement of rough-in frames and anchors concealed in walls.

1.03 SUBMITTALS

A. **Product Data**: AED cabinet, including rough opening dimensions and anchoring points.

B. **Manufacturer's Installation Instructions**: Indicate special installation requirements and coordination provisions.

PART 2 – PRODUCTS

2.01 AUTOMATED EXTERNAL DEFIBEILLATOR

A. **Specified Manufacturer**: Physio-Control, Inc., Redmond, WA (800-442-1142).

B. **Acceptable Manufacturers**: Defibtech, LLC., Guilford, CT. Equivalent products of other manufacturers will be acceptable in accordance with the “or equal” provision specified in Section 01600 – Products and Materials

C. **AED Device**: By Physio-Control, Inc., Model: LIFEPAK CR Plus Defibrillator.

1. Unit shall include: Carry case, extra electrodes, extra Charge-Pak battery charger and Ambu Res-Cue Mask Kit. Quantity 2.

2.02 AED WALL CABINET

D. **Specified Manufacturer**: Model-Metal Products, Inc. Owatonna, MN (800-435-5544)

E. **Acceptable Manufacturers**: General Medical Devices, Inc. Palatine, IL

(888-541-2337). Equivalent products of other manufacturers will be acceptable in accordance with the "or equal" provision specified in Section 01600 - Product and Materials.

F. **AED Wall Cabinet**: Manufactured by Modern Metal Products, Inc. Model 147R1-SS., recessed stainless steel cabinet suitable for the automated external defibrillator (AED). Quantity 2.

1. Cabinet dimensions: 14-inches high by 14-inches wide by 6.0-inches deep.
2. Construction: Stainless steel, with exposed surfaces No. 4 satin finish.

G. **Rough-in Provisions**: Provide frames, anchors, supports, accessories and closure trim, appropriate to scheduled equipment. Coordinate depth of wall cavity with requirements for recessed cabinet.

PART 3 - EXECUTION

3.01 PREPARATION

A. **Rough-In**: Prepare rough-in openings to suit recessed cabinet. Installation height shall be as indicated on the Drawings and as required by Authority Having Jurisdiction (AHJ). Refer to Section 06100 – Rough Carpentry.

3.02 AED WALL CABINET INSTALLATION

A. **AED Wall Cabinet Installation**: Comply with manufacturer's instructions and recommendations and requirements of Authority Having Jurisdiction (AHJ), including Fire Marshal. Coordinate cabinet installation with requirements of AED manufacturer, provided by Owner through Construction Manager.

3.03 PROTECTION AND CLEANING

A. **Protection**: Retain protective coverings on stainless steel. Remove coverings in preparation for Completion review.

B. **Cleaning**: Clean interior and exterior surfaces to dust-free condition for Completion review. Remove fingerprints and polish stainless steel.

END OF SECTION

SECTION 12494

ROLLER SHADES

PART 1 - GENERAL

1.01 DESCRIPTION: Division 1 applies to this Section. Provide manually operated roller shades complete as indicated, specified and required.

A. Work In This Section: Principal items include:

1. Submittals.
2. Manual roller shades complete with all hardware.
3. Motorized roller shades complete with all hardware.

B. Products Supplied But Not Installed Under This Section:

1. Metal shade pockets or housings surface mounted assembly.

C. Related Sections:

1. Rough Carpentry.
2. Gypsum Wallboard.
3. Electrical Connections.
4. Metal Finishes.

1.02 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

D. WCMA – ANSI/WCMA A100.1-2022 Safety of Window Covering Products; 2022

1.03 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
3. Storage and handling requirements and recommendations.
4. Mounting details and installation methods.
5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

C. **Shop Drawings**: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

1. Prepare shop drawings on Autocad or Microstation format using base sheets provided electronically by the Architect.

D. **Window Treatment Schedule**: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.

E. **Selection Samples**: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

F. **Verification Samples**: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.

G. **Maintenance Data**: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.04 QUALITY ASSURANCE

A. **Manufacturer Qualifications**: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.

B. **Installer Qualifications**: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. **Fire-Test-Response Characteristics**: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. **Electrical Components**: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.

E. **Anti-Microbial Characteristics**: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

F. **Mock-Up**: Provide a mock-up of one roller shade assembly for evaluation of mounting, appearance and accessories.

1. Locate mock-up in window designated by Architect.
2. Do not proceed with remaining work until, mock-up is accepted by Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. **Deliver shades in factory**-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.06 PROJECT CONDITIONS

A. **Environmental Limitations**: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.07 WARRANTY

A. **Roller Shade Hardware Warranty**: Manufacturer's standard non-depreciating 25 year limited warranty.

B. **Standard Shadecloth**: Manufacturer's standard twenty-five year warranty.

C. **Roller Shade Installation**: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: To establish a standard of quality, design and function desired, drawings and specifications are based on products by MechoShade Systems, Inc.; as represented by ARCHITYPE, Tel: (213) 631-5001. Fax: (213) 884-4790, Contact: Jean-Guy Poitras. Email: jean-guy.poitras@mechoshade.com ; jeanguy@architype.net.

2.02 ROLLER SHADE TYPES

A. **Manually Operated Shades**: (Doors, Windows and Sidelights)

1. Mounting: Surface mounted with fascia and wire guides. See mounting details on drawings for each location.
2. Configuration: Single solar shadecloth.
3. Solar Shadecloths:
   a. Fabric: EuroTwill 6200, (color: 6210 Nickel) Reversable Weave, 2 percent open
4. Mecho5x, Managed Lift Force, Hardware: Lifts single band or multiband shade assemblies:
   a. Lifting Force: 3.5 to 8.5 pounds (1.6 to 3.9 kg) for shade assemblies with a shade band hanging weight, not including mounting hardware, of 35 pounds (16 kg).
   b. Backward compatible to Mecho-5 components including facia, regular and reverse roll, pockets, and wall-mounting accessories.
   c. Includes offset drive capability, left/right, front, or back to allow for utilization of blackout or ShadeLoc Zipper channels.
   d. Allows for ease of operation when obstructions do not allow for direct drive chain access.
   e. Offset chain drive shall not cause an increase of friction or pull

force when operated up to a 26 degree angle from vertical.

B. Motorized Shades:

1. Mounting: Reverse roll surface mounted with fascia and wire guides. See mounting details on drawings for each location.
2. Configuration: Single solar shadecloth.
3. Solar Shadecloths:
   a. Fabric: EuroTwill 6200, (color: 6210 Nickel) Reversable Weave
4. Controls: Electrically operated, Whispershade IQ2-DC with IQ2-DC motor control panel low voltage system for all upper shades as shown on drawings.

2.03 SHADE CLOTH

A. Visually Transparent Shadecloth: MechoShade Systems, Inc., EuroTwill Series series, reversable weave, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl.

2.04 SHADE BAND

A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
2. Shade Band and Shade Roller Attachment:
   a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.
   b. Provide for positive mechanical engagement with drive / brake mechanism.
   c. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
   d. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
   e. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.05 SHADE FABRICATI0N

A. **Fabricate units to** completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

B. **Provide battens in standard** shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

C. **For railroaded shadebands**, provide seams in railroaded multi-width shadebands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shadebands.

D. **Provide battens for railroaded** shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be responsible for proper use and placement of battens to assure proper tracking and roll of shadebands.

2.06 COMPONENTS

A. **Access and Material Requirements**:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. **Motorized Shade Hardware and Shade Brackets**:

1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade.
2. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
3. Provide Catch-Pin Bracket hardware system with 4 removable support pins and removable ears for pocket mounting.

C. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
8. Drive Bracket / Brake Assembly:
    a. MechoShade Drive Bracket model Mecho5x shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
    b. Mecho5x drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
    c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
    d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
    e. The entire Mecho5x assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
    f. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.
    g. Chain Tensioner: Chain tensioning device complying with ANSI/WCMA A100.1-2022.

2.07 SHADE MOTOR DRIVE SYSTEM

A. Low Voltage EDU (24 VDC):

1. Basis of Design: MechoShade Systems LLC; WhisperShade IQ2-DC System. Tubular, asynchronous, integral DC motor. 24 VDC; temperature Class B, thermally-protected, totally enclosed, maintenance-free. Powered by low voltage power supply connection equipped with disconnect plug assembly furnished with EDU.
2. Audible Noise: 38 dBA measured 3 ft (914 mm) from motor unit, depending on motor torque.
3. Nominal Speed: 10 to 28 RPM. Configurable. Speed managed such that it does not vary due to load/lift capacity.
4. Low voltage power supply for powering external accessories connected to either the dry contact or network port.
    a) Products that require accessories to be powered by a plug-in or externally-supplied power supply are not acceptable.
5. Override Mode: Place motor into Override Mode when local switch commands shade to new position.
    a) Local switch command sources:
        1) Keypad connected to EDU dry contact inputs.
        2) Third-party system connected to EDU dry contact inputs.
        3) Network keypad or other device that serially communicates with EDU and configured to issue override commands as if it were a local switch connected to EDU dry contact inputs.
    b) Entering Override Mode: Monitor and log positioning commands from automation devices. Do not act until exiting Override Mode.
    c) Return from Override Mode: Position shade to last commanded position in log.
    d) Automated Return from Override Mode:
        1) Override Return Timer: When Override Mode is entered by changing shade position with local switch as described above, Enable override return timer to make these changes temporary such that automation can regain control of shade after configurable time duration (default of 60 minutes).
        2) Pocket temperature sensor integral to EDU to track pocket temperature.
            a. When shade is in Override Mode and Heat Gain Sensing is Enabled: Sensor determines when direct sunlight and associated solar heat gain has left the window.
                1. When this condition occurs, after the shade has been overridden to cover the window, EDU to return from Override Mode if Override Return Timer has not done so already in order for automation controllers to once again optimize shade position for exposure to daylight.
6. Preventative Maintenance:
    a) Internally monitor important operating parameters to ensure motor and its shade assembly are functioning properly.

b) Performance Degradation: Provide visual indication via feedback LED and communicate warnings on repetitive basis through its serial port.
c) Warning Conditions: Logged and queryable. Allow sending of multiple warnings until condition is acknowledged.
d) Stop shade rotation for parameters of critical concern until reset by trained technician after being serviced.
e) Devices capable of receiving warnings include SolarTrac automated solar-evaluation control system.
f) Tracked Parameters to include:
    1) Operating life (cycles, hours).
    2) Pocket temperature.
    3) Internal motor temperature.
    4) Vibration.
    5) Stall.
    6) Power reset.
    7) Maintenance Mode.
    8) Speed regulation.
    9) Position targeting.
    10) Movement without command.
    11) One Bus availability.
g) Detectable Potential Warning Conditions to Include:
    1) Assembly vibration/bearing wear warning.
    2) Tube/shade assembly drop.
    3) Fabric hung-up/telescoping.
    4) Motor mount warning.
    5) Lifecycle replacement warning.
    6) Brake/limit failure.
    7) Network warning.
    8) Motor internal temperature warning.
    9) Pocket temperature warning.

B. Modes of Operation:

1. Uniform Mode: Shades move to defined intermediate stop positions in order to maintain aesthetic uniformity.
2. Normal Mode: Shades move to defined intermediate stop positions and any position between defined upper and lower limits.
3. Maintenance Mode: Prevents shade from moving via dry contact or network control commands mode has been cleared/disabled.

C. Control Methods: Local isolated dry contact input and network control.

1. Local Isolated Dry Contact Inputs:
    a) Local switch control, third party system integration without separate interface.
    b) Moving EDU/shade to upper and lower limits and local switch preset positions.
    c) Configuration of upper and lower limits, custom presets, and key modes of operation without a PC or microprocessor-based tools.
    d) Configuration under protected sequences to prevent changes by casual user.

e) Switch Personalities: Configuration of dry contact control port over network such that any type of dry contact keypad/third-party interface and actuation methodology (maintained and/or momentary actuation) can be used to operate shade.

f) Dry Contact Control Connection Options to Include:
   1) One-button.
   2) Two-button.
   3) Three-button. Able to support configuring limits, presets, and key operating modes (default).
   4) Three-button. No configuration capability to prevent accidental changes in settings.

2. Network Control:
   a) Bi-directional network communication to enable commanding operation of large groups of shades over a common backbone.
   b) Each EDU:
      1) Support eight network addresses capable of being employed for various levels of group control.
      2) Dry Contact Ports: Assigned its own local switch address which can be matched by other EDUs within eight network addresses in order to support group control when dry contact commands are received.
         a. The EDU receiving dry contact commands may or may not be configured to operate based on commands coming through its own dry contact input port.
      3) To have an independent unique identifier address (UID) enabling EDU to be independently controlled and configured over network via handheld configurator and/or PC controller.
   c) Network Communication Card: Integral with tubular EDU assembly.
   d) Support configuration of upper and lower limits using either a handheld removable program module/configurator or a local switch.
   e) Support configuration of addresses using a handheld removable program module/configurator.

D. Alignment Positions:

1. Repeatable and precisely aligned shade positions and limits.
   a) Support positioning commands from 0 to 100 percent in 1 percent increments.
   b) Customizable Presets: 32.
   c) Include three intermediate dry contact presets
2. Shades on same switch circuit or same network group address with same opening height, to align at each intermediate stopping position when traveling from any position, up or down.
3. Shades of differing heights: Capable of custom, aligned intermediate stop positions when traveling from any position, up or down.
4. Alignment of shade bands mechanically aligned on same EDU: Plus or minus 0.125 inch (3 mm).

5. Alignment of standard shades on adjacent EDUs: Plus or minus 0.25 inch (6 mm) when commanded to same alignment position.

E. Local Switch Presets:

1. Minimum of three customizable preset positions accessible over the local dry contact control inputs and over the network connection.
2. Preset positions: Customizable to any position between and including defined upper and lower limits (initially defaults to 25, 50, and 75 percent of shade travel).
3. Configuration of Custom Preset Positions: A handheld removable program module/configurator or a local switch.

F. Network Presets:

1. Minimum of 32 customizable preset positions (including the three local switch presets) accessible via network commands.
2. Preset positions: Customizable to any position between and including defined upper and lower limits (initially defaults to defined lower limit).
3. Configuration of Custom Preset Positions: A handheld removable program module/configurator or a local switch.

2.08 MOTOR CONTROLS, INTERFACES, AND ACCESSORIES

A. Unless indicated to be excluded, provide required equipment as necessary for a complete operating system providing the control intent specified. Provide components and connections necessary to interface with other systems as indicated.

B. Digital Network Controls:

1. Basis of Design: MechoShade Systems LLC; MechoNet. Low-voltage network utilizes standard Category 5/6 UTP cable; maximum of 4,000 feet (1,219 m), 250 nodes.
2. Reprogram control without requiring wiring modifications.
3. Ten-year non-volatile power failure memory for system configuration settings.

C. Low-Voltage Wall Controls; IQ Switch:

1. Momentary dry contact switch enables manual local control or network control of any individual shade motor or shade group/sub-group on MechoNet network.
2. Control Functions:
   a) Open: Automatically open controlled shades to fully open position when button is pressed.
   b) Close: Automatically close controlled shades to fully closed position when button is pressed.
   c) Presets: For selection of predetermined shade positions.
   d) Dual Stations: For individual control of two shades/groups.
3. Finish: White.

4. Single Station: 5-button (open, close, and three intermediate stop positions).
5. Double Station: 10-button (open, close, and three intermediate stop positions for each of two shades/groups).

D. Wireless Controls:

1. MechoNet Wireless Controllers:
   a) Serves as gateway, router, and controller between EnOcean wireless devices and MechoNet network.
   b) Communicates with EnOcean wireless devices via 902 MHz RF. Supports wireless daylight sensors, occupancy/vacancy sensors, and switches.
   c) Controller to manage up to 16 EnOcean wireless devices.
   d) Controller to be configurable as follows:
      1) Solar Activated Control Mode: Utilizes EnOcean wireless sensor and control information for internal automation algorithms to adjust shade positions.
         a. Adjusts shade positions based daylight sensors input optimizing visual comfort. Enables five shade positions; full-up, full-down, and three configurable intermediate preset stop positions. Default of three positions; full-up, full-down, and preset number two.
         b. Configurable daylight thresholds for shade positions. Includes configurable hysteresis setting, default of 20 percent, preventing frequent cycling of shades during fluctuating daylight conditions.
         c. Configurable delay timers inhibit shade position changes due to short duration changes in daylight conditions. Default of 300 seconds delay for up, 60 seconds delay for down.
         d. Night Mode: Configurable night time shade position to support light pollution, privacy, and/or energy conservation requirements. Configurable daylight threshold. Default of 18.6 footcandles (200 lux), Duration: Default of 60 minutes to enter night mode, 30 minutes to exit night mode.
         e. Occupancy/Vacancy: Where wireless occupancy/vacancy sensors are specified, enables configurable unoccupied/vacant mode shade position (default of full-down) to optimize energy conservation. Configurable timers for detection of unoccupied and occupied states.
         f. Manual Override: Where local switches are specified. Enables manual temporary override of shade positions for configurable duration. Default of 60 minutes.
         g. Retract Mode: Manages changes to light level based on shade position for comfort and increasing exposure of occupant to daylight. Shades move up in stepped one-position increments as daylight levels drop. Each step is maintained for one minute

while controller retests daylight conditions before authorizing the next step until target is reached.

e) Capable of being powered by a dedicated low-voltage power supply or through certain MechoNet devices without additional power supplies.

f) Multiple sensors to be configurable to automate the same shade control zone in order to ensure operation based on worst case comfort conditions across the zone.

g) Sensors to be configuralbe to automate multiple shade control zones.

h) Maintain a circular log of previous 48 hours of data received from each of 16 possible wireless devices. Data to be capable of being downloaded and stored for record keeping, performance optimization, or troubleshooting purposes.

2. Wireless Daylight Sensors:

a) Monitors daylight through curtainwall and communicates with MechoNet Wireless Controller. Adjusts shade position based on user-defined light thresholds.

b) Powered by integral photovoltaic cells. No batteries or external power supplies.

c) Data Transmission:

1) Provide the following data with each message:

a. Charge level.

b. Illuminance: 0 to 6,100 footcandles (0 to 65,656 lux). Plus or minus 5 percent accuracy.

2) Transmit message when daylight level changes by three percent.

3) Transmit "heartbeat" message once per minute during daylight and once per hour at night for determining when maintenance/support is required.

d) Mountable horizontally, vertically, and upside-down on mullion without screws.

3. Wireless Switches:

a) Communicates with MechoNet Wireless Controller. Adjusts shade positions based on switch operation.

b) Enables manual local control or network control of any individual shade motor or shade group/sub-group on MechoNet network.

c) Self-powered via rocker switch operation.

2.09 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Reverse fascia to be mounted to horizontal mullion.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.
6. Fascia finish to match custom color of window mullion finish.

2.10 FINISHES

A. Aluminum Components: Color for Fascia are from custom PPG Duranar XL UC51568XL Champagne Gold or unless otherwise selected by Architect.

B. Steel Components: Cadmium-plated, satin-finished, or bonderized prior to painting with Manufacturer's standard baked-enamel finish.

C. Motorized Shade Hardware and Shade Brackets:

1. Provide shade hardware constructed of minimum 1/8" thick, cadmium plated steel or thicker as required to support 150% of the full weight of each shade.
2. Provide shade hardware system that allows for removal of shade roller tube from brackets without removing hardware from opening or without requiring end or center support brackets to be removed.
3. Provide shade hardware system that allows for field adjustment of motor or replacement of any operable hardware component without requiring removal of brackets regardless of mounting position (inside or outside mount).
4. Provide shade hardware system that allows for removable regular roll fascia(s) to be mounted continuously across two or more shades without requiring exposed fasteners.
5. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 12° from the motor axis between shade bands, 6° on each side of the radial line, by a single motor (Multi-banded shades) subject to manufacturer's design criteria.
6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Do not rely on friction fit connections for drive mechanism to shade roller tube. Shade roller and shade cloth attachment:

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. **If substrate preparation** is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 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.

3.03 INSTALLATION

A. **Install roller shades level**, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2” to interior face of glass. Allow proper clearances for window operation hardware.

B. **Turn-Key Single-Source Responsibility for Motorized Interior Roller Shades**: To control the responsibility for performance of motorized roller shade systems, assign the design, engineering, and installation of motorized roller shade systems, motors, controls, and low voltage electrical control wiring specified in this Section to a single manufacturer and their authorized installer/dealer. The Architect will not produce a set of electrical drawings for the installation of control wiring for the motors, or motor controllers of the motorized roller shades. Power wiring (line voltage), shall be provided by the roller shade installer/dealer, in accordance with the requirements provided by the manufacturer. Coordinate the following with the roller shade installer/dealer:

1. The General Contractor shall provide power panels and circuits of sufficient size to accommodate roller shade manufacturer's requirements, as indicated on the mechanical and electrical drawings.
2. The General Contractor shall coordinate with requirements of roller shade installer/dealer, before inaccessible areas are constructed.
3. The General Contractor shall run line voltage as dedicated home runs (of sufficient quantity, in sufficient capacity as required) terminating in junction boxes in locations designated by roller shade dealer.
4. The General Contractor shall provide and run all line voltage (from the terminating points) to the motor controllers, wire all roller shade motors to the motor controllers, and provide and run low voltage control wiring from motor controllers to switch/ control locations designated by the Architect. All above-ceiling and concealed wiring shall be plenum-rated, or installed in conduit, as required by the electrical code having jurisdiction.
5. The General Contractor shall provide conduit with pull wire in all areas, which might not be accessible to roller shade contractor due to building design, equipment location or schedule.

3.04 PROTECTION

A. **Protect installed** products until completion of project.

B. **Touch-up, repair** or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12600

TELESCOPIC STANDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. **Telescopic Gym Seating.** Includes multiple-tiered seating rows comprising of seats, deck components, understructure that permits closing without requiring dismantling, into a nested configuration for storing or for moving purposes.
1. Operation: Manual.
2. Wall-attached.

1.2 RELATED SECTIONS

A. **Section 04220 Concrete Masonry Units**: For wall finishes adjacent to the telescoping stands.

B. **Section 09250 Gypsum Wallboard:** For wall finishes adjacent to the telescoping stands.

C. **Section 09645 Cushioned Wood Flooring Assemblies**: For floor finishes adjacent to telescoping stands.

1.3 SUBMITTALS

A. Submit under the provisions of Section 01300.

B. 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.

C. **Each Supplied Product:** Must have a current evaluation report issued by ICC Evaluation Services (ICC-ES) certifying it meets the structural design requirements of the current ICC 300 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands, including every specified load combination.

D. **Current Welding Certifications**: AWS or CSA.

E. Installer Information: Name, Current Certification Number, and Product Qualifications.

F. **Warranty Documents:** Manufacturers' standard.

G. **Shop Drawings:** For telescoping stands in both stacked and extended positions.
1. Show seat heights, row spacing and rise, aisle widths and locations, assembly dimensions, anchorage to supporting structure, material types, and finishes.
2. Electrical: Indicate power supply requirements.
3. Graphic Drawing Proofs and Layouts.

H. **Samples:** For units with factory-applied finishes.

I. **Operation and Maintenance Data:** For telescopic bleachers.
1. Include Operations and Maintenance Manual.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. The Manufacturer is to be a current Certified Welding Fabricator as defined by either AWS or CWB, or both.
2. Comply with structural welding codes that are applicable to their products or materials.
3. Welding Codes: As produced by AWS or CSA.

B. **Installer Qualifications:** Company specializing in performing Work of this section with documented experience for projects of similar scope and complexity.
1. Factory trained and certified by the Manufacturer.

C. **Each Supplied Product:** Must have a current evaluation report issued by ICC Evaluation Services (ICC-ES) certifying it meets the structural design requirements of the current ICC 300 Standard for Bleachers, Folding and Telescopic Seating, and Grandstands, including every specified load combination.

D. **Source Limitations:** Provide each type of product from a single manufacturing source to ensure uniformity.

1.5 PRE-INSTALLATION CONFERENCE

A. **Convene a conference** approximately two weeks before the scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. The agenda shall include schedule, responsibilities, critical path items and approvals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Deliver telescoping stands in manufacturers packaging** clearly labeled with manufacturer name and content.
1. Deliver at a scheduled time for installation that will not interfere with other trades operating in the building whenever and wherever possible.

B. **Store and handle** bleacher equipment in a manner to prevent damage and in compliance with manufacturer's written instructions and recommendations.

C. **Protect from damage** due to weather, excessive temperature, and construction operations.

1.7 PROJECT CONDITIONS

A. **Field Measurements:** Coordinate actual dimensions for construction affecting telescoping stands installation with accurate field measurements before fabrication.
1. Document field measurements on final shop drawings.
2. Coordinate field measurements and fabrication schedule with construction progress to avoid delay of Work.

1.8 WARRANTY

A. **Manufacturer's Warranty**: Contact manufacturer for detailed warranty information.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Acceptable Manufacturer:** Hussey Seating Company
38 Dyer St. Ext.
North Berwick, ME 03906
Toll Free Tel: 800-341-0401
Tel: 207-676-2271
Web:https://www.husseyseating.com
1. Local Dealer – Herk Edwards, Inc. – Steve Saunders
20655 S. Western Ave., Suite 120
Torrance, CA 90501
Tel: 310-373-0543
E: ssaunders@herkedwards.com

B. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. **Electrical Components, Devices, and Accessories:** Must be listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.

B. **Seating Layout:** Telescoping stands to comply with ICC 300 for year 2024 - Standard for Bleachers, Folding and Telescopic Seating, and Grandstands, except where additional requirements are indicated or imposed by authorities having jurisdiction.

C. **Structural Performance:** Engineer, design, fabricate and install telescopic gym seating systems to the following structural loads without exceeding allowable design working stresses of materials involved, including anchors and connections. Apply each load to produce maximum stress in each respective component of each telescoping stand unit according to ICC 300.

D. Manufacturer's System Design Criteria:
1. Gymnasium Seat Assembly; To support and resist, in addition to its own weight, the following forces:
   a. Live Load: 120 lbs. per linear foot (1.75 kN per m) on seats and decking.
   b. Uniformly Distributed Live Load: Not less than 100 lbs. per square foot (4.79 kN per sq m) of gross horizontal projection.
   c. Parallel Sway Load: 24 lbs. per linear foot (0.35 kN per m) of row combined with the Uniformly Distributed Live Load as specified.
   d. Perpendicular Sway Load: 10 lbs. per linear foot (0.15 kN per m) of row combined with the Uniformly Distributed Live Load as specified.
   e. Parallel and Perpendicular Sway Loads: Are not applied concurrently.
2. **Hand Railings, Posts and Supports:** To withstand the following forces applied separately:
   a. Concentrated Load: 200 lbs. (0.89 kN) applied at any point and in any direction.
   b. Uniform Load: 50 lbs. per foot (0.73 kN per m) applied in any direction.
3. **Guard Railings, Post and Supports**: To withstand the following forces applied

separately:

a. Concentrated Load, Top Rail: 200 lbs. (0.89 kN) applied at any point and in any direction along top rail.

b. Uniform Load, Top Rail: 50 lbs. per foot (0.73 kN per m) applied in any direction at top rail.

c. Uniform Load, Infill Panels: 50 lbs. (0.22 kN) applied on an area equal to 12 x 12 inch (305 x 305 mm) applied on all guardrail infill panels.

2.3 MATERIALS

A. Wood:

1. Lumber: NIST PS 20. Southern pine complying with SPIB's "Standard Grading Rules for Southern Pine Lumber" for B and B (B and better) grade-of-finish requirements.
2. Plywood: NIST PS 1, APA-grade trademarked. Grade: A-C.

B. Steel:

1. Structural-Steel Shapes, Plates, and Bars: ASTM A36.
2. Galvanized-Steel Sheet: ASTM A653, Grade 40 (276 MPa) coating designation G60.
3. Uncoated Steel Strip; Non-Structural Components: ASTM A1011, Commercial Quality, Type B, Hot-Rolled Strip.
4. Uncoated Steel Strip; Structural Components: ASTM A1011 Grade 33 (228 MPa), Grade 36 (249 MPa), Grade 40 (276 MPa), Grade 45 (311 MPa), or Grade 50 (345 MPa), Structural Quality, Hot-Rolled.
5. Galvanized Steel Strip: ASTM A653 Grade 40 (276 MPa) or Grade 64 (441 MPa), structural quality, coating designation G60.
6. Tubing: ASTM A500, cold formed; Grade B, or ASTM A513, 46 ksi min yield.

C. **Polyethylene Plastic:** High-density polyethylene; injection molded, color-pigmented, textured, impact-resistant, and dimensionally stable.

2.4 TELESCOPIC STANDS

A. **Wall-Attached Telescoping Stands:** Forward-folding system.

1. The rear of the understructure is permanently attached to the floor and to a wall.
   a. The wall provides structural support and must support loads imposed by the telescoping stands.

1.5 DIMENSIONAL AND OPERATIONAL CRITERIA

A. NORTH BANK Dimensions:

1. Model MAXAM26
2. Stand Type: Wall Attached
3. Bank Length: 62’-3”
4. Number of Tiers: 3
5. Row Spacing: 24 inches (610 mm).
6. Row Rise: 9-5/8 inches (244 mm).
7. Open Dimension: 6’-2 5/16”
8. Closed Dimension: 3’-5”
9. Overall Unit Height: 3’-0 3/8”
10. Net Capacity: 108
11. Gross Seats: 120
12. Maximum Net Capacity with Flex Row Fully Recovered:

B. SOUTH BANK Dimensions:

1. Model MAXAM26
2. Stand Type: Wall Attached
3. Bank Length: 62'-3"
4. Number of Tiers: 3
5. Row Spacing: 24 inches (610 mm).
6. Row Rise: 9-5/8 inches (244 mm).
7. Open Dimension: 6'-2 5/16"
8. Closed Dimension: 3'-5"
9. Overall Unit Height: 3'-0 3/8"
10. Net Capacity: 108
11. Gross Seats: 120
12. Maximum Net Capacity with Flex Row Fully Recovered:

C. WEST BANK Dimensions:

1. Model MAXAM26
2. Stand Type: Wall Attached
3. Bank Length: 62'-3"
4. Number of Tiers: 4
5. Row Spacing: 24 inches (610 mm).
6. Row Rise: 9-5/8 inches (244 mm).
7. Open Dimension: 8'-2 5/16"
8. Closed Dimension: 3'-5"
9. Overall Unit Height: 3'-10"
10. Net Capacity: 142
11. Gross Seats: 160
12. Maximum Net Capacity with Flex Row Fully Recovered:

D. NORTHEAST BANK Dimensions:

1. Model MAXAM26
2. Stand Type: Wall Attached
3. Bank Length: 33-7 1/2"
4. Number of Tiers: 4
5. Row Spacing: 24 inches (610 mm).
6. Row Rise: 9-5/8 inches (244 mm).
7. Open Dimension: 8'-2 5/16"
8. Closed Dimension: 3'-5"
9. Overall Unit Height: 3'-10"
10. Net Capacity: 75
11. Gross Seats: 84
12. Maximum Net Capacity with Flex Row Fully Recovered:

E. SOUTEAST BANK Dimensions:

1. Model MAXAM26
2. Stand Type: Wall Attached
3. Bank Length: 33-7 1/2”
4. Number of Tiers: 4
5. Row Spacing: 24 inches (610 mm).
6. Row Rise: 9-5/8 inches (244 mm).
7. Open Dimension: 8’-2 5/16”
8. Closed Dimension: 3’-5”
9. Overall Unit Height: 3’-10”
10. Net Capacity: 75
11. Gross Seats: 84
12. Maximum Net Capacity with Flex Row Fully Recovered:

2.6 OPERATIONAL CRITERIA

A. **Operation: Manual.**

1. Manual: User operates system by manually pulling/pushing each section with operating handles.

2.7 SEATING

A. **Seating Type: Polymer Seat System**.

1. Model: Courtside Collection XC10. Load tested to 600 lbs. (2.67 kN).
    a. Seat Depth: 10 inches (254 mm). Seat Length: 18 inches (457 mm).
2. Material: Gas assist injection-molded HDPE; high density polyethylene.
    a. Recyclable: 100 percent.
3. End Caps at Aisle End Locations: Integrally molded.
4. Recess Pockets for Seat Number and Row Letters: Integrally molded.
5. Rear Closure Panel at Back of Seat: Integrally molded. Allows "continuous clean sweep" of debris at deck level and minimizes visibility of structural ribbing.
6. Seat Numbers: Color: Black number over grey background.
7. Row Identification: Color: Black letter over grey background.

B. **ADA Accessible Seating**:

1. Locate first tier modular units to provide wheelchair-accessible seating at locations indicated on Drawings. Modular units are available in 2 seat to 7 seat sizes inclusive and are custom configured according to number of tiers, section size, aisle locations, etc.
    a. Flex-Row Units: First row modular recoverable seating units.
        1) Closed Configuration: Accommodates persons requiring ADA spaces or other temporary space needs.
        2) Opened Configuration: For standard usage.
        3) Units are to have a handle for easy operation.
        4) Full-surround steel skirting with a 3/4 inch (19 mm) floor clearance for safety and improved aesthetics. Color: Black.
        5) End Cap for the Nose Beam: Injection molded. For safety and improved

aesthetics. Color: Black.

6) Mechanical Positive Lock: When the Flex-Row system is in the open and closed position.
   a) Handle: Unlocks the modular recoverable seating unit for operation.
7) Flex-Row can be utilized with the full system in the open or closed position.
8) The modular units are designed to achieve multi-use front row seating to accommodate team seating, ADA requirements, and facility specific requirements.
9) Flex-Row.

2.8 RAILS, PANELS AND STEPS

A. End Rails: Self-storing.

1. Starting no higher than the second tier, 42 inches (1066 mm) high above seat.
2. End Rail Material: 1.5 inch (38 mm) square steel tubing.
3. Baluster Material: 0.5 inch (13 mm) square steel.
   a. Intermediate members attached with 4 inch (102 mm) sphere passage requirements.

B. Center Aisle Rails: Manual Rotating.

1. Single pedestal mount handrails, 34 inches (864 mm) high with terminating mid rail. Permanently attached handrail and mounted socket. Rail rotates in the socket for rail storage.
2. Rail is to deploy easily, lock in the use position, and require intent and effort to unlock, and return to the stowed position.
3. Ends of the Handrail: Return to the post and not extend away from it.
4. Not Acceptable: Rails having openings to avoid interference with closed decks.
5. Rail Material: 1.5 inch (38 mm) square steel tubing.

C. Steps:

1. Step Type: Sure-Step. Flip-up Front Aisle Step.
   a. Permanently hinged to the front row. Ensures availability and ease of operation.
   b. Two 3 inch (76 mm) diameter x 3/4 inch (19 mm) wide non-marking front wheels.
   c. The system can operate with the Sure-Step in the stored or deployed position.
   d. Edges are coined, hemmed or radiused with front edge rubber bumpers.
   e. Abrasive-backed non-slip tread identifier on leading edge of nosing.
   f. For Aisle Widths Greater Than 6 feet (1.8 m): Two side by side hinged steps are provided.
2. **Step Type: Intermediate Aisle Steps.**
   a. Fully enclosed, at each vertical aisle.
   b. End Caps: Full radius on all four edges.
   c. Tread Surface: Abrasive Non-slip, Adhesive-backed.

2.9 COMPONENTS

A. Decking:

1. Material: Plywood. 5/8 inch (16 mm) thick AC grade tongue and groove Southern Yellow Pine with clear urethane, high gloss finish.

B. Understructure:

1. Finish: Rust-inhibiting black finish.
2. Hardware Finish: Zinc-plated, Rust inhibiting black finish.

3. Posi-locks and Other Surfaces: Powder coated black; Rust inhibiting black finish.
4. Nose Beam: ASTM A653 grade 40 (276 MPa) steel.
    a. Continuously roll-formed closed tubular shape.
    b. No steel edges exposed to spectators after product assembly.
    c. Through-bolted fore/aft to deck stabilizers and frame cantilevers to create the deck structure.
5. Rear Riser Beam: ASTM A653 Grade 64 (441 MPa) steel.
    a. Continuously roll-formed.
    b. No steel edges exposed to spectators after product assembly.
    c. Through-bolted fore/aft to deck stabilizers and frame cantilevers to create the deck structure.
6. Frame: Welded assemblies, one left hand and one right hand per tier, comprised of the following components:
    a. Lower Track subassembly: ASTM A1011 Grade 50 steel.
        1) Continuous Positive Interglide System (casterhorn) interlocks each adjacent frame casterhorn using an integral, continuous, anti-drift feature and captive interlock with adjustable row spacing at front to prevent separation and misalignment.
    b. Lower Track Wheels: 3 per frame.
        1) 5 inch (127 mm) diameter by 1-1/4 inch (32 mm) wide with non-marring soft rubber face to protect wood and synthetic floor surfaces.
        2) Bushings: Molded-in sintered iron and oil-impregnated. To fit 3/8 inch (10 mm) diameter axles. Secured with E-type snap rings.
            a) Option: up to 6 wheels per frame for load distribution.
    c. Slant Columns: A500 Grade, tubular shaped steel.

    d. Cantilever Subassembly: Consists of ASTM A1011 Grade 50 steel nose connection plate, cantilever, and riser attachment plate welded together into a subassembly.
7. Lock System: Casterhorns at the end sections of powered banks (minimally), and manual sections, contain a Low Profile Posi-Lock LX to lock each row in the open position and allow unlocking automatically. Adjustable stops to allow field adjustment of row spacings.
8. Sway Bracing: ASTM A653 grade 40 (276 MPa) steel, tension members bolted to columns.
9. Deck Stabilizer: A1011 Grade 45 steel member, through-bolted to nose and riser at three locations per section. Securely captures front and rear edge of decking at rear edge of nose beam and lower edge of riser beam for entire length of section. Interlocks with adjacent stabilizer on upper tier using low-friction nylon roller to prevent separation and misalignment.

C. Fasteners: Vibration proof, in manufacturer's standard size and material.

2.10 FABRICATION

A. **Fabricate understructure** from structural-steel members in size, spacing, and form required to support design loads specified in referenced safety standard.

B. **Welded understructure** to comply with applicable AWS standards.

C. **Round corners and edges** of components and exposed fasteners to reduce snagging and pinching hazards.

D. **Form exposed sheet metal** with flat, flush surfaces, level and true in line, and without cracking and grain separation.

2.11 ACCESSORIES

A. **Operating Handles for manual applications:** 3/4 inch (19 mm) OD steel tubing.
1. Handles are to engage at the first tier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Do not begin installation** until the substrates have been properly constructed and prepared.
1. Examine areas where telescoping stands are to be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Tolerances:
   a. Flooring: Level and within 1/8 inch (3 mm) in 8 feet (2438 mm).
   b. Rear Wall: Plumb within 1/8 inch (3 mm) in 8 feet (2438 mm).

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 INSTALLATION

A. **Install in accordance with manufacturer's instructions,** approved submittals, and in proper relationship with adjacent construction.
1. Comply with referenced safety standards.

3.4 FIELD QUALITY CONTROL

A. **Field Inspection:** Coordinate field inspection in accordance with appropriate sections in Division 01.

B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 ADJUSTING AND CLEANING

A. **On completion of installation,** lubricate, test, and adjust each telescoping stand unit so that it operates according to manufacturer's written operating instructions.

B. **Clean installed telescoping stands** on exposed surfaces. Touch up shop-applied finishes or replace components as required to restore damaged or soiled areas.

3.6 MAINTENANCE SERVICE

A. **Service Capability:** Show proof of full-time service capability by factory certified technicians directly employed by the installer.

1. A four to eight-hour maximum on-site repair response is required during normal working hours, 8 a.m. to 5 p.m. weekdays (excluding holidays).
2. All Full-Time Service Personnel shall be Factory Authorized and Trained.
3. Provide proof of Service Capability and a list of service parts regularly maintained in inventory.

3.7 DEMONSTRATION

A. **Engage a factory-authorized service representative** to train the Owner's maintenance personnel to adjust, operate, and maintain telescoping stands.

END OF SECTION

SECTION 15300

AUTOMATIC FIRE SPRINKLERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wet-pipe automatic fire sprinkler systems for new construction and renovation projects at California public K-12 school facilities under the jurisdiction of the Division of the State Architect (DSA).
2. Aboveground wet-pipe sprinkler system piping, fittings, valves, and accessories.
3. Fire sprinkler heads for all hazard classifications.
4. Alarm valves and water flow detection devices.
5. Fire department connections (FDC).
6. System risers, control valve assemblies, and trim.
7. Seismic bracing and restraints for sprinkler piping per NFPA 13 (2025) Chapter 18 and ASCE 7-22.
8. Testing, flushing, and commissioning.
9. Access panels for concealed valves and equipment.
10. Underground piping corrosion protection.

B. Regulatory Framework - California K-12 DSA Projects:

1. Division of the State Architect (DSA): Primary authority having jurisdiction for plan review, approval, and construction oversight of fire sprinkler systems at California public K-12 schools per California Administrative Code (CAC), Title 24, Part 1.
2. California Building Code (CBC) 2025: Title 24, Part 2, Chapter 9 - Fire Protection and Life Safety Systems.
3. California Fire Code (CFC) 2025: Title 24, Part 9.
4. California Code of Regulations (CCR), Title 19, Division 1: State Fire Marshal requirements for inspection, testing, and maintenance.
5. California Education Code, Chapter 12.5 (commencing with Section 17070.10) (School Facility Program); and California Building Code (Title 24, Part 2), Section 903.2.19 and applicable subsections: Automatic sprinkler systems required throughout new state-funded public-school campuses.
6. DSA Guideline GL-1: Project Submittal Guideline: Automatic Fire Sprinkler Systems.
7. DSA Interpretation of Regulations IR A-25: Design, Installation and Maintenance of Automatic Fire Sprinkler Systems.

8. DSA Policy PL 09-01: Fire Flow for Buildings.
9. DSA Policy PL 10-01: Plan Submittal Requirements: Automatic Fire Sprinkler Systems (AFSS).
10. DSA IR 16-13: Seismic Requirements for Mechanical, Electrical, and Plumbing Distribution Systems.

C. Work or equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided by the Contractor and incorporated under this Section of the work at no additional cost to the Owner.

1.02 DEFINITIONS

A. AHJ: Authority Having Jurisdiction. For California K-12 public schools, DSA serves as the primary AHJ during design, plan review, and construction phases. The Local Fire Authority (LFA) serves as AHJ for ongoing inspection and maintenance after project certification and occupancy.

B. AFSS: Automatic Fire Sprinkler System.

C. CBC: California Building Code (Title 24, Part 2).

D. CFC: California Fire Code (Title 24, Part 9).

E. CAC: California Administrative Code (Title 24, Part 1).

F. DSA: Division of the State Architect. California state agency providing design and construction oversight for K-12 schools, community colleges, and state essential services buildings.

G. FDC: Fire Department Connection.

H. LFA: Local Fire Authority. Local fire department or fire marshal with jurisdiction over ongoing fire safety inspections after building occupancy.

I. NFPA: National Fire Protection Association.

J. OSFM: Office of the State Fire Marshal (California).

K. PIV: Post Indicator Valve.

L. Supplemental Sprinkler: Per NFPA 13 (2025) Section 3.3.223.3.6, a sprinkler installed below an obstruction greater than 4 feet wide.

M. Area of Discharge: Per NFPA 13 (2025) Section 3.3.8, the floor area covered by a sprinkler that takes into account walls or obstructions whose summation determines the remote area.

N. IOR: Inspector of Record (DSA Project Inspector).

1.03 SYSTEM DESCRIPTION

A. General: Complete wet-pipe automatic fire sprinkler system(s) complying with NFPA 13 (2025) and all applicable California codes for protection of K-12 school facilities.

B. System Type: Wet-pipe sprinkler system with piping containing water at all times. Water discharges immediately upon activation of individual sprinkler heads.

C. Occupancy Hazard Classifications are indicated on Drawings for each area.

D. It shall be the Contractor's responsibility to identify any areas requiring other than a wet automatic fire sprinkler system due to occupancy type, storage of materials, or climatic conditions (below 40 degrees F at sprinkler pipe locations). These special requirements shall be incorporated into the automatic fire sprinkler design as necessary to conform with NFPA 13 (2025), Owner's Insurance Underwriter, and all other governing authorities.

1.04 REFERENCES

A. National Fire Protection Association (NFPA):

1. NFPA 13 (2025): Standard for the Installation of Sprinkler Systems.
2. NFPA 14 (2025): Standard for the Installation of Standpipe and Hose Systems.
3. NFPA 24 (2025): Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
4. NFPA 25: Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, California Edition, as adopted by CFC 2025.
5. NFPA 72 (2025): National Fire Alarm and Signaling Code.

B. American Society of Civil Engineers (ASCE):

1. ASCE/SEI 7-22: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (seismic design requirements).

C. ASTM International:

1. ASTM A53/A53M (latest edition): Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A135/A135M (latest edition): Standard Specification for Electric-Resistance-Welded Steel Pipe.
3. ASTM A795/A795M (latest edition): Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
4. ASTM A536: Standard Specification for Ductile Iron Castings.

D. American National Standards Institute (ANSI):

1. ANSI/AWWA C110: American Water Works Association - Ductile-Iron and Gray-Iron Fittings.
2. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast.
3. ANSI/AWWA C104: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
4. ANSI/AWWA C111/A21.11: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C105/A21.5: Polyethylene Encasement for Ductile-Iron Pipe Systems.
6. ASME B16.1: Gray Iron Pipe Flanges and Flanged Fittings.
7. ASME B16.3: Malleable Iron Threaded Fittings, Classes 150 and 300.

8. ASME B16.9: Factory-Made Wrought Buttwelding Fittings.

E. Underwriters Laboratories (UL):

1. UL 199: Standard for Automatic Sprinklers for Fire-Protection Service.
2. UL 262: Standard for Gate Valves for Fire-Protection Service.
3. UL 312: Standard for Check Valves for Fire-Protection Service.
4. UL 789: Standard for Indicator Posts for Fire-Protection Service.

F. Factory Mutual (FM) Global:

1. FM Approvals: Products listed in Approval Guide for fire protection equipment.

G. California Codes and Regulations:

1. California Building Code (CBC) 2025: Title 24, Part 2.
2. California Fire Code (CFC) 2025: Title 24, Part 9.
3. California Mechanical Code (CMC) 2025: Title 24, Part 4.
4. California Plumbing Code (CPC) 2025: Title 24, Part 5.
5. California Administrative Code (CAC) 2025: Title 24, Part 1.
6. California Code of Regulations, Title 19, Division 1: State Fire Marshal.
7. California Health and Safety Code Sections 13195-13196.5.

H. American Welding Society (AWS):

1. AWS D10.9: Qualification of Welding Procedures and Welders for Piping and Tubing.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Design Document Scope:

1. Contract Documents include complete fire sprinkler system design prepared by the Fire Protection Engineer or Mechanical Designer of Record.
2. Contract Drawings constitute complete fire sprinkler shop drawings. The Contractor shall install the system precisely as indicated on Drawings. Sprinkler head types, locations, orientations, deflector positions, pipe sizes, pipe routing, hanger locations, seismic brace locations, and all other system components are fully designed and detailed on the Drawings. The Contractor shall not modify, relocate, substitute, or deviate from any element shown on Drawings without a DSA-approved Construction Change Document (CCD).
3. Contract Documents include:
    a. Floor plans showing all sprinkler head locations with spacing dimensions.
    b. Piping layout with pipe sizes.
    c. Hazard classifications for each area.
    d. Ceiling heights and types (flat, sloped, exposed structure).

e. Obstructions requiring supplemental sprinklers.

f. Seismic brace locations.

g. Riser diagrams showing all components, valve sizes, and elevation data.

h. Hydraulic calculations per NFPA 13 (2025) Chapter 27.

i. Seismic calculations per NFPA 13 (2025) Chapter 18.

B. DSA Plan Approval:

1. Contract Documents have been submitted to DSA for review and approval.

2. Contractor shall not begin installation until DSA-approved drawings are available.

3. Contractor shall install system per DSA-approved Contract Documents.

C. Contractor Submittal Requirements:

1. Installer Qualifications:

a. C-16 Fire Protection Contractor license documentation.

b. OSFM fitter certifications for all installers per Cal Fire Information Bulletin 17-002.

2. Water Flow Test Data: If flow test data on Contract Documents is older than 12 months at time of construction, provide updated flow test "wet" signed by water purveyor or local fire authority.

D. Field Coordination:

1. Contractor shall verify all dimensions and conditions prior to installation.

2. Report any conflicts or discrepancies between Contract Documents and field conditions to Engineer immediately.

3. Do not deviate from Contract Documents without written authorization.

E. DSA Construction Change Documents (CCD):

1. Any changes to approved sprinkler system design during construction shall be submitted to DSA via the CCD process per IR A-6.

2. Engineer shall prepare CCD documents for DSA approval.

3. Field changes without DSA approval are not permitted.

4. Contractor shall notify Engineer of any field conditions requiring design changes.

F. Water Supply Verification:

1. Water supply data shown on Contract Documents is based on flow test conducted per DSA requirements.

2. Contractor shall verify water supply pressure and flow match design requirements prior to final connection.

3. If field-verified water supply differs from Contract Documents, notify Engineer immediately.

4. Per DSA BU 15-02: During declared drought conditions, coordinate with DSA for alternative flow test procedures.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:

1. Fire Sprinkler Contractor: California State Contractors License Board C-16 Fire Protection Contractor license.
2. Underground Contractor: California State Contractors License Board C-34 Pipeline Contractor license or C-16 license.
3. Fire Sprinkler Fitters: Certified by Cal Fire-Office of the State Fire Marshal per Information Bulletin 17-002. All persons who plan, lay out, fabricate, install, alter, or repair water-based fire protection systems must be OSFM-certified.
4. Installing contractor shall have prior experience in similar scope of this project within the last 5 years.

B. Product Listings:

1. All fire sprinkler system components shall be listed by a nationally recognized testing laboratory:
   a. Underwriters Laboratories (UL).
   b. Factory Mutual (FM) Global.
   c. Other listing organizations acceptable to DSA.
2. Products shall be used only within the limitations of their listing.
3. Verify product listings match those specified in Contract Documents.

C. Pre-Installation Conference:

1. Conduct pre-installation meeting with Contractor, DSA Project Inspector, Engineer, and fire sprinkler subcontractor.
2. Review DSA-approved Contract Documents and specifications.
3. Review product data submittals.
4. Coordinate work sequence with other trades.
5. Review testing and inspection requirements.
6. Establish communication procedures for field issues and RFIs.

D. Installation Quality:

1. Contractor shall install system in strict accordance with DSA-approved Contract Documents.
2. Contractor shall use materials and products as specified or approved equal.
3. Workmanship shall comply with NFPA 13 (2025) requirements.
4. DSA Project Inspector shall observe installation and witness required tests.

E. Uninspected Work:

1. Contractor shall not allow or cause any work to be covered up or concealed until it has been inspected, tested, and approved by DSA Project Inspector and all authorities having jurisdiction.
2. Should any work be covered up or concealed before such inspection, Contractor shall, at Contractor's own expense, uncover the work to the satisfaction of the DSA Project Inspector. All related costs shall be borne by the Contractor.

1.07 SUBMITTALS

A. Product Data Submittals (Prior to Installation):

1. Submit product cut sheets for all components to Engineer for verification of compliance with Contract Documents:
   a. Sprinkler heads (all types and temperature ratings).
   b. Alarm valves and trim.
   c. Check valves and control valves.
   d. Waterflow switches and tamper switches.
   e. Fire department connections.
   f. Hangers and seismic bracing components.
   g. Pipe and fittings.
   h. Grooved coupling systems.
   i. Access panels.
2. Substitution Requests: If proposing products are different from those specified, submit substitution request with complete technical data demonstrating equivalence. Substitutions require Engineer approval and may require DSA CCD.
3. Product data submittals are for verification only and do not constitute approval to deviate from specified products. Where submitted products differ from those specified, a substitution request per Paragraph 1.07.A.2 is required.
4. Submittals will be checked for general conformance with the design concept of the project, but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

B. Qualification Submittals:

1. Contractor Qualifications: C-16 license documentation.
2. Fitter Certifications: OSFM certification documentation for all installers.
3. Manufacturer Certifications: Written statements from manufacturers certifying products are suitable for intended application.

C. Pre-Installation Submittals:

1. Updated Water Flow Test: If flow test on Contract Documents is older than 12 months, provide current test data "wet" signed by water purveyor or LFA.

D. Closeout Submittals:

1. As-Built Drawings: Provide record drawings marked up to show actual installed conditions including:
    a. Any field-approved deviations from Contract Documents.
    b. Actual sprinkler head locations if adjusted for field conditions.
    c. Actual seismic brace locations.
    d. Final pipe routing if modified.
2. Completed Test Reports:
    a. Hydrostatic test certificates.
    b. Flushing reports.
    c. Functional test reports (alarms, drains, tamper switches).
3. Contractor's Material and Test Certificate: Per NFPA 13 (2025) Chapter 29 and CCR Title 19 requirements.
4. Operation and Maintenance Manuals: Including:
    a. System description and operation.
    b. Component information and replacement parts.
    c. Testing and maintenance schedules per NFPA 25 California Edition.
    d. Emergency procedures.
5. Spare Parts: Provide spare sprinkler cabinet with:
    a. Minimum 6 spare sprinklers of each type/temperature rating installed, or quantity per NFPA 13 Table 6.2.9, whichever is greater.
    b. Sprinkler wrench for each type of sprinkler.
    c. Mounted in readily accessible location per NFPA 13 (2025) Section 6.2.9.
    d. List of sprinklers in cabinet posted inside cabinet door.
6. Warranty Documentation: Written warranty from Contractor.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver materials in original, unopened containers with manufacturer's labels intact.
2. Verify all materials match approved submittals.
3. Inspect materials upon delivery for damage.

B. Storage:

1. Store materials in clean, dry, protected location.
2. Protect sprinkler heads from physical damage.
3. Store pipe elevated off ground on suitable supports.

4. Protect threaded ends and grooves from damage.

C. Handling:

1. Handle materials carefully to prevent damage.
2. Do not drop or throw sprinkler heads.
3. Protect glass bulbs and fusible elements from damage.
4. Sprinklers that have been dropped, damaged, have cracked bulbs, or show visible loss of fluid shall not be installed.

1.09 PROJECT CONDITIONS

A. Environmental Conditions:

1. Wet-pipe systems shall only be installed in areas where ambient temperatures remain above 40 degrees F (4 degrees C).

B. Field Measurements:

1. Verify field dimensions and conditions prior to fabrication.
2. Coordinate ceiling heights, structural conditions, and obstructions.
3. Coordinate with other trades for available space.

C. Seismic Design Requirements:

1. Building Location: Seismic Design Category as determined by project-specific geotechnical data and ASCE 7-22 for the applicable Risk Category, but no less than SDC D per CBC Section 1613A.2.5. Refer to project structural documents for site-specific seismic design parameters.
2. Seismic bracing is required for all fire sprinkler systems in California K-12 schools.
3. Component Importance Factor (Ip): 1.5 for fire sprinkler systems per ASCE 7-22.

1.10 COORDINATION

A. General Coordination:

1. Coordinate with Architect for:
   a. Finish color requirements for exposed sprinklers and piping.
   b. Routing of pipe in exposed areas subject to Architect’s approval.
2. Coordinate with Structural Engineer for:
   a. Penetrations through structural members.
3. Coordinate with Plumbing/Civil Engineer for:
   a. Water supply connection and backflow prevention.
   b. Underground piping connections.
4. Contractor shall cooperate and coordinate work with all other trades. Piping runs found to be in conflict with the work of other trades, as a result of neglected coordination, shall be removed and reinstalled in new locations designated by the Architect at no additional cost to the Owner.

5. To achieve coordination, Contractor shall contact the Architect and obtain necessary information to design the system to fit into allotted spaces without interfering with work by other trades.

B. Fire Alarm Coordination:

1. Connect waterflow switches to building fire alarm system.

2. Connect tamper switches on all control valves to fire alarm system.

3. Coordinate supervision requirements with fire alarm contractor.

4. All required alarm devices including flow switches and tamper switches shall be provided and installed by the automatic fire sprinkler contractor. All associated conduit, wiring, and electrical connections between such devices and the fire alarm system shall be the responsibility of the fire alarm contractor.

1.11 PROTECTION

A. All work, equipment, and materials shall be protected at all times. Contractor shall repair all damage caused either directly or indirectly by Contractor's own workers. Contractor shall also protect installed work from damage. Close all pipe openings with caps or plugs during installation. Protect all equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until written notice of acceptance from the Engineer.

1.12 WARRANTY

A. Contractor's Warranty:

1. Provide written warranty covering materials and workmanship for minimum 1 year from date of DSA project certification.

2. Warranty shall cover repair or replacement of defective materials and correction of defective workmanship at no additional cost to Owner.

3. If during the warranty period any material, equipment, or any part of the system fails to function properly, Contractor shall make good the defects promptly and without any expense to the Owner.

B. Manufacturer's Warranties:

1. Provide all manufacturer's warranties for system components.

2. Sprinkler heads: Provide manufacturer's standard limited lifetime warranty.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: The following manufacturers are listed as basis of design. Other manufacturers producing equivalent products listed by UL or FM may be submitted for approval.

B. Sprinkler Heads:

1. Viking Corporation.

2. Tyco Fire Products (Johnson Controls).
3. Reliable Automatic Sprinkler Co., Inc.

C. Valves and Trim:
1. Viking Corporation.
2. Tyco/Potter Roemer.
3. Reliable Automatic Sprinkler Co., Inc.
4. Kennedy Valve Company.
5. Nibco.

D. Pipe and Fittings:
1. Bull Moose.
2. Victaulic Company (grooved fittings).
3. Anvil International (threaded fittings).
4. Johnson Controls (Grinnell) grooved fittings.
5. Victaulic Company (mechanical tee branch outlets).

E. Hangers and Seismic Bracing:
1. Anvil International.
2. B-Line (Eaton).
3. Tolco (Eaton).
4. Unistrut.

F. Access Panels:
1. Smith (Model 4762): Stainless steel (Type 304), vandal-proof Allen wrench lock – for locations requiring stainless steel per Article 2.12.
2. Elmdor (Model DW-SS-AKL): Stainless steel construction with Allen key latch.
3. Elmdor (Model DW-AKL): Galvannealed steel with Allen key latch – for drywall applications where stainless steel is not required.

G. Seismic Expansion Joints:
1. Metraflex, MLU series, UL listed.

2.02 UNDERGROUND PIPING

A. Main Water Services Below Grade:
1. Pipe shall be ductile iron, cement lined with mechanical joint fittings Class 250, flanged or mechanical joint, in accordance with ANSI/AWWA C111/A21.11, Class 52 or AWWA C153 ductile iron compact fittings of dimensions to match pipe outside diameter, with AWWA C104 cement lining and AWWA C111 neoprene gaskets.
2. Provide concrete thrust blocks at all underground fittings per manufacturer’s recommendations.

B. In-Building Fire Service Riser (from underground entry to aboveground system):

1. Ames (Watts Water Technologies) or approved equal.
2. Type 304 stainless steel.
3. Minimum 200 PSI working pressure.
4. UL listed and FM approved for fire protection service.
5. Size: As indicated on DSA-approved drawings.

2.03 PIPING AND FITTINGS

A. Steel Pipe - Aboveground:

1. Schedule 40 black steel pipe per ASTM A53 or ASTM A795:
   a. 1 inch through 1-1/2 inches: Threaded joints.
2. Schedule 10 black steel pipe per ASTM A135 or ASTM A795:
   a. 2 inches and larger: Grooved mechanical joints only.

B. Fittings - Threaded:

1. Cast iron or malleable iron conforming to ASME B16.3 (malleable iron) or ASME B16.4 (gray iron).
2. Class 150 minimum.
3. Black finish for standard applications.

C. Fittings - Grooved Mechanical:

1. Listed rigid and flexible couplings per application.
2. Rigid couplings: Use for standard runs and where rigidity is required.
3. Flexible couplings: Use at equipment connections, building expansion joints, and seismic separation joints.
4. Gaskets: EPDM rated for potable water service. Gaskets shall be molded and produced by the coupling manufacturer.
5. Housing: Ductile iron per ASTM A536, Grade 65-45-12; or ASTM A47 Grade 32510 malleable iron; or ASTM A53 fabricated steel fittings with grooves designed to accept grooved end couplings.
6. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from end to groove.

D. Fittings - Mechanical-Tee Branch Outlets:

1. UL Listed and FM Approved for fire sprinkler service.
2. Mechanical tees may be used to form branch outlets from steel pipe mains and branch lines in wet-pipe sprinkler systems where permitted by NFPA 13 and the fitting listing.
3. Mechanical tees shall be installed only on pipe sizes and wall thicknesses permitted by the fitting manufacturer.
4. Outlets shall be threaded or grooved as required to match the connected piping.
5. Mechanical-tee outlets shall not be used where prohibited by sprinkler manufacturer listings.

E. Flanged Fittings:

1. Cast iron, class 125, conforming to ASME B16.1.
2. Provide flanged connections where required.

F. Welded Fittings:

1. Wrought steel conforming to ASME B16.9.

G. Pipe Nipples:

1. Factory fabricated, Schedule 40 black steel.
2. Brass nipples at sprinkler drops in armover configurations.

H. Unions:

1. 150 PSI malleable iron, black or galvanized to match pipe.
2. Provide at equipment connections for maintenance accessibility.

I. One-piece reducing fittings shall be used wherever a change is made in pipe size. Bushings and reducing couplings shall not be permitted.

J. Close nipples and threaded unions are prohibited. Where a threaded union or coupling is needed, a groove type fitting shall be used.

K. Plain-end locking fittings are prohibited.

L. Fittings for hole-cut connections are not acceptable and shall not be used.

M. Flexible piping is not acceptable and shall not be used.

2.04 DRAIN AND TEST PIPING

A. Pipe: Schedule 40, galvanized steel, ASTM A-53.

B. Fittings: Cast iron, drainage pattern, standard weight, screwed.

2.05 SPRINKLER HEADS

A. General Requirements:

1. All sprinkler heads shall be listed by UL or FM for their intended application.
2. All sprinkler heads shall be new. Relocation of existing sprinklers is not permitted.
3. Sprinkler heads shall be compatible with pipe connection type.
4. Sprinklers shall be glass bulb type.
5. Sprinklers shall be same manufacturer throughout the project.
6. Sprinkler head type, K-factor, rating, and response are scheduled on the drawings.

B. Concealed Pendent Sprinklers:

1. Provide with matching cover plate in ceiling color.
2. Cover plate release temperature: Shall be rated to release at a temperature lower than the sprinkler activation temperature, in accordance with the manufacturer’s listing.
3. Factory installed escutcheon and cover plate.

C. Sprinkler Finishes:

1. Standard brass, chrome, or white factory finish as scheduled. All sprinkler heads/pendants in Gymnasium ceiling to be white. All cover plates in acoustical ceiling tile and painted gypsum board to be white. All cover plates in linear wood ceiling to be custom color to match wood.

2. Custom colors: Factory-applied finish. Field painting of sprinkler heads is not permitted.

3. Exposed piping in finished spaces: Match sprinkler finish.

4. Corrosion-resistant finish shall be installed at exterior areas; finish shall be polyester or Teflon coating with matching escutcheon.

D. Sprinkler Guards:

1. Required sprinkler guards are shown on DSA approved drawings.

2. Sprinkler guards shall utilize a bolt-on feature to the base of the sprinkler or be a factory-installed guard. Wire cage type, listed for fire sprinkler service.

E. Temperature Ratings:

1. Heads below finished ceilings and in all other occupied areas shall have an Ordinary temperature rating (155-165 degrees F) unless otherwise indicated on Drawings.

2. Heads in unventilated, concealed, and void spaces shall have an Intermediate temperature rating (200-212 degrees F) unless otherwise required by code or indicated on Drawings.

2.06 ALARM VALVES AND TRIM

A. Waterflow Alarm Devices:

1. Vane-Type Waterflow Switch:

a. Listed for fire sprinkler service.

b. Retard feature: Adjustable, factory set at 30 seconds. Maximum retard setting shall not exceed 90 seconds.

c. Contact rating: Suitable for fire alarm panel.

B. Inspector’s Test Connection:

1. Minimum 1-inch valve with orifice equivalent to smallest sprinkler in system.

2.07 VALVES

A. Control Valves - General:

1. All control valves shall be listed indicating-type valves.

2. Minimum 175 PSI rated working pressure.

3. All shutoff valves including PIV and backflow preventer shall be electronically supervised.

B. OS&Y Gate Valves (Outside Screw and Yoke):

1. UL listed, 175 PSI minimum working pressure.

2. Iron body, bronze mounted.
3. 2 inches and smaller: Threaded ends, solid wedge, rising stem, screw-in-bonnet, and malleable iron handwheel. Valves shall be capable of being repacked under pressure, with valve wide open.
4. 2-1/2 inches and larger: Flanged ends, solid taper wedge, flanged bonnet with body and bonnet conforming to ASTM A126 Class B; replaceable bronze wedge facing rings; packing assembly consisting of cast iron gland flange, brass gland, packing, bonnet, and bronze bonnet bushing.

C. Post Indicator Valves (PIV):
1. UL listed to UL 789.
2. Wall post indicator valve (WPIV) or standard PIV as indicated.
3. Clear "OPEN/SHUT" indicator window.
4. Locking device for security.

D. Butterfly Valves:
1. UL listed indicating butterfly valve for fire protection service.
2. Grooved-end type for grooved piping systems.
3. Gear operator for 6-inch and larger.
4. Visual indicator for open/closed position, easily readable from floor level.
5. Minimum 300 PSI rated working pressure for sprinkler risers; minimum 175 PSI for other locations.
6. Weatherproof gearbox.
7. Bubble-tight shutoff at rated working pressure.
8. Corrosion resistant body coating per manufacturer’s standard.
9. DPDT supervisory (monitor) switch, compatible with building fire alarm system.

E. Ball Valves:
1. UL listed for fire protection service.
2. Use for 2-inch and smaller drain and test connections.
3. Full port design.

F. Globe or Angle Valves:
1. UL/FM listed for fire protection service.
2. Bronze, 2 inches and smaller, screwed-in bonnet, threaded ends, rising stem.

G. Check Valves:
1. UL listed to UL 312.
2. Swing check type for horizontal installation.
3. Grooved end or flanged end as required.

H. Pressure Relief Valves: Provide listed pressure relief valves in accordance with NFPA 13 (2025) requirements for wet-system overpressure protection.

1. Minimum size: 1/2-inch (15 mm) NPT.
2. Setpoint: 175 psig or 10 psig above the maximum normal static system pressure (downstream of any backflow/PRV that defines the zone).

2.08 FIRE DEPARTMENT CONNECTION

A. General:

1. Provide fire department connection(s) as indicated on Drawings.
2. Location: Visible and accessible from fire apparatus access road.
3. Per CBC Section 912: Coordinate thread type with local fire department.

B. Wall-Mounted FDC:

1. UL listed siamese connection.
2. Two 2-1/2 inch female swivel inlets with threads matching local fire department (typically 2-1/2 inch NH).
3. Brass body with chrome or satin finish.
4. Clapper-type check valves in each inlet.
5. Plugs or breakable caps with chains.
6. Escutcheon plate with "AUTO SPKR" designation.

C. Freestanding FDC:

1. UL listed freestanding or post-type connection.
2. Height: 36 to 42 inches to center of inlets.
3. Concrete pad base or bollard protection as indicated.

D. FDC Check Valve:

1. Provide listed check valve in FDC supply pipe.
2. Install between FDC and system riser.

E. Signage:

1. Provide identification sign per NFPA 13 and local fire department requirements.
2. Sign shall indicate "AUTO SPKR" or "AUTOMATIC SPRINKLER".
3. Comply with CBC Section 912.4 for FDC signage.

2.09 HANGERS AND SUPPORTS

A. General Requirements:

1. All hangers shall be listed for fire sprinkler service.
2. Maximum hanger spacing per DSA approved drawings.
3. Hanging, bracing, and supports shall be by one manufacturer and listed as an approved assembly.

B. Hanger Types:

1. Adjustable band hangers.
2. Trapeze hangers: For multiple parallel runs.

C. Hanger Rods:

1. Minimum 3/8-inch diameter threaded rod for pipe 4-inch and smaller.
2. Minimum 1/2-inch diameter threaded rod for pipe size 5-inch.
3. Minimum rod sizes for pipe 6-inch and larger per NFPA 13 Table 17.2.1.1 (hanger rod sizes) and Table 17.2.3.5.1 (bolt/rod through steel).

D. Structural Attachments: Per DSA approved drawings.

E. Maximum Hanger Spacing: Per DSA approved drawings.

F. Size all anchors and fasteners per NFPA 13. All lag screws, bolts, and drive screws shall be installed as required by codes and accepted good practices. Pilot holes shall be drilled in all wood framing members as required by structural engineer. Under no circumstances shall lag screws or bolts be hammered or pounded into framing.

2.10 SEISMIC BRACING

A. General Requirements:

1. Seismic bracing shall comply with NFPA 13 (2025) Chapter 18, ASCE 7-22, and DSA approved drawings.

B. Brace Types:

1. Lateral Braces: Resist horizontal seismic forces perpendicular to pipe.
2. Longitudinal Braces: Resist horizontal seismic forces parallel to pipe.
3. 4-Way Braces: Resist horizontal seismic forces in all directions.

C. Brace Components: Per DSA approved drawings and fire protection product data submitted to DSA by design engineer.

D. Seismic Separation Assemblies:

1. Per DSA approved drawings and fire protection product data submitted to DSA by design engineer.
2. Seismic separation assembly shall be UL/FM listed swing joint assembly rated at a minimum of 175 PSI.

E. Flexible Couplings: Per DSA approved drawings and fire protection product data submitted to DSA by design engineer.

2.11 SIGNAGE AND IDENTIFICATION

A. General Requirements:

1. Provide durable identification for sprinkler piping, control valves, test/drain assemblies, fire department connections, and riser room(s).
2. Materials: Engraved rigid plastic or metal signs; corrosion-resistant wire/chain or mechanical fasteners; indoor/outdoor rated.

B. Valve Signage:

1. Provide a permanent sign at each sprinkler system control valve indicating:

a. Valve function.

b. System/zone designation served.

c. Portion of building served.

d. Associated drains or auxiliary equipment shutoff coordination as applicable.

2. Minimum 1/2-inch white letters on red background, or per NFPA 170 and local fire authority requirements.

C. Riser Room Signage:

1. Hydraulic data nameplate at each riser showing:

a. Contractor’s name and C-16 license number.

b. Date of installation.

c. Hazard classification.

d. Design density and area.

e. Hose stream allowance.

f. Total water demand (GPM at PSI).

g. Name of installing contractor’s representative.

D. Fire Department Connection Signage:

1. "AUTOMATIC SPRINKLER" or "AUTO SPKR" sign per CBC Section 912.4.

2. Indicating signs directing fire department to FDC location if not visible from street.

E. Pipe Identification Labels:

1. Red lettering on white background: "FIRE SPRINKLER" with directional arrows.

2. Provide pipe labels on sprinkler mains, risers, and drains.

2.12 ACCESS PANELS

A. General Requirements:

1. Provide access panels at all concealed valves, drain connections, and equipment requiring periodic access for inspection or maintenance.

2. Square construction. Stainless steel (Type 304) at locations indicated on Drawings or where required by environmental conditions. Galvannealed steel acceptable at interior drywall locations where stainless steel is not required.

3. Vandal-proof door lock operated by Allen wrench.

4. Size: As required to provide adequate access to concealed components. Minimum 12 inches by 12 inches.

2.13 ESCUTCHEONS, SLEEVES, AND PENETRATION ACCESSORIES

A. Sprinkler Escutcheons:

1. Pipe through ceilings at sprinkler head locations shall be furnished with a two-piece or fully concealed escutcheon.
2. Escutcheons shall be identical and match throughout the building for each application type.
3. Escutcheons in areas with finished ceilings: White, or as selected by Architect.

B. Pipe Escutcheons:

1. Furnish and install steel chrome plated set screw type escutcheons on all exposed pipes passing through walls, floors, ceilings, and partitions.

C. Sleeves:

1. Sleeves shall be provided for all pipes passing through walls, floors, and lath and plaster partitions and ceilings. For concrete construction, sleeves shall be set in forms before concrete is poured. Provide one-inch (1") clearance between sleeves and pipe.
2. Where installed in fire-rated walls or floors, caulk space between pipe and sleeves with listed firestop sealant and fill material in accordance with the tested assembly.
3. In slab construction, sleeves shall be Schedule 40 black steel pipe. Sleeves shall extend two inches (2") above finished floor and upper surface to be sealed with mastic.

2.14 ACCESSORIES

A. Automatic Air Venting Valve:

1. Basis of Design: PurgeNVent model 7900AAV or approved equal.
2. Automatic air venting valve for wet-pipe sprinkler systems.
3. Listed for fire sprinkler service.
4. Minimum 175 PSI working pressure.

B. Alarm Bell:

1. Basis of Design: Potter PBA-AC or PDC Series vibrating type bells as required by system design and power source at bell location.
2. Outdoor use requires weatherproof back box.
3. 10" bell, red finish.
4. Bell shall be located as required by authorities having jurisdiction and as acceptable to Architect, approximately 10’-0" above finished grade on exterior wall.

C. Pressure Gauges:

1. Install as required by code. UL approved four and one-half inch (4-1/2") dial type with a maximum limit of not less than twice the normal working pressure at the point where installed.
2. Bourdon Tube. Copper alloy C-type.
3. Pressure connection: copper alloy, 1/4" NPT lower mount.
4. Copper alloy movement.

5. Dial: White aluminum with stop pin; black and red lettering.
6. Black aluminum pointer.
7. Black polycarbonate base.
8. Snap in clear polycarbonate window.

D. Tamper Switches:

1. Listed for fire protection service.
2. Compatible with building fire alarm system.
3. Two-switch design (one for supervisory, one for trouble) where required by fire alarm system.

E. Supervisory Switches: SPST, normally closed contacts, designed to signal valve in other than full open position.

F. Sprinkler System Supervision Alarms:

1. All valves controlling the water supply for automatic sprinkler systems and water flow switches on all sprinkler systems shall be electrically supervised in accordance with CBC Section 903.4.
2. All required alarm devices including flow switches and tamper switches shall be provided and installed by the automatic fire sprinkler contractor. All associated conduit, wiring, and electrical connections between such devices and the fire alarm system shall be the responsibility of the fire alarm contractor.
3. Refer to electrical drawings and specifications and fire alarm specifications for additional information.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Pre-Installation Verification:

1. Verify all rough-in conditions are ready for sprinkler installation.
2. Verify structural framing is complete and accessible.
3. Verify ceiling heights match Drawings.
4. Identify and document obstructions.
5. Examine areas and conditions under which work shall be performed. Correct conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordination Verification:

1. Verify HVAC ductwork installation is coordinated.
2. Verify electrical conduit routing is coordinated.
3. Verify plumbing installations are coordinated.

C. Water Supply Verification:

1. Verify underground piping is complete and tested.

2. Verify water supply pressure and flow match design requirements.

3. Conduct final water flow test prior to system completion.

3.02 PREPARATION

A. Protection of Work:

1. Protect installed work from damage by other trades.

2. Cap open pipe ends at end of each workday.

3. Protect sprinkler heads from paint, debris, and physical damage.

4. Sprinkler bulb protectors shall be removed by hand only after installation is complete and area is clean.

5. Contractor shall be held responsible for all damage to equipment and material until written notice of acceptance from the Engineer.

B. Pipe Preparation:

1. Cut pipe square and deburr.

2. Remove all cutting oil, debris, and foreign material.

3. Remove scale and foreign matter from inside and outside of pipes before assembly.

4. Prepare grooved ends per coupling manufacturer’s requirements.

5. Clean and prepare threads for proper engagement.

3.03 INSTALLATION - GENERAL

A. The Contractor shall furnish the services of an experienced Superintendent who shall be qualified in all phases of the work of this Section and who shall constantly be in charge of the work.

B. All installations shall be per referenced standards. Follow manufacturer’s directions and recommendations in all cases as required for all approvals and warranty enforcement.

C. Any cutting of structure shall be subject to approval by the Architect. Beams, decks, and other structural components shall not be cut or altered in any way unless previously approved.

D. Entire sprinkler system shall be installed in such a manner so that it can be drained in accordance with NFPA 13 (2025). Drains shall be located at suitable points as approved by Architect. No primary or auxiliary drain shall be located in any public area or electrical room. All drains shall discharge into dedicated receptors.

E. No work shall be covered or enclosed until inspected, tested, and approved by Architect, DSA Project Inspector, and authority having jurisdiction.

F. Sprinkler heads at finished ceilings and in exposed locations shall form a symmetrical pattern, carefully integrated into the ceiling layout. Heads shall be located at the centerline of ceiling tiles.

G. Use best workmanship in the installation of all piping and in particular all piping exposed in areas having no suspended ceilings. Install all piping as high as possible and where possible, install branch piping between structural framing and run main piping only below beams.

H. Sprinkler head layout must accommodate ceiling-mounted HVAC register and lighting locations. Coordination with work of these trades is the responsibility of Contractor.

I. Without exception, no piping shall be run under or through any skylight or skylight well. Any additional upright or pendent sprinklers required by skylight locations shall be the responsibility of this Contractor.

J. All penetrations of wall and/or floor assemblies shall be suitably sleeved, patched, and/or sealed in order to preserve fire rating, where applicable.

3.04 INSTALLATION - PIPING AND FITTINGS

A. General Piping Requirements:

1. Install piping per DSA-approved drawings.
2. Provide auxiliary drains at all trapped piping per NFPA 13.
3. Do not penetrate structural members without structural engineer approval.
4. All drain valves shall be plugged and piped to accessible location. Those installed within walls shall be equipped with locking access panels.

B. Threaded Joints:

1. Apply pipe joint compound or Teflon tape to male threads only.
2. Engage minimum number of threads per NFPA 13.
3. Do not back off fittings after threading.

C. Grooved Joints:

1. Cut grooves per coupling manufacturer’s requirements.
2. Verify groove dimensions with go/no-go gauge.
3. Lubricate gaskets per manufacturer’s requirements.
4. Tighten bolts evenly to proper torque.
5. Grooved joints shall be installed in accordance with the manufacturer’s latest published installation instructions.

D. Mechanical-Tee Branch Outlets:

1. Install mechanical tees in accordance with the fitting manufacturer’s installation instructions including:
   a. Proper hole cutting or drilling procedures.
   b. Correct gasket placement and bolt torque.
   c. Pipe wall thickness limitations.
2. Quality Control:
   a. Inspect mechanical-tee installations for proper hole size, gasket seating, and bolt tightening.
   b. Replace fittings installed on improperly prepared pipe.

E. Welded Joints (Where Permitted):

1. Welding methods shall comply with AWS D10.9, Level AR-3 and ANSI B31.1.

2. Contractor shall be responsible for all welded joints and any qualifying procedures or certification required for welders and related personnel.

3. Joining Materials: Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials appropriate for the wall thickness and chemical analysis of the pipe being welded.

4. Holes in pipe for welded outlets shall be cut to full inside diameter of fitting, prior to welding in place. Holes shall be free of slag and welding residue, and of smooth, continuous bore. Fittings shall not penetrate internal diameter of run piping. Holes shall be cut by hole saw or other rotary bit. Torch-cutting of holes is strictly prohibited.

5. Clean interior of pipe after welding.

6. All welded pipe shall be subject to inspection by authority having jurisdiction before it is installed. Provide documentation of acceptance at time of project close-out.

F. Branch Line Installation:

1. Maximum deflection of branch lines: Per sprinkler listing.

2. Support branch lines within 3 feet of sprinkler head.

3. Armover unsupported length: Per NFPA 13 (2025) requirements for applicable pipe size.

G. Riser Installation:

1. Install risers plumb.

2. Provide base support for riser weight.

3. Install flexible coupling within 24 inches of top of riser.

4. Install 1/2-inch pressure relief valve at riser.

H. Drain Piping:

1. Sprinkler system shall be provided with complete drainage facilities in accordance with NFPA 13 and CBC standards.

2. System main drain shall be piped to nearest standpipe drain in riser room with air gap.

3.05 INSTALLATION - SPRINKLER HEADS

A. General Sprinkler Installation:

1. Install sprinkler heads only after rough-in piping is complete and flushed.

2. Use only manufacturer’s recommended wrench for installation.

3. Do not grip or damage deflector, frame, or heat-responsive element.

4. Apply Teflon tape to threads per manufacturer’s instructions.

B. Sprinkler Positioning:

1. Install sprinkler heads at locations, types, spacing, and deflector positions shown on DSA-approved drawings.

2. Position sprinkler deflectors parallel to ceiling.

3. Maintain clearances from obstructions per NFPA 13 (2025) Chapter 9 and DSA-approved drawings.

C. Sprinkler spacing, coverage areas, and wall distances are indicated on Drawings and comply with NFPA 13.

D. Concealed and Recessed Sprinklers:

1. Install after ceiling is complete.

2. Verify proper fit and adjustment of escutcheon/cover plate.

3. Verify cover plate is properly seated and aligned.

E. Protection of Sprinklers During Construction:

1. Protect sprinkler heads with factory-provided caps until area is clean.

2. Replace any sprinkler that has been painted, damaged, or loaded.

3. Do not hang materials or equipment from sprinkler piping.

3.06 INSTALLATION - SEISMIC BRACING

A. Brace Installation:

1. Install seismic braces per approved DSA drawings.

2. Maximum angles per NFPA 13 (2025): 45 degrees from horizontal.

3. Minimum angles per NFPA 13 (2025): 30 degrees from horizontal for steel pipe.

B. Lateral Bracing:

1. First lateral brace within 6 feet of riser.

2. Maximum spacing per DSA approved drawings.

3. Brace to structure on opposite side of pipe from lateral load direction.

C. Longitudinal Bracing: Maximum spacing per DSA approved drawings.

D. Branch Line Restraints: Restrain branch lines at locations shown on DSA approved drawings.

E. Flexible Couplings:

1. Install flexible couplings within 24 inches of top of riser.

2. Install at building expansion joints.

3. At system riser after flange connection to in-building-riser and before check valve.

4. Provide sway bracing as required by coupling locations.

3.07 INSTALLATION - VALVES AND ACCESSORIES

A. Control Valve Installation:

1. Install control valves in accessible locations.

2. Provide minimum 18-inch clearance in front of valves.

3. Install tamper switches on all control valves.

4. Install valve position (open/closed) indicator.

B. Fire Department Connection Installation:

1. Mount FDC per manufacturer's requirements.
2. Height: Inlets 18 inches minimum, 42 inches maximum above grade.
3. Install check valve in FDC supply line.
4. Provide signage per NFPA 13 and CBC requirements.

C. Inspector's Test Connection:

1. Install at hydraulically most remote point.
2. Pipe discharge to exterior or visible drain location.
3. Provide signage identifying test connection.

D. Waterflow Switch Installation:

1. Install per manufacturer's requirements.
2. Connect to fire alarm system per Division 28 requirements.
3. Set retard time per local fire authority requirements (typically 30-90 seconds).

E. Pressure Relief Valve:

1. Locate relief valve in riser room in a visible and accessible location.
2. Provide clearance for inspection, service, and replacement without removing other equipment.
3. Pipe relief valve discharge full size to a safe, observable location where discharge will not cause injury or property damage.
4. Terminate discharge at an approved drain receptor with an air gap.
5. Testing:
    a. Provide a written test plan describing how hydrostatic testing will be performed without leaving the system unprotected at turnover.
    b. Where lockable relief valves are used for hydrostatic testing, lock/return valves to normal operating condition after testing and provide tamper-evident seal.
    c. At acceptance, verify: valve listing, size, nominal setting, discharge routing, and absence of leakage at normal system pressure.

F. Local alarm bell shall be located so that it can be easily heard and seen by passersby and fire department personnel.

3.08 EXCAVATION, TRENCHING, AND BACKFILL

A. Do all necessary trench excavation, backfilling, and compaction required for the proper laying of underground piping. Provide a 6" sand bed above and below piping and backfill with selected materials properly moistened and mechanically compacted to ninety percent (90%). Piping shall have a minimum of thirty-six inches (36") of cover.

B. Concrete, anchor, and thrust blocks required for underground piping shall be provided under the work of this Section.

3.09 CORROSION PROTECTION

A. General:

1. Corrosion protection shall be provided for all below grade ductile iron piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping (polywrap). The polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

B. Materials:

1. Polywrap shall be minimum 8 mil in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall meet or exceed the requirements of AWWA C105/A21.5 and ASTM D4976.

2. Polywrap shall be secured with 2-inch wide pressure sensitive plastic tape not less than 10 mils thick.

C. Installation:

1. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. With the pipe suspended from the center, the tube shall be slipped over the spigot end and bunched up between the point of support and the spigot end. After the pipe is installed into the bell of the adjacent pipe, the pipe shall be lowered to the trench bottom and the supporting sling removed. The tube shall be slipped along the full length of the barrel with enough left at each end to overlap the adjoining pipe about 1 foot.

2. Rips, punctures, or other damage to the tube shall be repaired with adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

3. Valves, tees, crosses, and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice, and secured with adhesive tape.

3.10 FABRICATION

A. All pipe, fittings, etc. shall be prepared by qualified and trained personnel, experienced with the products involved, and the recommended methods of preparation. All cuts, threads, and grooves shall be made according to applicable codes, standards, and accepted good practices. Pipe shall be free of damage, flaws, and burrs. Threads and grooves shall not be excessively shallow or deep. Fittings shall be made onto pipe no tighter than necessary. Cracked or broken fittings shall be replaced by Contractor, without exception. Excess dope and oils shall be removed before shipment to job site.

B. Service Connections: Coordinate exact location with contractor installing underground service main.

3.11 FLUSHING AND CLEANING

A. Do not connect aboveground sprinkler system piping to the underground fire service lead-in until:

1. Underground flushing and hydrostatic testing are completed and accepted per NFPA 24 and AHJ requirements.
2. The Contractor's Material and Test Certificate for Underground Piping has been submitted.

B. Underground Flushing Requirements per NFPA 13 (2025) Section 28.1 and NFPA 24:

1. Flush all underground piping from water supply to system riser before connecting to aboveground piping.
2. Minimum flushing flow rates to achieve 10 feet per second velocity:
   a. 4-inch pipe: 390 GPM.
   b. 6-inch pipe: 880 GPM.
   c. 8-inch pipe: 1,560 GPM.
3. Use burlap bags or strainers at flush outlet to capture debris.
4. Continue flushing until discharge water is clear and free of debris.
5. Underground flushing shall be witnessed by DSA Project Inspector.

C. Aboveground Flushing Requirements per NFPA 13 (2025) Section 28.2:

1. Flush all aboveground piping before installing sprinkler heads.
2. Flush cross mains and feed mains through flushing connections.
3. Branch lines may be flushed through end-of-line test connections or open fittings.
4. Flush until water runs clear.
5. Do not install sprinkler heads until flushing is complete.

D. Flushing Connections per NFPA 13 (2025) Section 28.2.3:

1. Provide flushing connections at end of each cross main.
2. Minimum flush connection size per pipe being flushed:
   a. 2-inch and smaller pipe: Minimum 2-inch flush connection.
   b. 2-1/2-inch to 3-1/2-inch pipe: Minimum 2-1/2-inch flush connection.
   c. 4-inch and larger pipe: Minimum 4-inch flush connection.
3. Properly restrain and secure all flushing piping and hoses.

E. Documentation:

1. Document flushing operation including date, duration, and observations.
2. Record flow rate achieved.
3. Note clarity of water and any debris removed.
4. Provide signed flushing certificate to DSA Project Inspector.
5. Flushing certification is required before system acceptance.

3.12 HYDROSTATIC TESTING

A. Hydrostatic Test Requirements per NFPA 13 (2025) Chapter 29:

1. Test all new piping and attached appurtenances after installation and before concealment.
2. Test Pressure per Section 29.2.1.1:
    a. Standard: 200 PSI (13.8 bar) for 2 hours.
    b. High Pressure Systems: Where system working pressure exceeds 150 PSI, test at 50 PSI above maximum system working pressure for 2 hours per Section 29.2.1.3.
3. Acceptance Criteria per Section 29.2.1.2: No loss in gauge pressure or visual leakage.
4. Include Fire Department Connection (FDC) piping in hydrostatic test.

B. Hydrostatic Test Procedure:

1. Install sprinkler heads after piping passes hydrostatic test, or use approved test plugs per Section 29.2.1.9.
2. Fill system slowly from lowest point to allow air to escape through high point vents.
3. Apply test pressure using calibrated hydrostatic test pump.
4. Maintain test pressure for minimum 2 hours.
5. Visually inspect all joints, fittings, and connections for leakage during test.
6. Record pressure gauge readings at start and end of test.
7. Confirm pressure at highest elevation meets requirements (elevation loss is acceptable per Section 29.2.1.6).

C. Test Witnessing:

1. Coordinate with DSA Project Inspector for test witnessing.
2. Provide minimum 48-hour advance notice before testing.
3. All hydrostatic tests shall be witnessed by DSA Project Inspector.
4. Have approved drawings available at time of test.

D. Documentation:

1. Complete hydrostatic test certificate.
2. Record test pressure, duration, and gauge readings.
3. Document pass/fail and any repairs made.
4. Obtain DSA Project Inspector signature on test certificate.
5. Certify that no additives, corrosive chemicals, sodium silicate, brine, or other corrosive substances were used for testing or stopping leaks.

3.13 SYSTEM FUNCTIONAL TESTING

A. Main Drain Test per NFPA 13 (2025) Section 29.2.6:

1. Conduct main drain test with DSA Project Inspector present.
2. Procedure:
    a. Record static pressure with main drain valve closed.

b. Open main drain valve fully.

c. Allow pressure to stabilize.

d. Record residual pressure with drain fully open.

e. Close main drain valve.

3. Main drain shall be piped to exterior or visible interior drain.

4. Document static and residual pressures on Contractor's Material and Test Certificate.

5. Results establish baseline for future annual main drain tests per NFPA 25.

B. Waterflow Alarm Test per NFPA 13 (2025) Section 29.2.5:

1. Open inspector's test connection at hydraulically remote location.

2. Verify waterflow switch activates and transmits signal to fire alarm panel.

3. Record time from test valve opening to alarm activation (shall not exceed 90 seconds).

4. Verify alarm bell sounds.

5. Verify correct identification of each zone/device at fire alarm control panel.

6. Close test connection and verify alarm restores.

C. Tamper Switch Test per NFPA 13 (2025) Section 29.2.4:

1. Verify all control valves are in normal (open) position.

2. Close each control valve partially (two turns maximum from fully open).

3. Verify tamper switch activates supervisory signal at fire alarm panel.

4. Return valve to fully open position.

5. Verify supervisory signal restores at fire alarm panel.

6. Test each supervised valve individually.

D. Backflow Preventer Forward Flow Test per NFPA 13 (2025) Section 29.2.9:

1. Where backflow preventer is installed in sprinkler supply, conduct forward flow test.

2. Flow water through system at system demand rate (or maximum achievable flow).

3. Verify backflow preventer check valves operate correctly.

4. Document test results.

E. Fire Department Connection Test per NFPA 13 (2025) Section 29.2.3:

1. Verify FDC clapper valves operate freely.

2. Verify FDC check valve holds under system pressure.

3. Verify FDC piping was included in hydrostatic test.

4. Verify threads are compatible with local fire department.

5. Verify signage is installed per NFPA 13 and CBC.

F. Pressure Gauge Calibration per NFPA 13 (2025) Section 29.2.7:

1. Verify all pressure gauges are installed per approved drawings.
2. Gauges shall be listed and suitable for fire protection service.
3. Calibrate or replace gauges not accurate within 3% of full scale.

G. Sign and Nameplate Verification per NFPA 13 (2025) Section 29.2.8:

1. Verify hydraulic design nameplate is installed at system riser.
2. Verify all required signage is installed:
   a. Control valve identification signs.
   b. Fire department connection signs.
   c. Inspector’s test connection signs.
   d. Spare sprinkler cabinet sign.

H. Local Fire Authority Notification:

1. Per DSA requirements, notify local fire authority of scheduled testing.
2. Invite local fire authority to witness tests (at school district’s discretion).
3. Provide test results to local fire authority after acceptance.

I. Deficiencies: Any deficiencies identified during testing shall be corrected and retested at no additional cost to the Owner until full compliance is achieved.

3.14 CONTRACTOR’S MATERIAL AND TEST CERTIFICATE

A. Provide Contractor’s Material and Test Certificate per NFPA 13 (2025) Chapter 29 including:

1. Contractor’s name, address, and C-16 license number.
2. Name of property owner and property address.
3. Description of work performed.
4. Hazard classification(s).
5. Design criteria (density/area).
6. Water supply data.
7. Materials used (pipe, fittings, sprinklers, valves).
8. Hydrostatic test results.
9. Main drain test results.
10. Flushing certification.
11. Alarm device test results.
12. Certification that installation complies with NFPA 13 and approved plans.
13. Signature of contractor’s authorized representative.

B. Submit certificate to:

1. DSA Project Inspector.
2. Owner.

3. Local Fire Authority.

3.15 DEMONSTRATION AND TRAINING

A. Owner Training:

1. Provide minimum 2-hour training session for Owner's maintenance personnel.

2. Training topics shall include:

a. System overview and operation.

b. Location of control valves and components.

c. Emergency procedures.

d. Inspection, testing, and maintenance requirements per NFPA 25 California Edition.

e. Spare sprinkler head cabinet location and use.

f. When to contact fire sprinkler service contractor.

B. Contractor-Provided Documentation:

1. Operation and Maintenance Manual including:

a. System description and operation.

b. Component information and replacement parts.

c. Recommended maintenance schedule per NFPA 25 California Edition.

d. Emergency procedures.

2. Manufacturer's literature for all installed components.

3. As-built drawings showing any deviations from Contract Documents and location of all system drawings.

4. All test certificates and reports.

C. Engineer-Provided Documentation (Included in Contract Documents):

1. Hydraulic calculations.

2. Seismic calculations.

3. Design drawings.

3.16 CLOSEOUT AND CLEAN-UP

A. Final Inspection:

1. Coordinate final inspection with DSA Project Inspector.

2. All punch list items shall be complete before final inspection.

3. Provide all required documentation for DSA project certification.

4. Final acceptance of the fire sprinkler system shall be subject to approval by DSA, IOR, and AHJ. System shall not be placed in service until all testing and documentation have been approved.

B. Required Documentation for DSA Certification:

1. Signed Contractor's Material and Test Certificate.

2. Hydrostatic test reports.
3. Flushing certification.
4. Functional test reports.
5. As-built drawings.
6. Operation and Maintenance Manuals.
7. Warranty documentation.

C. Local Fire Authority Coordination:

1. Provide copies of all test reports to local fire authority.
2. Fire sprinkler system must be complete and operational before occupancy per CBC.
3. Ongoing inspection, testing, and maintenance becomes responsibility of Owner and local fire authority after DSA project certification.

D. Cleaning:

1. Upon completion of the work specified, and at other times during the progress of the work when required, the Contractor shall remove all surplus materials, rubbish, and debris resulting from this work, and shall leave the entire building and involved portions of the site in a neat, clean, and acceptable condition.
2. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
3. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster, and other materials, and all oil and grease spots shall be removed.

E. Final Approval:

1. Prior to final acceptance of the installation, the Contractor shall furnish to the Engineer certificates of approval signed by the authority having jurisdiction, stating that the systems, as installed, have been inspected and tested and meet all governing code requirements.
2. Provide three copies of final inspection and certification as required by Owner’s Insurance Underwriter, and/or authorities having jurisdiction.
3. Submit two copies of guarantee.

END OF SECTION

SECTION 15300

PLUMBING

PART 1 - GENERAL

1.01 WORK INCLUDED

1. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.02 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:

1. C.C.R., Title 24, Part 5 (2022 CPC).
2. 2022 California Plumbing Code.
3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
4. National Fire Protection Association.
5. California State Division of Industrial Safety.
6. County Health Department.
7. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.03 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. **Special Note**: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field

conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.04 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.05 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Gas Service and Meter Assembly: The Contractor shall arrange with the serving utility company for the installation of new gas service with complete meter assembly of the capacity indicated and in the location as shown on the drawings. All items served with gas shall be operated at full fire and adjusted by the Contractor. In cooperation with gas utility, make all required adjustments to main gas pressure regulators. The Owner shall pay for all required fees.

E. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite

F. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system.

G. Storm Drain: The Contractor shall be responsible for the storm drain service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite storm drain system.

1.06 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.07 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.08 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.09 SUBMITTAL DATA (Also see General Conditions)

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.

4. To be valid, all submittals must:

a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.11 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of re-producibles shall be delivered to the Architect.

1.12 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT (See Schedules on Drawings)

A. **General**: All materials, as specified or required in the work, shall be new, free from defects and imperfections. All manufactured shall comply with California Assembly Bill 1953.

B. Pipe and Fittings:

1. Soil and Waste Piping:

a. Soil and waste piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301, ASTM A-888 or ASTM A-74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up with "Husky" SD 4000 series or “Clamp All” HI-TORQ 125 series stainless steel type 304 couplings and shall conform to ASTM C1540 & ASTM C564 except all above ground vent pipe fittings may be made with "Anaco" or "Tyler" stainless steel two band couplings conforming to CISPI Standard 310.

2. Vent Piping:

a. Concealed or underground vent piping shall be cast iron pipe and fittings as specified for soil and waste piping.

b. Exposed vent piping shall be Schedule 40 galvanized steel pipe, ASTM A53, with black cast iron

3. Domestic Water Piping:

a. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought-copper, Solder-Joint Fittings ASME B16.22.

b. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22.

c. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

4. Storm Drain Piping:

a. Concealed storm drain piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301, ASTM A-888 or ASTM A-74. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up with "Husky" SD 4000 series or “Clamp All” HI-TORQ 125 series stainless steel type 304

couplings and shall conform to ASTM C 1540 & ASTM C564.

b. Exposed storm drain piping shall be Schedule 40 galvanized steel pipe, ASTM A53, with black cast iron recessed drainage fittings.

5. Indirect Waste Piping.

a. Shall be Type "L" copper as specified for water piping.

6. Air Conditioning Condensate Drain Piping.

a. Shall be Type "M" copper as specified for water piping.

7. All exposed piping at plumbing fixtures shall be chrome plated yellow brass except exposed pipes in shop or utility areas.

8. Unions or flanges shall be furnished and installed at each threaded connection to all equipment or valves. The unions or flanges shall be located so that the piping can be easily disconnected for removal of the equipment, tank, or valve, and shall be of the type specified in the following schedule.

a. Unions:

1) **Black Steel Pipe**: 250 pound screwed black malleable iron, ground joint, brass to iron seat.

2) **Galvanized Steel Pipe:** 250 pound screwed galvanized malleable iron, ground joint, brass to iron seat.

3) **Copper or Brass Tubing:** 150 pound cast bronze or copper, ground joint, nonferrous seat with ends, by Walseal, Nibco or Mueller.

b. **Flanges**: Tube Turn or approved equal, raised face 150 pound class forged steel, weld, neck or slip-on type conforming to ASA B16.5 and ASTM A181. For copper piping systems, provide flanges conforming to ANSI B16.24. The faces of the flanges being connected to be alike in all cases. Locate flanges so that the piping can be easily disconnected for removal of the equipment or valve. Gasket material shall be of material suiting the service of the opening system in which installed and which conforms to its respective ANSI Standard (A21.11. B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.

9. All piping on roof shall be supported by pipe supports as manufactured by MAPA Products. Products by Miro Industries and Erico shall be accepted for submittal review.

a. Pressurized Piping:

1) For pipe sizes 1” and less: MS-1 single post, adjustable height pipe support.

2) For pipe sizes 2 ½” and less: MS-4 adjustable, roller pipe support.

3) For pipe sizes 4” and less: MS-5 adjustable, roller pipe support.

b. **Gravity System Piping 2” and Less**: MS-1 single post, adjustable height pipe support.

10. All underground non-metallic piping shall have 14 gauge copper "Tracer Wire" continuous for entire length.

C. Valves:

1. General:

a. Piping systems shall be supplied with valves arranged so as to give complete and regulating control of each building and piping systems throughout the building, and located so all parts are easily accessible and maintained.

1) Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems.

2) Sizes: Same size as upstream pipe, unless otherwise indicated.

3) Operators:

b. Hand wheels fastened to valve stem for all valves other than quarter turn.

c. Lever handles on quarter-turn valves, 6 inch and 8 inch and larger gear operated, except for plug valves. Provide plug valves with square heads and operating wrench.

d. Provide gear operator for valves 8 inch or larger.

1) Extended stems: Where piping insulation is indicated or specified, valves shall be equipped with 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops, which are fully adjustable after insulation is applied.

2) End Connection: 2 inch and under shall be threaded, 2-1/2 inches and larger shall be flanged or full lug style.

e. Valves for Potable Water must comply with California Lead Free Law, effective January 1, 2010.

1) *"Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%. Source: California Health & Safety Code (116875).*

2) *All valves must be 3rd party certified.*

3) *Bronze valves shall be made with dezincification-resistant material.*

f. Where possible, valves of one manufacturer shall be used.

g. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.

2. **Approved Manufacturers.** The following manufacturers (or equal) shall be accepted for submittal review provided that all features and options are equivalent to the corresponding items as specified.

a. General valves.
   1) NIBCO
   2) Hammond
   3) Milwaukee

b. Below grade domestic water shut-off valves (gate valves) 2” and larger.
   1) NIBCO.
   2) Clow.
   3) Mueller.

c. Butterfly Valves.
   1) NIBCO.
   2) Demco.
   3) Dezuric.

d. Plug Valves.
   1) Hammond.
   2) Milwaukee.

e. Check valves, lift type.
   1) Hammond.

3. Valves and cocks shall be installed in locations as indicated on plans per the following usage criteria:
   a. Below grade domestic water shut-off valves 1-1/2” and smaller.
      1) Gate valve.
   b. Below grade domestic water shut-off valves 2” and larger.
      1) Resilient seated gate valve.
   c. Above grade domestic water shut-off valves 2” and smaller.
      1) Ball valve.
   d. Above grade domestic water shut-off valves 2-1/2” and greater.
      1) Butterfly valve.
   e. Above grade gas shut-off cocks.
      1) Ball valve (for gas service).
   f. Below grade gas shut-off cocks.
      1) Polyethylene ball valve (for gas service).
   g. Check valves, general, horizontal.
      1) Check valve, swing type.

4. Gate Valves.
   a. Gate Valves, 1-1/2-Inch and Smaller.
      1) Rising Stem: Valves shall be Class 125 and 200 PSI CWP,

rising stem, union bonnet, solid wedge and manufactured in accordance with MSS-SP 80. Body, bonnet and wedge shall be of bronze ASTM B-62. Stems shall be of dezincification-resistant silicon bronze ASTM B-371 or low-zinc alloy B-99, non-asbestos packing and malleable or ductile iron hand wheel. Valve ends shall be threaded.

a) **Acceptable Valves**: NIBCO T124 (threaded), or approved equal.

2) **Non-Rising Stem:** Valves shall be Class 125 and 200 PSI CWP, non-rising stem, screw-in bonnet, solid wedge and manufactured in accordance with MSS-SP-80 and NSF-61-G. Body, bonnet, external stuffing box and wedge shall be of bronze ASTM B-584 C87850. Stems shall be of dezincification-resistant silicon bronze ASTM B-371 C69400 or ASTM B-99 C65100, Aramid Fibers with graphite packing and malleable iron hand wheel. Valve ends shall be threaded.

a) **Acceptable Valves**: NIBCO T113-LF (threaded), or approved equal.

b. Resilient Seated Gate Valves, 2-Inch and Larger.

1) Valves shall conform to AWWA C-509 and C515, fusion-bonded epoxy coating inside and out, meets or exceeds AWWA C-550, ductile iron body, rubber encapsulated D.I. wedge, rubber bonnet gasket, low torque operation, full diameter waterway, flanged, mechanical joint or ring-tite, UL/FM listed and approved. Provide complete with traffic weight cast iron valve box with cast iron cover and operating wrench.

a) **Acceptable Valves**: NIBCO F-607-RW OS&Y or F-609-RW NRS or M-609-RW, or approved equal by Clow or Mueller.

5. Ball Valves, 2 Inches and Smaller.

a. Valves shall be rated 250°F: 330 psig 600 PSI CWP, shall have 2-piece full port lead free dezincification resistant bronze bodies with TFE seats and seals, stainless steel stem, separate packing nut with blow-out proof adjustable stem packing, and vented stainless steel ball. Valves shall conform to ASTMB371 C69300, or ASTM B-584 C87850and conform to MSS-SP-110 and NSF-61-G.

1) **Acceptable Valves:** NIBCO T-68580-LF (threaded), or approved equal.

6. Butterfly Valves, 2-1/2” and Larger.

a. Valves shall be rated 200 PSI, full lug Ductile Iron Body ASTM A-536, with 2” extended neck for insulation, EPDM liner, 416 Stainless Steel Stem, and Aluminum Bronze disc. All Butterfly Valves shall be suitable for bi-directional dead end service at valves rated pressure without the need for a down stream flange. Valves 6” and smaller shall be supplied with 10 position lever locking handle. Valves 8” and larger shall have enclosed weatherproof gear

operators and conform to MSS-SP 67.

1) **Acceptable Valves:** NIBCO LD 2000, or approved equal.

7. Check Valves, Swing-Type, 2" and Smaller.

   a. Valves shall be Y-pattern swing-type manufactured in accordance with NSF-61-G and MSS SP-80, Class 125, Lead Free dezincification resistant bronze body ASTM B-584 C87850, with Nonmetallic TFE seat disc. Valve ends shall be threaded.

      a. **Acceptable Valves**: NIBCO T413-Y-LF (threaded), or approved equal.

8. Combination Temperature and Pressure Relief Valves: Shall be McDonald, Watts, or approved equal, bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Relief valves shall be factory set for 210 degree F. and 150 p.s.i. pressure. Relief valves shall be type as recommended by water heater manufacturer.

D. **Water Pressure Regulators**: Shall be of the manufacturer, model and sizes as indicated on the drawings, complete with shut-off valves (inlet and outlet of assembly), valve bypass, pressure gauges, strainers and pressure relief valves.

E. **Traps, Strainers and Tailpieces:** Every sanitary fixture, unless otherwise specified, shall be provided with a seventeen (17) gauge chromium tailpiece, a Los Angeles pattern chrome plated cast-brass trap and galvanized nipple trap arm and wall flanges. Trap arm shall be provided with chromium plated brass casing between the trap and wall flanges at each fixture. All sanitary waste system floor drains and floor sinks shall have cast iron "P" traps.

F. **Cleanouts:** Shall be Jay R. Smith and Zurn.

1. **General**: Provide cast-iron ferrule and countersunk brass clean-out plug with round cast iron access frame and heavy duty secured top cover.

2. **Wall Cleanouts:** Jay R. Smith No. 4472 for steel pipe and Jay R. Smith No. 4532 for cast iron pipe.

3. **Floor Cleanouts**: Jay R. Smith No. 4023 or 4028, bronze plug and non-skid nickel bronze top.

4. **Cleanouts to Grade:** Jay R. Smith No. 4258 or Jay R. Smith No. 4253 with X-H bronze plug and X-X-H non-skid cover with lifting device set flush with surface for concrete areas. Asphalt or nonsurfaced areas shall be installed with ring of concrete poured around the bottom flange six inches (6") below surface. Use cast iron soil pipe on cleanout risers. For cleanouts in non-traffic areas, terminate cleanout plug in concrete yard box.

G. **Access Panels:** Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.

1. **Wall, Non-Fire Rated:** Elmdor/Stoneman DW-SS-AKL, drywall, stainless steel finish, allen key latch.

2. **Ceiling, Non-fire Rated**: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.

3. **Wall, Fire Rated:** Elmdor/Stoneman FR-SS, fire rated, stainless steel finish,

return latch.

4. **Ceiling, Fire rated:** Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

H. **Yard Boxes & Vaults**: For service shut-off valves on gas and domestic water; for pressure regulator assemblies and for cleanouts, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type.

I. Roof Flashing:

1. Sanitary vents thru roof and grease vents thru roof: Stoneman No. 1100-5, one (1) piece, seamless, four (4) pound, series with reinforcing steel boot counterflashed with cast iron flashing sleeve and equipped with vandal-proof hood for all vent piping. Seal joint between flashing and pipe with waterproofing compound per flashing manufacturer's recommendations.

2. Water, gas, condensate drainage and other metallic piping thru roof: Stoneman No. 1100-4, one (1) piece, seamless, four (4) pound, series with reinforcing steel boot counterflashed with cast iron flashing sleeve. Seal joint between flashing and pipe with waterproofing compound per flashing manufacturer's recommendations

J. **Escutcheons:** Shall be chrome plated cast brass with setscrew locking device.

K. **Water Hammer Arresters**: Shall be sized per the manufacturer's recommendations. Install at all quick closing valves, clothes washers and dishwashers behind access panel.

L. **Dielectric Union Isolators:** Connection between incompatible materials above grade and inside building shall be made with two (2) dielectric unions separated by a twelve inch (12") section of red brass pipe. Dielectric union isolator for connection piping or non-compatible materials shall be of standard commercial design with threaded connections.

M. **Pipe Supports:** Unless otherwise indicated on the drawings, shall be as follows:

1. The Contractor shall furnish and install all miscellaneous iron work including angles, channels, etc., required to appropriately support the various piping systems. Hanger spacing and location shall conform to 2013 California Plumbing Code Table 313.1.

2. All horizontal runs of piping within the building to be supported from the structural framing with steel rods and split ring hangers, B-Line, Grinnell Company, Tolco, or approved equal. Steel rods shall be secured to overhead framing with side beam connectors. Where necessary, install angle iron between framing to accommodate hanger rods. Where several pipes are running together, Unistrut, B-Line or Powerstrut channels with clamps may be used in lieu of individual pipe hangers, and supported from structure as herein specified. Submit test data for type of hanger supports to be provided. For support conditions other than specified herein, the Contractor shall submit method of support for approval prior to any installation.

3. Horizontal Piping Hangers and Supports:

a. **General:** Provide factory fabricated horizontal hangers and supports

complying with one of the following MSS types listed to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.

a. Adjustable Steel Clevis Hangers: (MSS Type 1.) B-Line B 3100

b. Adjustable Swivel Pipe Rings: (MSS Type 5) B-Line B3690

4. Vertical-Piping Clamps:

a. **General:** Provide factory fabricated vertical-piping clamps complying with the following types listed, to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

b. Two-Bolt Riser Clamps: (MSS Type 8) B-Line B3373

5. Hanger-Rod Attachments:

a. **General:** Provide factory fabricated hanger-rod attachments B-Line, Tolco or approved equal, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-58 and manufacturer's published product information. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

b. Side beam eye socket, Tolco Fig. #57 for rod sizes 3/8" dia. and Tolco Fig. #25-30-251 for rod sizes 1/2" dia.

6. Building Attachments:

a. **General:** Provide factory fabricated building attachments, selected by Installer to suit building structural framing conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

7. Hanger Rods and Spacing shall conform to the following table:

Pipe Sizes	Spacing	Rods
2 Inch and Smaller	6 Feet	3/8 Inch
2-1/2 Inch to 3 Inch	8 Feet	1/2 Inch
4 Inch and larger	8 Feet	5/8 Inch

8. Hangers and Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 18 inches of joint. Support shall be provided at each horizontal branch connection.

9. Provide lateral bracing as manufactured by B-Line or approved equal for all piping to prevent swaying or movement in accordance with SMACNA "Guidelines for Seismic Restraints of Piping Systems". Piping smaller than

indicated in the guidelines shall be provided with bracing as specified for the smallest size indicated. The entire water distribution system shall be properly braced and will not move due to the action of quick closing of valves.

10. **Miscellaneous Supports, Wall Brackets, Etc**.: Provide where required in accordance with the best standard practices of the trade. Submit shop drawings for all fabricated supports.

11. **Isolators.** All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line vibra clamp and cushion, Super Strut, Stoneman "Trisolator", or approved equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

12. Shields:

    a. **General:** Provide shields at piping hangers and supports, factory-fabricated, for all insulated piping as manufactured by Pipeshields Incorporated or approved equal. Size shields for exact fit to mate with pipe insulation.

    b. **Protection Shields:** MSS Type 40; provide high density insert of same thickness of insulation or equal 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

N. Insulation:

1. **Hot Water Pipe Insulation:** All hot water supply piping, except exposed connections to plumbing fixtures, flanges and unions shall be insulated with ASTM C547, Class I, "Johns-Manville" "Micro-Lock" 850-APT, Owens-Corning Fiberglass Corp., ASJ/SL-11 or approved equal, 1" thick for sizes up to 2" and 1-1/2" thick for sizes 2" and larger with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2013 CMC

    a. Exposed insulated piping in occupied areas and exposed outside the building shall be covered with Johns-Manville” “Zeston” 30-mil thick white PVC jacketing material per ASTM D1784 with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Jacketing shall comply with ASTM E84, and shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2013 CMC

2. **Condensate Pipe Insulation**: All condensate piping within the building shall be insulated with "Imcoa" "Imcolock" ¾” nominal wall thickness closed-cell insulation. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2013 CMC. All joints shall be mitered and secured with black duct tape.

3. **Indirect Waste Pipe Insulation:** All indirect waste drains from refrigerated kitchen equipment shall be insulated with "Armacell" "Armaflex" insulating tape.

4. All insulation shall be continuous through supports and hangers.

5. All fixtures complying with the provisions of the Americans with Disabilities Act shall be provided with Prowrap insulation for exposed hot water pipe, tailpiece, and trap as manufactured by Mc

6. Guire, and secured per manufacturers recommendations. No tape wrapping shall be permitted.

O. Equipment and Fixtures:

1. Fixtures:

a. See schedule on drawings.

b. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 1115B. Heights and location of all fixtures shall be in according to CBC Section 1115B.4 and Table 1115B-1. Fixture controls shall comply with CBC Section 1115B.4.4.4 for showers, 1115B.4.3.1 for lavatories, 1115B.4.1.5 for toilets and 1115B.4.2.3 for urinals. Sinks shall not exceed 6-1/2" in depth, CBC Section 1115B.4.7.1.

2. Acceptable Manufacturers.

a. The following manufacturers (or equal) shall be accepted for submittal review provided that all features and options are equivalent to the corresponding items as specified on plans and in specifications:

a. Vitreous China Plumbing Fixtures.

a) American Standard.

b) Kohler.

b. Flushometer Valves.

a) Sloan.

c. Toilet Seats.

a) Bemis.

b) Olsonite.

d. Wall-Hung Water Closet Carriers.

a) Zurn.

e. Stainless Steel Sinks.

a) Elkay.

b) Just.

f. Faucets.

a) Chicago.

g. Lavatory and Sink Drains.

a) McGuire.

b) Elkay.

h. Angle Stops / Supplies.

a) Chicago.

i. Enameled Cast Iron Service Sinks.

a) Ceco.

j. Trap Primers.

a) Mifab.

b) Precision Plumbing Products.

k. Water Hammer Arrestors.

a) Zurn.

b) Precision Plumbing Products.

l. Floor Drains and Area Drains.

a) Zurn.

b) Jay. R. Smith.

m. Roof Drains and Overflow Drains.

a) Zurn

b) Jay R. Smith.

n. Floor Sinks.

a) Zurn.

o. Electrical Water Coolers.

a) Haws.

b) Elkay.

p. Thermal Expansion Tanks.

a) Wilkins.

b) Watts.

c) Amtrol.

q. Hose Bibbs.

a) Acorn.

b) Woodford.

r. Recessed Hose Bibbs.

a) Acorn.

s. Electric Storage Tank Type Water Heaters.

a) Bradford White.

b) AO Smith.

c) American.

t. Thermostatic Mixing Valves.

a) Symmons.

b) Bradley.

c) Leonard.

3. Furnish complete with necessary trim, including stops. All trim and fittings shall be chrome-plated brass including handles, supply tailpieces, traps and escutcheons.

4. Connections to fixtures shall be in accordance with code requirements except as exceeded herein or on the drawings and in no case less than the supply stop size.

5. All plumbing fixture faucets submitted for review shall have identification label or certification showing compliance with California TITLE 24, PART 5, ARTICLE I, "Energy Conservation Standards". ARTICLE I, T20-1406; ARTICLE 2, T20-1525 and ARTICLE 4, 1604 and 1606.

6. Minimum waste sizes shall be four-inch (4") for water closets and two inch (2") for lavatories.

P. Water Heaters (See Equipment Schedule on Drawings):

1. Electric Storage Tank Type Water Heaters:

a. Electric water heater shall be a glass-lined commercial electric model of the size and capacity as indicated on the drawings and as manufactured by Rheem, Bradford White, or American. Heater shall be constructed in accordance with ASME code for 160 psi working pressure and shall bear appropriate symbol and listed with the National Board as required. Heater shall be listed with Underwriters' Laboratories and approved by National Sanitation Foundation. All internal surfaces of the heater exposed to water shall be glass-lined. Tank shall be cathodically protected with adequate extruded magnesium rod. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Control compartment to be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactor, immersion style operating thermostat, element fusing per N.E.C., and commercial grade incoloy sheathed flange mounted elements with prewired terminal leads. All factory wired temperature controls shall include high temperature cut-off for each element, high and low pressure switches, indicating pilot lights, switch with manual reset. Foam insulation, (R-16), shall exceed latest requirements of ASHRAE 90.1b-1990 for heat loss efficiency. Heater shall include ASME T & P relief valve and drain valve.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. **Openings:** Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

C. **Closing-In of Uninspected Work**: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other

trades, to its original and proper condition.

D. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact locations and depth of existing utility and service lines to which he is going to connect. In event depth of existing sewer main or storm drain is not sufficient to permit installation of piping as detailed on drawings or to make connection in manner indicated, Contractor shall confer with the Architect, Owner's representative and Engineer for Direction.

E. **Excavation, Trenching and Backfill:** Perform all necessary trench excavation, shoring, backfilling and compaction required for the proper laying of the pipe lines.

1. The Contractor shall coordinate the layout of all below grade piping and components with the General Contractor prior to bid to determine the extent of required sawcutting, excavation, alterations, and subsequent repair/restoration of all affected hardscape and softscape surfaces. All such items shall be included in bid.

2. Backfill shall be clean soil free from rocks and debris. Compact to ninety percent (90%) of surrounding soil. All piping shall be installed in a minimum 6" sand bed and covered with 6" of sand prior to backfill. Continue backfill with materials free of rocks and debris, properly moistened and mechanically tapered and compacted to 90% of surrounding soil.

3. Water, soil and waste piping shall have twenty-four (24") of cover minimum, except all PVC pipe material and all gas piping shall have eighteen (18") of cover minimum. All other pipe shall have not less than eighteen inches (18") of cover, unless otherwise noted on the drawings. Offset gas and water piping as required to permit crossover of underground piping systems, and electrical conduit systems.

4. **Bottoms of Trenches**: Cut to grade and excavate bell holes to ensure the pipes bearing for their entire length upon the outside periphery of the lower third of the pipe.

5. Water piping shall not be run in the same trench with sewer or drainage piping unless separated as required by the CPC.

6. All horizontal soil and waste piping 3” and smaller shall be installed to a uniform grade of not less than one-fourth inch (1/4") per foot. All horizontal soil and waste piping 4” and larger shall be installed to a uniform grade of not less than one-eighth inch (1/8") per foot, unless otherwise indicated or directed.

F. Piping Installation:

1. All piping shall be concealed in finished portion of the building except where otherwise indicated or directed at the time the work is done. All piping shall be installed to clear all framing members and beams, even if drawings do not indicate same. Contractor shall constantly check the work of other trades so as to prevent any interference with the installation of this work.

2. All piping into stem walls and footings shall be double half lap wrapped with 1/8" thick "Armaflex" insulation. The Contractor shall also provide blocked out areas in stem wall and footing as required for the installation of the piping. All piping shall avoid the lower 9" of the footing and the Contractor shall coordinate and provide dropped footings as required for the installation of the underground piping.

3. Unions shall be installed on one side of all screwed shut-off valves, at both

sides of screwed automatic valves and on all by-passes, at all equipment connections and elsewhere as indicated or required for ease of installation and dismantling.

4. Connections between copper tubing and equipment shall be with Mueller Brass Company, or approved equal, brass stream line copper to P.P.S. ground joint unions.

5. Hot and cold water supplies to lavatories and sinks shall be provided with ninety degree (90°) drop-ear copper to pipe thread elbows. Cold water supplies to water closets and urinals shall be provided with ninety degree (90°) drop-ear copper to pipe thread elbows. Bolt securely to backing plates located between wall studs to provide a rigid anchor for exposed supply pipes and stops.

6. Corrosion Protection:

   a. General.

      1) Corrosion protection shall be provided for all below grade cast iron and copper piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping, referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure, the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.

   b. Materials.

      1) Cast iron piping encasement.

         a) The polywrap shall be minimum 8 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall meet or exceed the requirements of AWWA C105, ANSI A21.5 and ASTM A674.

         b) The polywrap shall be as manufactured by Northtown Company or approved equal.

      2) Copper piping encasement.

         a) The polywrap shall be minimum 6 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall conform to the requirements of ASTM D1248.

         b) The polywrap shall be as manufactured by Northtown Company or approved equal.

      3) The minimum Polywrap flat tube width for each pipe diameter shall be as follows:

Pipe Size / Type	Polywrap Flat Tube Width
½” to ¾” copper	2”
1” to 1-½ copper	3”
2” copper	4”

2-1/2” copper	5”
3” copper	6”
2” to 3” cast iron	14”
4” cast iron	16”

4) The polywrap shall be secured as specified with 2 inch wide pressure sensitive plastic tape not less than 10 mils thick.

a) Tape shall be Scotchwrap No. 50, Polyken No. 900, Tapecoat CT, Johns-Manville No. V-10 Trantex or approved equal.

c. Installation.

1) The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. . A shallow bell hole must be made at each joint to facilitate installation of the polywrap. The bunched-up polywrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. The end of the polywrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3 foot intervals along the pipe.

2) Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

3) Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

G. Sleeves: Shall be plastic or galvanized steel where pipes pass through concrete walls or floor slabs.

1. Isolate pipes through ground floor slabs with Kraft paper, plastic tape or similar materials unless conduit is specified or indicated.

2. Sleeves for pipes through exterior walls shall be non-metallic with minimum 2” weep ring as manufactured by Link Seal. Pipe shall be sealed with Link Seal modular seal with EPDM seal elements.

3. Sleeves in or through fire rated walls shall be per U.L. Fire Resistance System No. WL1146 for drywall construction, and U.L. Fire Resistance System No. CAJ1044 for concrete construction. See architectural plans for

all locations of rated walls.

H. **Contraction and Expansion:** Install all work in such a manner that its contraction and expansion will not do any damage to the pipes, the connected equipment, or the building. Install offsets, swing joints, expansion joints, seismic joints, anchors, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

I. Pipe Joints and Connections:

1. Copper Tubing and Brass Pipe with Threadless Fittings:

a. Solder joints for copper shall be made with 95/5 lead free solder in accordance with manufacturer's recommendations for the service intended.

b. Use threaded adapters on copper tubing where threaded connections are required.

2. **Welded Joints:** All welding to be performed by welders certified as passing ASME Boiler and Pressure Code (Section IX) and shall comply with ANSI Std. B31.1.0 and the American Welding Society, Welding Handbook.

J. All closet bends shall be adequately blocked and secured. Trap arms and similar connections installed below the floor level or under concrete slabs shall be adequately supported and anchored to prevent motion in any direction. All piping installed above grade within buildings shall be secured to structural framing with Unistrut or pipe clamps to provide a rigid installation. Piping utilizing gaskets as a seal shall be given prime consideration to providing adequate stability through proper supports and anchors because of its flexible nature.

K. Flexible piping of any kind will not be permitted except when indicated on drawings. Provide Hose Master Inc., flexible pipe appliance connector model UNP, female union, male nipple and plastic cover, AGA approved for kitchen equipment only.

L. Each pipe penetration of the roof shall be separated from other piping and any roof equipment by a minimum of 18" to insure a proper pipe flashing installation.

M. **Floor, Wall and Ceiling Plates**: Where pipes pierce finished surfaces, C.P. brass split flanges with setscrew lock shall be provided.

N. **Roof Flashings:** Extend pipe a minimum of seven inches (7") above finished roof line, except where a vandal proof hood is required in which case pipe shall extend to a height required to receive the hood and also where specifically required to exceed this dimension by the local authority due to snow conditions.

O. Installation of Plumbing Fixtures:

1. Install each fixture at the exact height and location shown on the Architectural Drawings.

2. Set fixtures, supplies, trap and trap outlet square with the wall, in line with fixture outlets without any offsets, angles, or bends.

3. Grout joint between the fixtures and the walls or floors with polysulfide or silicone sealant to be smooth, even and watertight.

P. Completion of Installation:

1. **Cleaning and Flushing:** Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.

2. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.

3. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.02 STERILIZATION OF DOMESTIC WATER LINES

A. Sterilize water lines by filling with a solution containing fifty (50) parts of chlorine per million parts water and holding the solution therein for at least eight (8) hours with a water head of at least five feet (5') above the highest point in the system. Unless otherwise directed, thoroughly flush each line prior to sterilization. Introduction of sterilizing solution or materials into the lines shall be such as to provide thorough and uniform distribution throughout the system.

1. Operate all valves during the retention period. Following retention period, the heavy chlorinated water shall be flushed from the system with clean water.

2. Continue flushing until the residual chlorine at the end of 24 hours is as required by AWWA C651.

3. All work and certification of performance must be done by an approved laboratory utilizing qualified applications and personnel.

a. Upon completion of the domestic water line sterilization, Contractor shall submit sterilization report directly to the Architect stating that all testing was performed as specified and that testing was performed by an approved laboratory utilizing qualified applications and personnel.

3.03 TESTING

A. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.

Schedule of Test Pressures:

System Tested	Gauge	Test	Duration
Water	100 PSI	Water	4 Hours

Waste, Vent and Storm Drain: Per California Plumbing Code (Minimum 10 Feet of Head)

3.04 OPERATION INSTRUCTION

A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the

various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

3.05 PIPE AND EQUIPMENT IDENTIFICATION

A. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.

B. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

C. All equipment shall be provided with name plate indicating all pertinent information on it.

END OF SECTION

SECTION 15800
HEATING, VENTILATION AND AIR CONDITIONING

PART 1- GENERAL

1.01 DESCRIPTION

A. Work under this section includes all labor, equipment, material, services, transportation, etc. required for and reasonably incidental to the complete and satisfactory installation of all of the HVAC Systems as indicated on the Drawings or specified herein.

1.02 WORK INCLUDED

A. Packaged, Outdoor, Central-Station Air-Handling Units (Rooftop Units).

B. Split-System Air-Conditioners and Heat Pumps.

C. Refrigerant Piping and Specialties.

D. Centrifugal Roof Ventilators.

E. Diffusers, Registers, and Grilles.

F. Ductwork, including single-wall rectangular and round ducts and fittings.

G. Air Duct Accessories (fire and smoke dampers, backdraft dampers, volume dampers, flexible connectors, turning vanes, access doors, flexible ducts).

H. Duct Insulation.

I. HVAC Piping Insulation.

J. Instrumentation and Control for HVAC (refer to Section 23 09 00).

K. Testing, Adjusting, and Balancing.

L. Duct Sealing and Leakage Testing.

M. Seismic Restraints for HVAC Equipment and Ductwork.

N. Submittals and Shop Drawings.

O. Record Drawings.

P. Operation and Maintenance Manuals.

Q. Warranty.

1.03 GENERAL REQUIREMENTS

A. This section of the specification shall be considered as a part of the entire specification and all applicable portions of General Conditions, Special Conditions, and Division 1 shall apply.

B. Erection: The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the erection of the work, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start, operate, and test the work involved.

1.04 REFERENCES

1. AABC – National Standards for Field Measurement and Instrumentation, Total System Balance.

2. AMCA 210 – Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
3. AMCA 300 – Reverberant Room Method for Sound Testing of Fans.
4. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
5. AMCA 99 – Standards Handbook.
6. ANSI/NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
7. NFPA 90B – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
8. AHRI 210/240 – Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
9. AHRI 340/360 – Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
10. AHRI 270 – Sound Rating of Outdoor Unitary Equipment.
11. ASHRAE 15 – Safety Standard for Refrigeration Systems.
12. ASHRAE 33 – Methods of Testing Forced-Circulation Air Cooling and Air Heating Coils.
13. ASHRAE 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
14. ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality.
15. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.
16. ASHRAE 111 – Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.
17. ASCE/SEI 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
18. ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
19. ASME B31.5 – Refrigeration Piping and Heat Transfer Components.
20. ASTM A653/A653M – Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
21. ASTM B88 – Seamless Copper Water Tube.
22. ASTM B280 – Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
23. ASTM C518 – Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
24. ASTM C547 – Mineral Fiber Pipe Insulation.
25. ASTM C553 – Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
26. ASTM C612 – Mineral Fiber Block and Board Thermal Insulation.

27. ASTM C871 – Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions.
28. ASTM C916 – Adhesives for Duct Liner in Sheet Metal Air Ducts.
29. ASTM C920 – Elastomeric Joint Sealants.
30. ASTM C1071 – Fibrous Glass Duct Liner.
31. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
32. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
33. AWS A5.8 – Brazing Filler Metal.
34. AWS D1.1 – Structural Welding Code – Steel.
35. AWS D9.1 – Sheet Metal Welding Code.
36. NAIMA AH124 – Fibrous Glass Duct Liner Standard.
37. SMACNA – HVAC Duct Construction Standards – Metal and Flexible, latest edition.
38. SMACNA – HVAC Systems – Duct Design, latest edition.
39. SMACNA – Seismic Restraint Manual: Guidelines for Mechanical Systems, latest edition.
40. SMACNA – HVAC Air Duct Leakage Test Manual.
41. UL 181 – Factory-Made Air Ducts and Air Connectors.
42. UL 555 – Fire Dampers.
43. UL 555S – Smoke Dampers.
44. UL 705 – Power Ventilators.
45. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.
46. UL 1995 – Heating and Cooling Equipment.
47. California Building Code (CBC), current edition.
48. California Mechanical Code (CMC), current edition.
49. California Energy Code (Title 24, Part 6), current edition.
50. California Electrical Code (CEC), current edition.
51. California Fire Code (CFC), current edition.

1.05 SUBMITTALS AND SHOP DRAWINGS

A. Contractor agrees that shop drawings submittals processed by the Owner do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor’s convenience in organizing his work and to permit the Owner to monitor the Contractor’s progress and understanding of the design. If deviations, discrepancies, or conflicts between shop drawing submittals and the Contract Documents are discovered, the Contract Documents shall control and shall be followed.

B. Materials and Equipment: As soon as possible and within 35 days after award of the contract, and before their purchase, the Contractor shall submit to the Owner seven bound booklets for approval containing a complete list of materials, specialties, and equipment he is to furnish. Literature shall be standard manufacturer's catalog cuts and items to be installed shall be clearly indicated. All submittals shall be made at one time.

C. Each item shall be identified by manufacturer, brand and trade name, number, size, rating, and whatever other data is necessary to properly identify and check the materials and equipment. The words "as specified" will not be considered sufficient identification. Drawings shall be ¼" scale.

D. Accessories, controls, finish, etc., not submitted or identified with the submitted equipment shall be furnished and installed as specified.

E. Approval of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc. which are shown or specified, or all additional items required to provide complete and correctly operating mechanical systems.

F. Submit product data for the following manufactured products, assemblies, and testing agencies required for this project:

1. Packaged rooftop units, including rated capacities, operating characteristics, certified fan performance curves, certified sound-power ratings, motor ratings, electrical characteristics, dampers, roof curbs, and fan speed controllers.
2. Split-system air-conditioning and heat pump units, including rated capacities and accessories.
3. Refrigerant piping materials and specialties.
4. Power ventilators, including AMCA-certified performance and sound data, motor ratings, dampers, roof curbs.
5. Diffusers, registers, and grilles, including throw/drop data, static-pressure drop, and NC ratings.
6. Ductwork materials, including liners, adhesives, sealants, and gaskets.
7. Seismic-restraint devices.
8. Fire and smoke dampers, including UL 555 and UL 555S listings.
9. Insulation materials, including thermal conductivity, water-vapor permeance, thickness, and jacket data.
10. HVAC piping insulation materials.
11. Detailed TAB procedures, agenda, sample report forms, and copy of AABC National Project Performance Guarantee.
12. Controls: Refer to Section 23 09 00.

G. Prepare and furnish fully coordinated shop drawings showing ductwork and piping on separate drawings. The drawings shall be minimum 1/4" = 1'-0" scale and shall show dimensioning of piping and ductwork from gridlines, bottom of elevation marks for ductwork and piping and fittings, valves, dampers, devices, etc. with labels. In addition, coordinate with related work and reference on the same drawings major plumbing piping, structural steel, fire protection piping, conduit runs and cable trays.

Review and sign these drawings to verify coordination. Conflicts shall be brought to the attention of the Owner prior to issuance.

H. Contractor shall provide detailed shop drawings minimum 45 days prior to installation for a complete functional system indicating all equipment, ductwork routing, changes in elevation, direction, sway bracing, etc. Contractor shall indicate all roof curb locations and sizes.

1.06 SUBSTITUTIONS

A. Should the Contractor desire to substitute any material, equipment, or other items for those specified, he shall submit a complete list, including detailed equipment layouts and performance characteristics within 35 calendar days after the scheduled Start of Construction. Said data shall be submitted in 7 copies, assembled in individual brochures.

B. The entire cost of all changes of any type due to substitution for materials specified shall be borne by the Contractor at no extra cost to the Owner.

C. The contractor shall submit the amount of cost credit to the Contract in the event the proposed substitution is accepted.

D. In all cases where substitutions are proposed after bids are received, the Contractor shall bear the cost of evaluation on the basis of 2-1/2 times technical salaries of engineering personnel involved.

1.07 AVAILABILITY OF SPECIFIED EQUIPMENT

A. Verify prior to bidding that all specified equipment is available and can be obtained in time for installation during orderly and timely progress of the work.

B. In the event that specified items will not be so available, notify the Owner prior to receipt of bids.

C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, will be back-charged as necessary and shall not be borne by the Owner.

1.08 RECORD DRAWINGS

A. The contractor shall arrange and pay for one set of white prints of the HVAC drawings, which he shall alter in red to show all changes made to the original layout. These drawings shall be kept current.

B. The contractor shall deliver these completed to the Owner when the job is finished and accepted prior to final payment.

1.09 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to final inspection, bound in 8-1/2" x 11" text pages, binders with durable plastic covers. Prepare binder covers with printed title “OPERATION AND MAINTENANCE INSTRUCTIONS”, and title of project. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titling clearly printed under reinforced laminated plastic tabs.

B. Contents: Prepare a Table of Contents with each product or system description identified.

1. Part 1: Directory listing names, addresses, and telephone numbers of Owner, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system, identifying: significant design criteria; list of equipment; parts list for each component; operating instructions; maintenance instructions for equipment and systems; maintenance instructions for special finishes.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Owner comments. Revise content as required prior to final submittal.

D. Submit final volumes (revised) within ten days after final inspection.

1.10 WARRANTY

A. The Contractor, in accepting this contract, binds himself to replace or repair at his own expense any defect in workmanship or material which may appear within a period of one year from the date of the final acceptance of the building, and to pay for all resulting damage which shall appear within the said period; provided the Contractor shall not be liable for anything attributable to acts of the agents of the Owner, or for ordinary wear.

B. The Contractor guarantees that all piping as provided in this specification will be free from all obstructions, and that all piping will be tight and drip free.

C. Equipment-Specific Warranty Periods (from date of Substantial Completion):

1. Refrigerant Compressors: Five (5) years.

2. Gas Furnace Heat Exchangers: Five (5) years.

3. Solid-State Ignition Modules: Three (3) years.

4. Control Boards: Three (3) years.

5. All Other Parts: One (1) year.

6. Labor: One (1) year.

1.11 LOCAL CONDITIONS

A. The Contractor and trades submitting tenders on this work shall visit and will be deemed to have visited the site to ensure that they are familiar with all conditions relating to the work. Failure to visit the site will in no way relieve the successful Contractor of the necessity of furnishing any material or performing any work that may be required to complete the work without additional cost to the Owner.

1.12 RULES, REGULATIONS AND CODES

A. All work and materials shall be in full accordance with the latest California Mechanical Code, California Plumbing Code, California Building Code, California Energy Code, California Electrical Code, California Fire Code, and local rules and regulations; State Fire Marshal regulations; the safety orders of the Division of Industrial Safety; the National Electric Code; the standards of the National Fire Protection Association; American Gas Association; OSHA; ANSI; ASME; ASTM; SMACNA; and other applicable laws, codes, or regulations. Nothing in these specifications shall be construed to permit work not conforming to these codes.

B. Electrical Work: Motors, electrical apparatus, and wiring specified in this section shall conform to NEMA standards and the National Electric Code and bear the Underwriter’s label of approval.

C. The Contractor shall furnish, without extra charge, any additional material and labor when and where required to comply with these rules and regulations, though the

work be not mentioned in these Specifications or shown on the Drawings. When these Specifications or Drawings call for materials or construction of a better quality or larger sizes than required by codes, the provisions of these specifications and accompanying drawings shall take precedence.

1.13 FEES AND PERMITS

A. The Contractor must obtain and pay all fees for permits, licenses, inspections, etc., which are required by any legally constituted authority. Coordinate exact requirements with the Owner prior to bid.

1.14 COORDINATION

A. Following the general arrangement indicated on the Drawings as closely as possible, the Contractor shall coordinate with the architectural, structural, plumbing, electrical, and all other trades prior to installation of the materials and equipment to verify adequate space available for installation. The Owner shall be immediately notified if an area of conflict occurs between trades.

B. The Contractor shall bear all costs incurred for work that must be relocated due to conflicts between trades.

C. The Mechanical Contractor shall coordinate all requirements for all points of connection with the General Contractor and other trades prior to bid.

D. Coordinate sizes and locations of concrete bases, roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.15 SEISMIC REQUIREMENTS

A. Structural Performance: All HVAC duct hangers, supports, equipment supports, and piping supports shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible," SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems," and ASCE/SEI 7.

B. Provide seismic bracing for all ductwork, piping, and equipment as required by the California Building Code and ASCE/SEI 7.

C. Install accessories in accordance with manufacturer's instructions and to meet the provisions of SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems," latest edition.

D. Seismic-restraint device manufacturers: Cooper B-Line, Hilti, Mason Industries, Unistrut, or equal.

1.16 DRAWINGS

A. The work shall be installed as indicated on Drawings; however, changes to accommodate installation with other work, or in order to meet architectural or structural conditions, shall be made without additional cost to the Owner.

B. For the purpose of clarity and legibility, the Drawings are essentially diagrammatic to the extent that many offsets, bends, unions, special fittings, and exact locations are not indicated. The Contractor shall make use of all data in all of the Contract Documents, and shall verify this information at the site.

1.17 INSPECTION

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities having jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any work be covered up before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.18 DELIVERY, STORAGE AND PROTECTION

A. Place orders for all equipment in time to prevent any delay in construction schedule. If materials or equipment are not ordered in time, additional charges made by equipment manufacturers together with any special handling charges shall be borne by the contractor.

B. Materials shall be delivered in ample quantities for the uninterrupted progress of the work. They shall be stored as to cause the least obstruction and distributed so as to prevent overloading any portion of the structure.

C. All work, equipment, and materials shall be protected at all times. The Contractor shall make good all damage caused either directly or indirectly by his own workmen. He shall close all pipe and duct openings with caps or plugs during installation. He shall protect all equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

1.19 DAMAGE BY LEAKS

A. The Contractor shall be responsible for all damage to any part of the premises or work of other Contractors, caused by leaks or breaks in the piping or equipment furnished and/or installed under this section, during the construction and warranty period.

1.20 ACCESS TO EQUIPMENT FOR MAINTENANCE

A. Install all equipment, piping, etc. to permit access for normal maintenance. Maintain easy access to filters, motors, etc. Perform any relocation required to permit access at request of Owner at no additional cost.

B. Furnish and install access doors or panels in walls, floors, and ceilings to permit access to equipment, dampers, and all other items requiring service. Coordinate location of access doors with other trades as required.

C. Size access panels to allow inspection and removal of all items served.

D. Use Milcor style as required for material in which door is installed. Where door is installed in fire-rated construction, provide door bearing UL label required for condition.

PART 2- PRODUCTS

2.01 GENERAL

A. All materials and equipment shall be new and of the best of their respective grades, free from all defects and of the make, brand, or quality herein specified or as accepted by the Owner.

B. All materials and equipment shall be identified by manufacturer’s name or nameplate data. Unidentified material or equipment shall be removed from the site.

C. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in the catalog as standard with the equipment. Optional or additional accessories shall be furnished as specified.

D. Where no specific make of material or equipment is mentioned, any first-class product of a reputable manufacturer may be used, provided it conforms to the requirements of the system and meets with the approval of the Owner.

E. Equipment and materials damaged during transportation, installation, or operation shall be considered as "totally damaged" and shall be replaced with new. Any variance requires written approval of the Owner.

F. Products shall not contain asbestos, lead, mercury, or mercury compounds.

G. Airstream Surfaces: All surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.02 PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

A. Manufacturers:

1. Carrier.
2. Trane.
3. Subject to compliance with requirements, provide products by other manufacturers providing equivalent performance.

B. General:

1. Provide roof-mounted units, electrically controlled heating and cooling utilizing scroll hermetic compressors with crankcase heaters for cooling duty and induced draft gas combustion for heating duty.
2. Units shall be of ultra-high cooling efficiency and utilize R-454B refrigerant.
3. Unit shall be a factory assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-454B), and special features required prior to field start-up.
4. Minimum efficiency shall comply with California Energy Code (Title 24, Part 6), current edition.

C. Quality Assurance:

1. Units shall be rated in accordance with AHRI 210/240 and AHRI 340/360 for performance. Units shall be rated per AHRI 270 and 370 for sound.
2. Unit shall be designed to conform to ASHRAE 15.
3. Unit shall be UL and UL Canada tested and certified per ANSI Z21.47 and UL 1995 as a total package.
4. Unit shall be manufactured in a facility registered to ISO 9001.
5. Each unit shall be subjected to completely automated run testing on the assembly line.
6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
7. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

D. Unit Cabinet:

1. Constructed of galvanized steel, bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Structural members shall be minimum 18 gauge, with access doors or removable panels of minimum 20 gauge.
3. All airstream interior surfaces shall be insulated with a minimum 1/2-inch thick, 1 lb density foil-faced cleanable insulation. Insulation shall be bonded with a thermosetting resin and coated with an acrylic or other material that meets NFPA 90A flame retardance requirements and has an R-Value of 3.70.
4. Cabinet panels shall be hinged with stainless steel hinges. Hinged access panels for the filter, compressors, evaporator fan, control box, and heat section areas. Each panel shall use multiple quarter-turn latches and handles. Each major external hinged access panel shall be double-wall construction and permanently attached to the rooftop unit. Panels shall also include tiebacks.
5. Return air filters shall be accessible through a hinged access panel and be on a slide-out track using standard size filters.
6. Holes shall be provided in the base rails (minimum 16 gauge) for rigging shackles and level travel during overhead rigging operations.
7. Fork lift slots shall be available from multiple sides of the unit.
8. Unit shall have a factory-installed internally sloped condensate drain pan, providing a minimum 3/4-inch-14 NPT connection to prevent standing water from accumulating. Pan shall conform to ASHRAE 62.1 self-draining provisions with minimum one percent slope in at least two planes. An alternate vertical drain (3/4-inch NPT) connection shall also be available.

E. Fans:

1. Centrifugal supply air blower shall have rubber-isolated, pillow-block ball bearings and adjustable belt drive.
2. Fan wheel shall be made from steel with a corrosion resistant finish. It shall be a dynamically balanced, double-inlet type with forward-curved blades.
3. The indoor fan system (blower wheels, motors, belts, and both bearings) shall slide out for easy access.
4. Evaporator-fan motors shall be continuous operation, open drip-proof. Bearings shall be sealed, permanently lubricated ball-bearing type.
5. Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades riveted to corrosion-resistant steel supports. They shall be dynamically balanced and discharge air upwards. Condenser fan motors shall be totally enclosed, thermally protected, and be of a shaft-down design.
6. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved, centrifugal type. It shall be made from aluminized steel with a corrosion-resistant finish and shall be dynamically balanced.

7. Motor Efficiency: All motors shall comply with current DOE minimum efficiency standards. Motors 1 HP and larger shall be NEMA Premium Efficiency per NEMA MG 1.

F. Compressors:

1. Fully hermetic, scroll type with crankcase heaters, internal high-pressure and temperature protection.
2. Factory mounted on rubber grommets and internally spring mounted for vibration isolation.
3. On dual electrically and mechanically independent refrigerant circuits.
4. Provide five-year manufacturer's warranty on compressors.

G. Coils:

1. Standard evaporator coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
2. Dual circuit models shall have face-split type evaporator coil.
3. Condenser coils shall be continuous slab design to facilitate easy coil cleaning.
4. Coils shall be leak tested at 170 psig and pressure tested at 1875 psig.

H. Heating Section:

1. Induced-draft combustion type with energy saving direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
2. Heat Exchanger: Stainless steel tubular-section type, constructed of a minimum of 20-gage type 409 stainless steel, including stainless steel tubes, vestibule plate, and collector box.
3. Burners shall be of the in-shot type constructed of aluminum-coated steel.
4. All gas piping shall enter the unit at a single location. All factory-installed orifices are for operation up to 2,000 feet of altitude.
5. The integrated gas controller (IGC) board shall include gas heat operation fault notification using an LED. LED shall be visible without removal of control box access panel.
6. Unit shall be equipped with anti-cycle protection. The IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch.
7. Gas burner tray, when disconnected, shall easily slide out for maintenance.

I. Refrigerant Components:

1. Each refrigerant circuit shall include: thermostatic expansion valve (TXV) with removable power element; solid core refrigerant filter driers; gage port connections on suction, discharge, and liquid lines.

J. Filter Section:

1. Standard filter section shall consist of factory-installed 2-inch thick MERV-13 pleated filters and shall be on a dedicated slide-out track.

2. Filter section shall use standard size filters and be of common sizes within cabinet sizes.

K. Controls and Safeties:

1. Unit shall incorporate a solid-state compressor lockout which provides optional reset capability at the space thermostat, should any safety device trip.
2. Compressor lockout protection provided for internal or external overload, low-pressure protection, freeze protection (evaporator coil), high-pressure protection, compressor reverse rotation protection, and loss of charge protection.
3. Supply-air sensor shall be located in the unit and detect both heating and cooling operation.
4. Induced draft heating section shall be provided with: high-temperature limit switch, induced-draft motor speed sensor, flame rollout switch, flame proving controls, and redundant gas valve.

L. Special Features:

1. Economizer (See schedule):
   a. Tilt-out economizer furnished and installed complete with outside air dampers and controls.
   b. Low-leakage, opposing, gear-driven dampers with UL approved gears, capable of introducing up to 100% outdoor air for minimum ventilation and free cooling.
   c. Damper actuator shall be electronic 4 to 20 mA/2 to 10 VDC fully modulating design.
   d. Economizer shall be available for either field or factory installation.
2. Economizer Fault Detection and Diagnostics (FDD): Controller shall provide economizer FDD as required by California Energy Code, current edition. Controller must be approved and listed on California Energy Commission (CEC) Certified Economizer FDD list. Provide a copy of the CEC listing during the submittal process.
3. Non-Fused Disconnect Switch: Factory-installed, internally mounted, NEC and UL approved. Shall be accessible from outside the unit and shall provide power-off lockout capability.
4. CO2 Sensor: Duct-mounted or wall-mounted CO2 sensor for demand control ventilation per California Energy Code requirements. The controller will use CO2 level information to modulate the economizer. Available as field or factory-installed.
5. Fan Status: Pressure switch indicating indoor fan operation. Available as field or factory-installed.
6. MERV-13 Pleated Return Air Filters: 2-inch pleated filters, MERV-13 efficient.
7. Roof Curb: Galvanized steel conforming to NRCA Standards with gaskets, nailer strips. Provide 2-inch isolation curb for all units greater than 5 tons

cooling capacity or where noted on plans. Coordinate curb height with roof insulation and required flashing prior to ordering.

2.03 SPLIT-SYSTEM AIR-CONDITIONERS AND HEAT PUMPS

A. Manufacturers:

1. Carrier.
2. Trane.
3. Mitsubishi Electric.
4. Subject to compliance with requirements, provide products by other manufacturers providing equivalent performance.

B. Concealed Evaporator-Fan Components (Indoor Units):

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with AHRI 210/240.
4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
5. Fan Motors: Multitapped, multispeed with internal thermal protection and permanent lubrication. Wiring Terminations: Connect motor to chassis wiring with plug connection.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Filters: Disposable, MERV-13 minimum.
8. Mixing box with economizer where indicated on Drawings.
9. Condensate Drain Pans: Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and to direct water toward drain connection. Extend drain pan downstream from leaving face to comply with ASHRAE 62.1. Minimum 2 inches deep. Single-wall, galvanized-steel sheet. Drain connection at lowest point, sized to prevent overflow, minimum NPS 1. Pan-top surface coating: asphaltic waterproofing compound.

C. Wall-Mounted Evaporator-Fan Components (where indicated):

1. Cabinet: Enameled steel with removable panels in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with AHRI 210/240.
3. Fan: Direct drive, centrifugal.
4. Fan Motors: Multitapped, multispeed with internal thermal protection and permanent lubrication. Enclosure Type: Totally enclosed, fan cooled where indicated.
5. Filters: Permanent, cleanable.

6. Condensate Drain Pans: Fabricated with one percent slope in at least two planes. Minimum 1 inch deep. Drain connection at lowest point, minimum NPS 1.

D. Air-Cooled Compressor-Condenser Components (Outdoor Units):

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed scroll type with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
3. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
4. Refrigerant Charge: R-454B.
5. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with AHRI 210/240.
6. Heat-Pump Components (where indicated): Reversing valve and low-temperature-air cutoff thermostat.
7. Fan: Aluminum-propeller type, directly connected to motor. Motor permanently lubricated, with integral thermal-overload protection.
8. Low Ambient Kit: Permits operation down to 45°F.
9. Mounting Base: Polyethylene.

E. Warranty:

1. Compressor: Five (5) years from date of Substantial Completion.
2. Parts: One (1) year from date of Substantial Completion.
3. Labor: One (1) year from date of Substantial Completion.

2.04 REFRIGERANT PIPING

A. Comply with ASHRAE 15 for refrigeration system safety.

B. Comply with ASME B31.5 for refrigeration piping.

C. Comply with California Mechanical Code Chapter 11.

D. Materials:

1. Copper Tube: ASTM B88, Type L.
2. Wrought-Copper Fittings: ASME B16.22.
3. Brazing Filler Metals: AWS A5.8.

E. Refrigerant: R-454B.

F. Line Test Pressures for R-454B:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Hot-Gas and Liquid Lines: 535 psig.

G. Piping Applications:

1. Suction Lines: Copper, Type L, drawn-temper tubing and wrought-copper fittings with brazed joints.
2. Hot-Gas and Liquid Lines: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

H. Product Storage: Store piping in a clean and protected area with end caps in place to ensure piping interior and exterior are clean when installed.

2.05 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers:
1. Greenheck Fan Corporation.
2. Loren Cook Company.
3. Subject to compliance with requirements, provide products by other manufacturers providing equivalent performance.

B. Quality Assurance:
1. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal. Certify performance ratings per AMCA 210 and sound-power level ratings per AMCA 301.
2. UL Standards: Power ventilators shall comply with UL 705.
3. Electrical Components: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

C. Performance Requirements:
1. Base fan-performance ratings on actual project site elevation.
2. Operating Limits: Classify according to AMCA 99.

D. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone. Upblast units: provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

E. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

F. Belt Drives:
1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

G. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Non-fusible type, with thermal-overload protection mounted outside fan housing, factory wired through an internal aluminum conduit.
3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.

4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

H. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base. Configuration: built-in cant and mounting flange. Overall Height: as required to maintain 12 inches above finish roof. Pitch Mounting: manufacture curb for roof slope. Metal Liner: galvanized steel. Sound Curb: curb with sound-absorbing insulation where indicated.

I. Motors:

1. Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2. Enclosure Type: Totally enclosed, fan cooled.

J. Extra Materials: Furnish one set of belts for each belt-driven unit.

2.06 DIFFUSERS, REGISTERS, AND GRILLES

A. Manufacturers:

1. Price Industries.

2. Titus.

3. Subject to compliance with requirements, provide products by other manufacturers providing equivalent performance.

B. General: Fabricated of steel with steel or aluminum frame and baked enamel off-white finish. Provide necessary sheet metal cans with appropriate collar to attach to air distribution device. Color selected by architect.

C. Supply Registers (SR): Double deflection type, constructed of steel.

D. Exhaust or Return Grilles (EG-2/RG-2): Fixed bar-type, constructed of steel.

E. Ceiling Diffusers (SD-1, RG-1, or where indicated): Modular core, square type. Steel, baked enamel finish, color selected by Architect. Surface mounted, adjustable pattern.

F. Suspended Round Diffusers (SD-3). 4 Cone, Constructed of steel. White finish or Color selected by Architect.

G. Perforated Diffusers (where indicated): Steel, baked enamel finish, color selected by Architect. T-bar mounted, flush face style, with adjustable pattern controller having louvered pattern modules at inlet.

2.07 DUCTWORK

A. General:

1. Non-combustible or conforming to requirements for Class 1 air duct materials, UL 181, NFPA 90A, and NFPA 90B.

2. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated.

3. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Sheet Metal Materials:

1. Galvanized Sheet Steel: ASTM A653/A653M, galvanized coating designation G90. Lock-forming quality. Exposed-surface finish: mill phosphatized.
2. Reinforcement Shapes and Plates: ASTM A36/A36M, galvanized steel.
3. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

C. Round Duct: Spiral seam construction.

D. Insulated Flexible Ducts: UL 181, Class 1. Polyethylene film supported by helically wound galvanized-steel wire; fibrous-glass insulation; aluminized vapor-barrier film. Maximum 0.23 K value at 75°F with metal connectors. Pressure rating: 10-inch wg positive and 1.0-inch wg negative. Maximum air velocity: 5500 fpm. Insulation R-value: comply with ASHRAE 90.1.

E. Sealants and Gaskets:

1. Surface-burning characteristics: maximum flame-spread index 25, maximum smoke-developed index 50 per UL 723.
2. Water-Based Joint and Seam Sealant: Brush-on application. Minimum 65 percent solids. Water resistant, mold and mildew resistant. Maximum VOC 75 g/L. Maximum static-pressure class: 10-inch wg.
3. Flanged Joint Sealant: Comply with ASTM C920. Single-component, acid-curing, silicone elastomeric.
4. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer.
5. Round Duct Joint O-Ring Seals: EPDM O-ring. Maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg. Rated for 10-inch wg static-pressure class.

F. Low Pressure Duct Fabrication:

1. Fabricate and support in accordance with current CMC, SMACNA HVAC Duct Construction Standards, and ASHRAE handbooks, except as indicated. Gages for galvanized steel ducts for low pressure systems where velocities do not exceed 2000 FPM shall be as follows:

RECTANGULAR DUCT	Gage		ROUND DUCT	Gage
Largest Side (L) inches			Diameter (D) inches	
L ≤ 12	26		D < 9	26
12 < L ≤ 30	24		9 ≤ D < 14	24
30 < L ≤ 54	22		14 ≤ D < 23	22
54 < L ≤ 84	20		23 ≤ D < 37	20
84 < L	18		37 ≤ D < 51	18
			51 ≤ D < 61	16
			61 ≤ D < 84	14

2. All joint and seam constructions as indicated in the CMC are acceptable. Exposed ductwork shall have clean joints.

3. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
4. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes per SMACNA Figure 4-3 and 4-4.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
6. Use double nuts and lock washers on threaded rod supports.

G. Duct Sealing:

1. Seal ducts per SMACNA seal and leakage class requirements:
   a. Outdoor, Supply-Air Ducts: Seal Class A.
   b. Unconditioned Space, Supply-Air Ducts ≤2-inch wg: Seal Class B.
   c. Unconditioned Space, Supply-Air Ducts >2-inch wg: Seal Class A.
   d. Unconditioned Space, Return-Air Ducts: Seal Class B.
   e. Conditioned Space, Supply-Air Ducts ≤2-inch wg: Seal Class C.
   f. Conditioned Space, Supply-Air Ducts >2-inch wg: Seal Class B.
   g. All Exhaust Ducts: Seal Class C minimum.
2. SMACNA Leakage Class for Rectangular: 24. For Round and Flat Oval: 12.

H. Duct Liner:

1. Fibrous-Glass Duct Liner: Comply with ASTM C1071, NFPA 90A, and NAIMA AH124. Manufacturers: CertainTeed, Johns Manville, Knauf, or Owens Corning.
2. Water-Based Liner Adhesive: Comply with NFPA 90A and ASTM C916. VOC content 80 g/L or less.
3. Insulation Pins and Washers: Cupped-head, capacitor-discharge-weld pins, 0.106-inch-diameter shank, with integral 1-1/2-inch galvanized carbon-steel washer.

I. Volume Control Dampers:

1. Fabricate in accordance with SMACNA standards, and as indicated.
2. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
3. On insulated ducts mount quadrant regulators on stand-off mounting brackets.

J. Duct Test Holes: Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or twist-on metal caps.

2.08 AIR DUCT ACCESSORIES

A. Backdraft and Pressure Relief Dampers:

1. Manufacturers: Greenheck, Pottorff, or Ruskin.

2. Description: Gravity balanced. Maximum air velocity: 2500 fpm. Maximum system pressure: 2-inch wg.
3. Frame: Hat-shaped, 18-gage galvanized sheet steel, with welded corners and mounting flange.
4. Blades: Multiple single-piece, center pivoted, maximum 6-inch width, 0.025-inch thick, roll-formed aluminum with sealed edges. Parallel blade action. Extruded vinyl blade seals, mechanically locked.
5. Bearings: Synthetic pivot bushings. Return spring: adjustable tension.
6. Accessories: Adjustment device for varying differential static pressure, counterweights and spring-assist kits for vertical installations, bird screens (removable, galvanized steel), 90-degree stops.

B. Barometric Relief Dampers:

1. Manufacturers: Greenheck, Pottorff, or Ruskin.
2. Suitable for horizontal or vertical mounting. Maximum air velocity: 2000 fpm. Maximum system pressure: 2-inch wg.
3. Frame: Hat-shaped, 16-gage galvanized sheet steel with welded corners and mounting flange.
4. Blades: Multiple, 0.025-inch thick roll-formed aluminum, maximum 6-inch width, parallel action, gravity balanced, eccentrically pivoted.
5. Bearings: Ball type. Return spring: adjustable tension. Rattle-free with 90-degree stop.

C. Manual Volume Dampers:

1. Manufacturers: Nailor Industries, Pottorff, Ruskin, or Trox USA.
2. Standard leakage rating. Suitable for horizontal or vertical applications.
3. Frames: Hat-shaped, 20-gage, galvanized sheet steel. Mitered and welded corners. Flanges for wall-mounting and flangeless for in-duct.
4. Blades: Multiple or single blade, parallel- or opposed-blade design, galvanized-steel 0.064-inch thick, stiffened for stability.
5. Blade Axles: Plated steel. Bearings: Molded synthetic.

D. Combination Fire and Smoke Dampers:

1. Manufacturers: Greenheck, Pottorff, or Ruskin.
2. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
3. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
4. Fire Rating: 1-1/2 and 3 hours as required.
5. Frame: Hat-shaped, 0.094-inch-thick galvanized sheet steel with welded or mechanically attached corners and mounting flange.
6. Heat-Responsive Device: Electric resettable device and switch package, factory installed.
7. Smoke Detector: Integral, factory wired for single-point connection.

8. Blades: Roll-formed, horizontal, interlocking, 16-gage galvanized sheet steel.
9. Leakage: Class II.
10. Mounting Sleeve: Factory-installed, 0.039-inch-thick galvanized sheet steel; length to suit wall or floor application.
11. Damper Motors: Two-position action. Spring-return motors with integral spiral-spring mechanism where indicated.
12. Accessories: Test and reset switches, remote mounted.

E. Turning Vanes:

1. Manufacturers: Ductmate Industries, Duro Dyne, or SEMCO.
2. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
3. Comply with SMACNA Figures 4-3 and 4-4.
4. Vane Construction: Double wall.

F. Duct-Mounted Access Doors:

1. Manufacturers: Ductmate Industries, Greenheck, or Pottorff.
2. Fabricate per SMACNA Figures 7-2 and 7-3.
3. Door: Double wall, rectangular, galvanized sheet metal with insulation fill. Vision panel. Hinges and latches: 1-by-1-inch butt or piano hinge and cam latches. Fabricate airtight and suitable for duct pressure class.
4. Frame: Galvanized sheet steel with bend-over tabs and foam gaskets.
5. Minimum 8" x 8" for hand access, 18" x 18" for shoulder access, and as indicated.

G. Flexible Connectors:

1. Manufacturers: Ductmate Industries, Duro Dyne, or Ward Industries.
2. Materials: Flame-retardant or noncombustible fabrics. Coatings and adhesives: Comply with UL 181, Class 1.
3. Metal-Edged Connectors: Factory fabricated with fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide galvanized sheet steel.
4. Indoor System Fabric: Glass fabric double coated with neoprene. Minimum weight 26 oz./sq. yd. Service temperature: minus 40 to plus 200°F.
5. Outdoor System Fabric: Glass fabric double coated with weatherproof synthetic rubber resistant to UV rays and ozone. Minimum weight 24 oz./sq. yd. Service temperature: minus 50 to plus 250°F.

H. Flexible Ducts:

1. UL 181, Class 1. Insulated: polyethylene film supported by helically wound galvanized-steel wire; fibrous-glass insulation; aluminized vapor-barrier film. Pressure rating: 10-inch wg positive and 1.0-inch wg negative. Maximum air velocity: 5500 fpm.

2. Maximum length shall not exceed 5 feet unless indicated otherwise on Drawings. Flexible duct shall be fully extended when installed—no excess length or kinks.

3. Connectors: Stainless-steel band clamps with worm-gear action, or adhesive plus sheet metal screws.

2.09 DUCT INSULATION

A. All insulation shall have composite (insulation, jacket or facing, and adhesive) fire-smoke hazard ratings as tested by ASTM E84, NFPA 255, and UL 723 not exceeding: Flame Spread: 25; Smoke Developed: 50.

B. All products or their shipping cartons shall bear a label indicating compliance. The Contractor shall certify that all products used meet these criteria.

C. Insulation values shown are a minimum. If the requirements of Title 24, Part 6 exceed these values, the amount and/or type must be increased to meet Title 24 requirements.

D. Products shall not contain asbestos, lead, mercury, or mercury compounds.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.

b. Johns Manville; Microlite.

c. Knauf Insulation; Friendly Feel Duct Wrap.

d. Owens Corning; SOFTR All-Service Duct Wrap.

F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

b. CertainTeed Corp.; Commercial Board.

c. Fibrex Insulations Inc.; FBX.

d. Johns Manville; 800 Series Spin-Glas.

e. Knauf Insulation; Insulation Board.

f. Manson Insulation Inc.; AK Board.

g. Owens Corning; Fiberglas 700 Series.

G. Glass Fiber Duct Liner, Rigid:

1. Insulation: ASTM C612; semi-rigid, noncombustible. K value: ASTM C518, 0.24 at 75°F. Maximum service temperature: 250°F. Density: 1.5 to 3.0 lb/ft³. Maximum velocity on coated air side: 4,000 ft/min.
2. Adhesive: Waterproof (fire-retardant) type.

2.10 HVAC PIPING INSULATION

A. Insulate the following piping systems: refrigerant suction piping, chilled-water piping (where present), and heating hot-water piping (where present), indoors and outdoors, as indicated on Drawings and as required by Title 24, Part 6.

B. Surface-Burning Characteristics per ASTM E84: Indoor: Flame-spread index 25 or less, smoke-developed index 50 or less. Outdoor: Flame-spread index 75 or less, smoke-developed index 150 or less.

C. Products shall not contain asbestos, lead, mercury, or mercury compounds.

D. Products in contact with stainless steel shall have leachable chloride content less than 50 ppm per ASTM C871.

E. Flexible Elastomeric Insulation (for refrigerant suction piping): Closed-cell, sponge or expanded rubber. Thermal conductivity: 0.27 Btu·in/(h·ft²·°F) at 75°F. Water vapor permeance: 0.10 perm-inch maximum.

F. Mineral Fiber Pipe Insulation (for hot-water piping): ASTM C547. Thickness per Title 24, Part 6 insulation tables.

G. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

2.11 INSTRUMENTATION AND CONTROL FOR HVAC

A. Control equipment and sequence of operation shall be as indicated on the Drawings.

B. The controls contractor shall provide a complete operational BACnet-based Energy Management System (EMS) per Mechanical Drawings.

C. All economizer controllers shall be listed on the California Energy Commission (CEC) Certified Economizer Fault Detection and Diagnostics (FDD) list.

D. Provide BACnet or LonWorks compatible interface for central HVAC control workstation with the ability to adjust set points, monitor fan operation, inquire damper position and air temperatures, and monitor occupied/unoccupied operations.

PART 3- EXECUTION

3.01 GENERAL

A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the Owner if suitability is doubted. Contractor shall notify the Owner before installation into any apparent improper locations or interference with other work.

3.02 INSTALLATION

A. Ductwork and Accessories:

1. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing, complete with metal can with spring device or screw to ensure against air leakage.

2. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
3. Provide balancing dampers at points on low-pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
4. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
5. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, at each change in direction and at maximum 50-foot spacing, and elsewhere as indicated.
6. Provide duct test holes where indicated and required for testing and balancing purposes.
7. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
8. Install diffusers to ductwork with airtight connection. Provide balancing dampers on duct take-off to diffusers and registers, regardless of whether dampers are specified as part of the diffuser or register assembly.
9. Paint ductwork visible behind air outlets and inlets matte black.
10. Install fire and smoke dampers according to UL listing. Install access doors at each fire/smoke damper location.
11. Set all dampers to fully open position before testing, adjusting, and balancing.
12. Install flexible ducts with maximum 60-inch length to connect diffusers. Fully extend without kinks. Connect with draw bands.
13. Protect duct interiors from moisture, construction debris, and other foreign materials. Comply with SMACNA's "IAD Guidelines for Occupied Buildings Under Construction."

B. Refrigerant Piping:

1. Install refrigerant piping according to ASHRAE 15 and ASME B31.5.
2. Install piping in concealed locations unless otherwise indicated, except in equipment rooms and service areas.
3. Install exposed piping at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.
4. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
5. Slope refrigerant piping to ensure proper oil return to compressor.
6. Refrigerant piping shown on Drawings is schematic only. Size piping and design actual layout including oil traps, double risers, specialties, and sizes to accommodate equipment, elevation differences, and piping length to ensure proper operation and compliance with equipment warranties.

C. Split-System Air-Conditioning Units:

1. Install units level and plumb.

2. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
3. Install ground-mounted compressor-condenser components on cast-in-place concrete equipment bases.
4. Install roof-mounted compressor-condenser components on equipment supports. Anchor units with removable, cadmium-plated fasteners.
5. Comply with seismic control requirements per ASCE/SEI 7.
6. Connect supply and return ducts with flexible duct connectors.
7. Install and connect precharged refrigerant tubing to component's quick-connect fittings where applicable. Install tubing to allow access to unit.

D. Rooftop Units:

1. Install on roof curbs, level and secure, per NRCA standards. Coordinate roof penetrations and flashing with roof construction.
2. Secure RTUs to upper curb rail and secure curb base to roof framing with anchor bolts.
3. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, designed for loads at Project site.
4. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
5. Gas Piping: Connect to burner full size of gas train inlet with union and shutoff valve with sufficient clearance for burner removal and service.
6. Install ducts to termination at top of roof curb. Remove roof decking only as required for passage of ducts. Connect supply ducts with flexible duct connectors.

E. Insulation:

1. Unless specifically indicated, Contractor may line or wrap ductwork to meet insulation requirements.
2. Fiberglass ductwrap: Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
5. Duct Liner Application: Adhere insulation with adhesive for minimum 90 percent coverage. Secure with mechanical liner fasteners per SMACNA standards, 4 inches from corners and at intervals not exceeding 12 inches transversely; 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally. Seal and smooth joints. Seal liner surface penetrations with adhesive.

6. Duct dimensions indicated are net inside dimensions for airflow. Increase duct size to allow for insulation thickness.

7. Secure transversely oriented liner edges facing the airstream with metal nosings (channel or Z profiles) at fan discharges, intervals of lined duct preceding unlined duct, and upstream edges of transverse joints where air velocities exceed 2500 fpm.

3.03 FIELD QUALITY CONTROL

A. Split-System Units:

1. Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

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, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Rooftop Units:

1. Engage a factory-authorized service representative to perform startup service.

2. Complete installation and startup checks according to manufacturer's written instructions, including: inspect for visible damage to casing, combustion chamber, compressor, coils, and fans; verify labels, clearances, controls, and filters; clean condenser coil and furnace flue; connect and purge gas line; verify lubrication; inspect fan-wheel rotation; adjust belts; start unit per manufacturer's instructions.

3. Test and adjust controls and safeties including: high-temperature limits, low-discharge-temperature safety, outdoor-air damper stroke and interlock, economizer operation, smoke and firestat alarms.

4. After startup and testing, replace existing filters with new filters.

C. Power Ventilators:

1. Verify shipping, blocking, and bracing are removed. Verify unit is secure on mountings.

2. Disconnect fan drive from motor, verify proper motor rotation direction, verify fan wheel free rotation and smooth bearing operation. Reconnect, align and adjust belts, install belt guards.

3. Adjust damper linkages. Verify lubrication for bearings.

4. Energize motor and adjust fan to indicated RPM. Measure and record motor voltage and amperage.

D. Ductwork:

1. Leakage Tests: Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Test representative duct sections totaling no less than 25 percent of total installed duct area for pressure classes exceeding 3-inch wg. Test

for leaks before applying external insulation. Conduct tests at static pressures equal to maximum design pressure. Give seven days' advance notice.

2. Duct System Cleanliness: Visually inspect to ensure no visible contaminants. Clean new duct systems before TAB. Use service openings for entry. Use HEPA filtration when venting vacuum system inside building.

3.04 AIR SYSTEM TEST AND BALANCE

A. Perform all tests to the entire satisfaction of the Owner. Air balancing contractor shall notify Owner seven days prior to scheduling air balance at the site.

B. TAB Contractor Qualifications:

1. Engage a TAB entity certified by AABC.

2. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.

3. TAB Technician: Employee of the TAB contractor and certified by AABC as a TAB technician.

C. ASHRAE Compliance:

1. Comply with ASHRAE 62.1, Section 7.2.2 – "Air Balancing."

2. Comply with ASHRAE 90.1, Section 6.7.2.3 – "System Balancing."

3. Instrumentation: Per ASHRAE 111, Section 5.

D. Examination:

1. Examine Contract Documents to become familiar with Project requirements and discover conditions that may preclude proper TAB.

2. Examine systems for installed balancing devices (test ports, gage cocks, thermometer wells, flow-control devices, balancing valves, manual volume dampers). Verify accessible locations.

3. Examine equipment performance data including fan curves. Calculate system-effect factors per AMCA 201 or SMACNA "HVAC Systems – Duct Design."

4. Verify that air duct system is sealed as specified.

5. Examine HVAC equipment and filters; verify bearings are greased, belts aligned and tight, and equipment with functioning controls is ready for operation.

6. Examine heat-transfer coils for correct piping connections and clean, straight fins.

7. Examine operating safety interlocks and controls on HVAC equipment.

E. Preparation:

1. Prepare a TAB plan with strategies and step-by-step procedures.

2. Verify: permanent electrical-power wiring complete; automatic temperature-control systems operational; equipment and duct access doors securely closed; balance, smoke, and fire dampers open; ceilings installed in critical areas.

F. Testing Procedures:

1. Procedures shall conform to AABC's "National Standards for Total System Balance," ASHRAE 111, and SMACNA's "HVAC Systems – Testing, Adjusting, and Balancing."
2. Test and adjust all supply, return, and exhaust blower RPM to design requirements.
3. Test and record all motor full load amperes.
4. Test and record system static pressures, suction and discharge. Measure static pressure across each component.
5. Test and adjust system for design recirculated air CFM.
6. Test and adjust system for design CFM outside air.
7. Adjust all supply, return, and exhaust outlets to within 10% of design CFM.
8. Adjust patterns of adjustable outlets for proper distribution without drafts.
9. Do not make fan-speed adjustments that result in motor overload. Measure amperage in full-cooling, full-heating, economizer, and other operating modes.

G. Motor Testing:

1. Motors 1/2 HP and larger: Test at final balanced conditions and record manufacturer's name, model, serial number, horsepower, RPM, efficiency rating, nameplate and measured voltage (each phase), nameplate and measured amperage (each phase), and starter thermal-protection-element rating.

H. Tolerances:

1. Supply, Return, and Exhaust Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

I. Certified TAB Reports:

1. Provide reports in PDF format, complete with index page. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, indicating thermostat locations.
2. Review field data reports to validate accuracy and prepare certified TAB reports.
3. Certify that the TAB team complied with the approved TAB plan.
4. Submit instrument calibration reports including instrument type, make, serial number, application, dates of use, and dates of calibration.
5. Include fan curves, manufacturers' test data, and system diagrams showing duct sizes, outlet/inlet sizes, and position of balancing devices.

J. Inspections:

1. After TAB is complete, operate each system and randomly check measurements to verify system is operating according to final test and balance readings. Measure airflow of at least 10 percent of air outlets. Verify that balancing devices are marked with final balance position.

2. If rechecks yield measurements that differ from documented measurements by more than specified tolerances, measurements shall be noted as “FAILED.” If failed measurements exceed 10 percent of total, TAB shall be considered incomplete and rejected.

K. Additional Tests:

1. Within 90 days of completing TAB, perform additional TAB to verify balanced conditions are maintained and to correct unusual conditions.

2. Seasonal Periods: If initial TAB was not performed during near-peak summer and winter conditions, perform additional TAB during near-peak conditions.

3.05 DEMONSTRATION AND TRAINING

A. Engage factory-authorized service representatives to train Owner’s maintenance personnel to adjust, operate, and maintain all HVAC units.

B. Demonstrate complete operating system to Owner’s representative.

C. Provide certificate stating that control system has been tested and adjusted for proper operation.

D. 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 two visits during other-than-normal occupancy hours.

END OF SECTION

ELECTRICAL GENERAL PROVISIONS

PART 1 – GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.
3. Division-1.

B. Organization of the Specifications into Divisions, Sections and Articles, and arrangement of Drawings shall not control the CONTRACTOR in dividing the Contract Work among Subcontractors or in establishing the extent of work to be performed by any trade.

1.02 GENERAL SUMMARY OF ELECTRICAL WORK

A. The Specifications and Drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the CONTRACTOR from providing such additional labor and materials.

B. Refer to the Drawings and Shop Drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

C. Before submitting a bid, the CONTRACTOR shall become familiar with all features of the Building Drawings and Site Drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.

D. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the OWNER'S Representative before submitting bid and before commencing work.

E. Provide work and material in conformance with the Manufacturer's published recommendations for respective equipment and systems.

1.03 LOCATIONS OF EQUIPMENT

A. The Drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

B. Where outlets are placed on a wall, locate symmetrically with respect to each other and other features or finishes on the wall.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the Contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.

D. Lighting Fixtures in Mechanical Spaces are shown in their approximate location only. Do not install light outlets or fixtures until mechanical piping and ductwork is installed; then install lights in a location to provide best lighting.

E. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.

F. The location of the existing utilities, building, equipment and conduit shown on the Drawings is approximate. Verify exact locations and routing of existing systems by potholing all trench routes prior to digging the trench. Pothole at least 100 feet ahead of the actual trenching to allow space to alter the new conduit routing to accommodate existing conditions.

G. The locations of existing underground utilities, where shown on Drawings, are shown diagrammatically and have not been independently verified by the OWNER, the OWNER'S Representative, the Architect/Engineer. The OWNER, the OWNER'S Representative, and the OWNER'S Architect/Engineer are not responsible for the location of underground utilities or structures, whether or not shown or detailed and installed under this or any other Contracts. The CONTRACTOR shall identify each existing utility line prior to excavation and mark the locations on the ground of each existing utility line.

1.04 AIR CONDITIONING, HEATING, PLUMBING EQUIPMENT WIRING

Provide electrical work, materials, and control components required for proper operation of the air conditioning, heating and plumbing systems as indicated on the electrical, mechanical, and plumbing Contract Documents and specified herein.

1.05 POWER, TELEPHONE AND OTHER SIGNAL SERVICES

A. Telephone, cable television, power, street lighting service and metering facilities shall conform to the Requirements of the serving Utility Companies. Contractor shall verify service locations and Requirements, and shall pay all costs levied by

the serving Utility Companies for rendering utility services to the Contract without additional cost to the OWNER. Service information will be furnished by the serving utilities.

B. Conform to all Requirements of the serving Utility Companies including electrical power, telephone and CATV. Location of transformer pad and or manholes and pull boxes and routing of service conduits indicated on the Drawings are approximate and shall be verified with the serving Utility Company prior to installation. Installation of service shall not begin until approved Drawings have been received from the serving Utility Company.

C. Within 30-calendar days of receipt of notice that the contract award has been made, the CONTRACTOR shall notify the New Business Departments of the District Office of the serving Utility Companies concerning the project Contract and shall provide information as to the total lighting, power, telephone, and signal Requirements of the Contract. The CONTRACTOR shall furnish at the same time information as to the estimated completion date of job or the date when the respective Utility Company circuits, will be ready for installation, energizing and activation of the respective services.

D. In addition to the Requirements of the serving Utility Companies, all power, telephone and signal service conduits for Utility Company circuits, shall be completely surround and encase in concrete on all sides, top and bottom. The concrete shall be red mix color and extend a minimum of 3-inches past the conduit on all sides on the conduits.

E. CONTRACTOR shall submit electrical utility metering and Electrical Service Entrance Equipment Shop Drawings to the Electric Utility Company supplying the project for review and approval by the serving Utility Company. The submittal and acceptance by the Utility shall occur prior to submitting of Shop Drawings to the OWNER'S Representative or A/E for review. Copies of the serving Electrical Utility approval of the service entrance equipment shall be included in the Shop Drawings submittals to the OWNER'S Representative and A/E.

1.06 PERMITS

Take out and pay for all required Permits, Inspections and Examinations without additional cost to the OWNER.

1.07 QUALITY ASSURANCE

A. Work and materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Documents Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:

1. California Code of Regulations Title 24.
2. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
3. California Building Code – CBC.

4. The National Electrical Code.
5. The National Life Safety Code.
6. The Uniform Building Code – UBC.
7. National Fire Protection Agency – NFPA.
8. Underwriter's Laboratory – UL.
9. Other applicable State and Local Government Agencies Laws and Regulations.
10. Electrical Installation Standards.
    National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):

    a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Contracting.
    b. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, etc.).
    c. NECA/NEIS-111: Recommended Practice Installing Nonmetallic Raceways
    d. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
    e. NECA/NEIS–331: Standards for Installing Building and Service Entrance Grounding.
    f. NECA/NEIS-400: Recommended Practice for Installing Switch-boards.
    g. NECA/NEIS-407: Recommended Practice for Installing Panel-boards.
    h. NECA/NEIS-409: Recommended Practice for Installing and Maintaining Dry-Type Transformers.
    i. NEIS/NECA and IESNA-500: Recommended Practice for Installing Indoor Commercial Lighting Systems
    j. NEIS/NECA and IESNA-501: Recommended Practice for Installing Exterior Lighting Systems
    k. NECA/BICSI-568: Standards for Installing Commercial Building Telecommunications System

B. All material and equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized testing laboratories, where such listings are available. Comply with all Installation Requirements and Restrictions pertaining to such listings.

C. Work and material shown on the Drawings and in the Specifications is new and included in the Contract unless specifically indicated as existing or N.I.C. (not in Contract).

D. Keep a copy of all applicable Codes and Standards available at the job site at all times for reference while performing work under this Contract. Nothing in plans or Specifications shall be construed to permit work not conforming to the most stringent of Building Codes.

E. Where a conflict or variation occurs between applicable Codes, Standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the Requirement of the Contract Documents.

1.08 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Review of CONTRACTOR'S submittals is for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the Requirements of the Plans and Specifications. CONTRACTOR is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.
2. The CONTRACTOR shall review each submittal in detail for compliance with the Requirements of the Contract Documents prior to submittal. The CONTRACTOR shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The CONTRACTOR shall clearly and specifically identify each individual proposed substitution, substitution of equal or proposed deviation from the Requirements of the Contract Documents with a statement "THIS ITEM IS A SUBSTITUTION".
   The burden of research, preparation of calculations and the furnishing of adequate and complete Shop Drawings information to demonstrate the suitability of CONTRACTOR'S proposed substitutions and suitability of proposed deviations from the Contract Documents is the responsibility of the CONTRACTOR.
3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the CONTRACTOR to comply with the Submittal Requirements shall render void any acceptance or any approval of the proposed variation. The CONTRACTOR shall then be required to provide the equipment or method without variation from the Contract Documents and without additional cost to the Contract.
4. The CONTRACTOR at no additional cost or delays to the Contract shall remove any work, material and correct any deficiencies resulting from deviations from the Requirements of the Contract Documents not approved in advance by the OWNER prior to commencement of work.
5. Shop Drawings submitted by the CONTRACTOR, which are not specifically required for submittal by the Contract Documents, or CONTRACTOR Shop Drawings previously reviewed and resubmitted without a written resubmittal request to the CONTRACTOR, will not be reviewed, considered, or commented on. The respective Shop Drawing submittal/resubmittal will not be returned to the CONTRACTOR and will be destroyed without comment or response to the CONTRACTOR. The respective submittal shall be considered null and void as being not in compliance with the Requirements of the Contract Documents.
6. Refer to Division-1 for Additional Requirements.

B. Material Lists and Shop Drawings:

1. Submit material list and Equipment Manufacturers for review within 35 days of award of Contract. Give name of Manufacturer and where

applicable, brand name, type and/or catalog number of each item. Listing of more than one Manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type designation, is not acceptable. Shop Drawings shall not be submitted before review completion of Manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.

2. After completion of review of the Material and Equipment Manufacturers list, submit Shop Drawings for review. Shop Drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The CONTRACTOR shall verify dimensions of equipment and be satisfied as to fit and that they comply with all Code Requirements relating to clear working space about electrical equipment prior to submitting Shop Drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the Contract Documents, must be specifically noted as such. The Requirements of the Contract Documents shall prevail regardless of the acceptance of the submittal.
3. Shop Drawings shall include catalog data sheets, instruction manuals, dimensioned plans, elevations, details, wiring diagrams and descriptive literature of component parts where applicable. Structural calculations and mounting details, signed by a Structural Engineer registered by the State of California, shall be submitted for all equipment weighing over 400-pounds, and shall be in compliance with Title 21 of the California Code of Regulations.
4. Each Shop Drawing item shall be identified with the Specification Section and paragraph numbers, lighting fixture types and Drawing Sheet numbers; the specific Shop Drawing is intended to represent. Shop Drawings 11-inches x 17-inches or smaller in size shall be bound in 3-ring binders. Divider tabs shall be provided in the 3-ring binders identifying and separating each separate Shop Drawing submittal item. Shop Drawings larger than 11-inches x 17-inches, Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
5. The time required to review and comment on the CONTRACTOR'S submittals will not be less than 14 calendar days, after receipt of the submittals at the office of FBA Engineering. The review of Contractor submittals and return to CONTRACTOR of submittals with review comments will occur in a timely manner conditioned upon the CONTRACTOR complying with all of the following:

    a. The submittals contain complete and accurate information, complying with the Requirements of the Contract Documents.
    b. CONTRACTOR'S submittals are each marked with Contractor's approval "Stamp", and with Contractor signatures.
    c. The submittals are received in accordance with a written, Shop Drawing submittal schedule for each submittal. The Contractor distributes the schedule not less than 35-day calendar days in advance of the Shop Drawing Submittals, and the schedule

identifies the calendar dates, the CONTRACTOR will deliver the various submittals for review.

6. Shop Drawings shall include the Manufacturers projected days for shipment from the factory of completed equipment, after the CONTRACTOR releases the equipment for production. It shall be the responsibility of the CONTRACTOR to insure that all material and equipment is ordered in time to provide an orderly progression of the work. The CONTRACTOR shall notify the OWNER'S Representative of any changes in delivery, which would affect the Project completion date.
7. Submittal Identification

    a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable Specification/Drawing references *(i.e., Submittal dated: 09/12/19 Submittal #4 Contents: Branch Circuit Panelboards Sheet #E5.1 and Transformers Specification Section 16050 Paragraph 2.11, etc.)*.
    b. Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled with submittal contents identification and applicable Specifications/Drawing references *(i.e., Original Submittal Date: 06/22/19 Resubmittal Date: 09/12/19 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section - 16050 Paragraph 2.11, etc.)*

C. The CONTRACTOR shall be responsible for incidental, direct and indirect costs resulting from the CONTRACTOR'S substitution of changes to; the specified Contract materials and work.

D. The CONTRACTOR shall pay, upon request by the OWNER'S Representative, a fee for the OWNER'S Representative time involved in the review of substitution submittals and design changes resulting from the CONTRACTOR'S requested substitutions. The fee shall be not less than $125.00 per hour but, in no case, less than stated in Division-1, whichever is greater.

E. Maintenance and Operating Manuals

1. The CONTRACTOR shall furnish three copies of typewritten maintenance and operating manuals for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the OWNER.
2. Instruct OWNER'S Personnel in correct operation of all equipment at completion of Project.
3. Maintenance and operating manuals shall be bound in three-ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the OWNER'S Representative, with an itemized receipt.

F. Portable or Detachable Parts: The CONTRACTOR shall retain in his possession, and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until

final completion of Contract Work. These parts shall then be delivered to the OWNER'S Representative with an itemized receipt.

G. Record Drawings (ADDITIONAL REQUIREMENTS)

1. Provide and maintain in good order a complete set of Electrical Contract "Record" prints. Changes to the Contract to be clearly recorded on this set of prints. At the end of the project, transfer all changes to one set of transparencies to be delivered unfolded to the OWNER'S Representative.
2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. If any necessary dimensions are omitted from the Record Drawings, the CONTRACTOR shall, at the Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
3. The CONTRACTOR shall keep the "Record" prints up to date and current with all work performed.
4. Refer to Division-1 for Additional Requirements.

1.09 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.10 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the OWNER and replace all damaged or defective work, materials and equipment before requesting final acceptance.

1.11 EXCAVATION, CUTTING, BACKFILL AND PATCHING ADDITIONAL REQUIREMENTS

A. General

1. Perform excavation, cutting, backfill, core drilling, directional boring, and patching of the construction work required for the proper installation of the electrical work.
2. Patching shall be of the same material, thickness, workmanship and finish as existing and accurately match surrounding work to the satisfaction of the OWNER'S Representative.

1.12 IDENTIFICATION

A. Equipment Nameplates

1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.
2. Nameplates shall be engraved laminated phenolic. Shop Drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
3. Provide black-on-white laminated plastic nameplates engraved in minimum ¼-inch high letters to correspond with the designations on the Drawings. Provide other or additional information on nameplates where indicated.

B. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions (minimum character size not less than 0.188 inch. Engraving shall indicate circuits and equipment controlled or connected):

1. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
2. Manual motor starting switches.
3. Where so indicated on the Drawings.

C. For Equipment and Access Doors or Gates to equipment containing or operating on circuits of more than 240 volts nominal, provide red-on-white laminated warning signs engraved in ½-inch high letters to read: "DANGER - 480 *(or applicable voltage)* VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".

D. Wire and Cable Identification

1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.

    a. Individual wire and cable larger than #6 AWG or 0.25-inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alphanumeric characters, character height 0.25-inch. Attach identification tags with plastic “tie” wraps, minimum of two for each tag. As manufactured by Almetek Industries-“EZTAG” series; or TECH Products - “EVERLAST” series.
    b. Individual wire and cable #6 AWG and smaller or smaller than 0.25 inch diameter, shall be provided with water and oil resistant,

flexible, pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification.

c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.

E. Cardholders and Cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuit, area, and connected load.

F. Junction and Pull Boxes shall have covers stenciled with box number when shown on the Drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.13 TESTING

A. The CONTRACTOR shall obtain an independent Testing Laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the OWNER'S Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the OWNER'S Representative for review.

1. Test for Phase to Ground and Neutral Condition:

a. Open main service disconnects.
b. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
c. Close all submain disconnects.
d. Close all branch feeder circuit breakers.
e. Turn all switches to "on" position, unplug all portable equipment from outlet receptacles.
f. Measure the resistance of each phase to ground and phase to neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
g. Record all readings after one minute duration and document into a complete report.

2. Isolating Grounds: In the event that low resistance ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.

B. Method of Obtaining Ground Resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.

1. Perform "fall-of-potential" 3-point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.
2. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

C. All Equipment and Personnel required for testing shall be furnished by the CONTRACTOR.

D. The testing, calibrating and setting of all ground and ground fault equipment circuit breakers, device protection relays, and meters adjustable settings shall be by an independent Testing Laboratory. Set as recommended by the respective Manufacturer and coordination study so as to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the OWNER’S Representative.

E. State of California Title-24 Compliance Testing

1. Mandatory California Title-24 Building Energy Code, Part-6 acceptance testing. Shall insure that respective systems properly installed and functioning, all in conformance with Title-24.
2. Refer to Process Guide to Acceptance Testing, published by the State of California, complete the testing and documentation.
3. Perform California Title-24 Testing and Certification. Submit the completed Certification of Acceptance documentation to the AHJ and OWNER’S Representative.

F. The Contractor shall complete the following work before any electrical equipment is energized:

1. All equipment shall be permanently anchored.
2. All bus connections shall be tightened per Manufacturer's instructions and witnessed by the OWNER'S Representative.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. All feeders shall be connected and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's overspray removed and equipment vacuumed clean. The OWNER'S Representative shall observe all interiors before covers are installed.
6. All dry wall work and painting shall be completed within areas containing electrical equipment prior to installation of equipment.

7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
8. Electrical rooms shall not be used as a storage room after power is energized.
9. The electrical system time current coordination and Arc-Flash studies shall be complete for circuit breakers, ground relays sets, and circuit relay sets, fuses; set-up, tested and calibrated accordingly. Protection settings for all devices shall be completed and tested.

1.14 COMMISSIONING - CX

A. General

1. The Commissioning shall verify the electrical systems for the term of the Contract, by observation; and by calibration; and by testing. The Commissioning shall ensure the electrical systems perform interactively and correctly, according to the Contract and operational Requirements.
2. Commissioning shall provide startup, testing and documented confirmation of the Contract constructed systems, materials and work, functions in compliance within the criteria set forth in the Contract Documents to the satisfaction of the Owner's needs. The Commissioning Scope shall encompass each system identified as requiring "Commissioning" by the Contract Documents, including but not limited to:

    a. Electrical circuits' protection, short circuit, overcurrent, ground fault devices and electrical grounding.
    b. Electrical circuits monitoring and metering.
    c. Light fixtures, lamps and ballasts.
    d. Lighting control devices, equipment and lighting control systems.
    e. Standby and emergency electric power supply equipment and systems.
    f. Motor Control Equipment.
    g. Fire alarm, equipment, devices, and fire alarm systems.
    h. Communications, low voltage and signal devices and systems.
    i. Additional systems described in the Contract Documents.

3. Commissioning process shall review all of the Shop Drawing submittals, including:

    a. Controls, operation and maintenance Requirements.
    b. Facility performance testing compliance.
    c. Project Contract Requirements compliance.
    d. Compliance with basis for design and operational descriptions provided in the Contract.

4. Commissioning shall be the process of ensuring all the systems described in the Contract Documents comply with the Contract Document design; all systems are installed properly; all systems are functional, tested and capable of being operated and maintained to perform within the Contract Requirements and design intent.

5. Functional setup, recalibration, correcting deficiencies, retesting and the associated costs, for system(s) that fail Commissioning, shall be the responsibility of the Contractor. The CONTRACTOR shall include all Commissioning costs in the Contract Scope of Work.
6. Complete all Commissioning functions prior to the occupancy of the facility by the OWNER, unless directed otherwise by the OWNER'S Representative.
7. Submit six copies of Commissioning Documentation to OWNER'S Representative.
8. Commissioning unless specifically indicated otherwise, shall be performed by Factory-Trained Technician(s) Authorized and Certified by the Manufacturers of the respective equipment/systems. Where specifically indicated, Commissioning shall be performed by Independent Test Lab.

B. Commissioning Procedures

1. Prepare a Commissioning Matrix identifying components and systems included in the Commissioning Scope; the status; actions completed and actions to be completed.
2. Verify Contractor compliance with Contract Document Requirements, Manufacturer's recommendations and approved Shop Drawings.
3. Perform startup, functional tests, reports, and document results.
4. Evaluate and document the setup parameters, operating condition and performance of each system at the time of functional test completion. Document and record each performance parameter and condition, in the Commissioning Report.
5. Schedule testing and prepare descriptions of testing.
6. Describe measures performed to correct deficiencies.
7. Verify that instructions to OWNER'S Representatives, operations and maintenance manuals comply with Contract Documents.
8. Prepare warranty matrix identifying the start dates, expiration dates, routine preventative maintenance dates and the OWNER’S responsibility for performing preventative maintenance and keeping logs for each maintenance function and warranty claims.
9. Confirm completion of all punch list items that have been acceptably accomplished and a list of what has not been acceptably completed.
10. Describe uncorrected deficiencies accepted by the OWNER.

C. Commissioning Phasing

The Commissioning Phases of work shall include the following activities:

1. SDQ – Shop Drawing Qualification shall verify complete and correct Shop Drawings have been submitted.
2. IQ – The Installation Qualification of Contract Work shall verify systems are correctly and properly installed.
3. OQ – Verify systems interfaces and software is correctly and properly operational.
4. ITM – Verify the Contract Inspection, Testing and procedures for Maintenance are complete.

5. PQ – Performance Qualification complete the functional performance testing to validate each building system.

1.15 TIME/CURRENT COORDINATION, SHORT CIRCUIT, ARC-FLASH AND SERIES RATED EQUIPMENT

A. Series Rated Equipment.

1. Circuit protective Devices identified as "Series Rated" or "Current Limiting" (i.e., SR – Series Rated; CLCB - current limiting circuit breaker; CLF - current limiting fuse, etc.) shall be series rated and tested (UL 489, UL 67, and CSA5) by the Manufacturer with all equipment and circuit protective devices installed downstream of the identified series rated or current limiting device.
2. Provide nameplates on all equipment located downstream, including the CLCB and CLF devices, to comply with CEC/NEC paragraphs 110-22 and 240-83 "CAUTION SERIES RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS".

B. Short Circuit, Coordination and Arc-Flash

1. Perform Engineering Analysis and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide the selective coordination within the limits of the specified equipment. Shall comply with the latest application standards of IEEE and ANSI. Provide electrical system short circuit worst case bolted-fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations. Obtain the necessary information to complete the calculations from the serving electrical utility company.
2. The information shall be submitted in tabular with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment. Shall comply with, but not limited to:

    a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
    b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
    c. IEEE-1584, Guide for Performing Arc-Flash Hazard Calculations.
    d. CEC/NEC

4. Provide permanent warning labels on each equipment location. The labels shall describe Arc-Flash, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also

describe actions to be taken if any circuit changes or equipment modifications occur.

5. Shall be submitted with the Shop Drawing submittals for the respective equipment.

1.16 INDEPENDENT TESTING LABORATORY

A. The Testing Laboratory shall meet Federal OSHA criteria for accreditation of Testing Laboratories Title 29 Part 1907.

B. Membership in the National Electrical Testing Association shall constitute proof of meeting said criteria, for testing of electrical systems.

1.17 SPARE FUSES

Provide three spare fuses for each size and type to match the installed fuses where the fuses are provided as part of the Contract. Provide spare fuse holders on inside door of each respective fuse compartment. Provide engraved nameplate on front of fuse access door indicating fuse type/catalog number ampere rating and Manufacturer of fuse.

1.18 EQUIPMENT SEISMIC REQUIREMENTS

A. Equipment Supports and Anchorage’s provided as part of the Contract shall be designed, constructed and installed in accordance with the earthquake regulations of the California Building Code, Title 24, Section 1632A, and the Uniform Building Code (UBC).

B. Provide Equipment Anchorage Details, Coordinated with the Equipment Mounting Provision, prepared, signed and "Stamped" with PE registration by a Civil or Structural Engineer licensed as a Professional Engineer (PE) in the State of California.

C. Mounting recommendations shall be provided by the Manufacturer based upon approved shake table tests used to verify the seismic design of that type of equipment.

D. The Equipment Manufacturer shall certify that the equipment can withstand, and function following the seismic event, including both vertical and lateral required response spectra as specified in California Title 24 and the UBC. Alternatively, the Manufacturer's certification may be based on an approved detailed structural analysis of the assembly, as specified in California Title 24 and the UBC.

E. The Equipment Manufacturer shall document the details necessary for proper seismic mounting, anchorage, and bracing of the equipment for back installation location.

F. Seismic qualification shall be considered achieved when the capability of the provided equipment, as described by the test response spectra, meets or exceeds the required response spectra as specified in California Title 24 and the UBC, for all equipment natural frequencies up to 35Hz.

G. The Seismic Requirements are typical for each equipment item exceeding 100 pounds, including but not limited to the following:

1. Switchboards
2. Transformers
3. Equipment racks
4. Panels
5. Conduits with ceiling or wall support suspension attachments.
6. Lighting equipment

H. Wall Mounted Electrical Equipment

1. Surface Mounted Equipment

a. Provide multiple horizontal sections of metal “C” channels for support and attaching wall mounted equipment to walls. Channels shall provide “turned lips” at longitudinal edges to hold “lock-in” fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.

b. The “C” channels shall be positioned horizontally within 3 inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate “C” channels at not less than 36 inches on center between the “top” and “bottom” “C” channel positions, located behind each equipment vertical section.

c. The “C” channels shall be of sufficient length to provide connection to not less than two vertical structural wall framing elements separated by not less than 16 inches; but in no case shall the “C” channel length be less than the width of the respective equipment section.

d. Attach the “C” channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.

e. Attach the “C” channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled “afterset” expansion anchors for existing masonry and concrete construction.

f. Attach the equipment to the “C” channels with threaded and bolted fasteners to “prelocate” and lock into the channel “turned lips” and channel walls.

1.19 POWER OUTAGES

A. Interruption of the Electrical Services for the existing facilities to remain shall be at the convenience of the OWNER and performed only after consultation with the OWNER’S Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the OWNER.

B. Provide Temporary Electrical Power to meet the Requirements of this article.

C. Any Added Costs to CONTRACTOR due to necessity of complying with this Article shall be included in the Contract Scope of Work.

D. When Electrical Work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.

E. The CONTRACTOR shall request in writing to the OWNER'S Representative a minimum of 3-weeks in advance, for any proposed electrical outage.

1.20 ELECTRICAL WORK CLOSEOUT

A. Prepare the following items and submit to the OWNER'S Representative before final acceptance.

1. Two copies of all test results as required under this section.
2. Two copies of Local and/or State Code Enforcing Authorities' Final Inspection Certificates.
3. Copies of Record Drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
4. Two copies of all receipts transferring portable or detachable parts to the OWNER'S Representative when requested.
5. Notify the OWNER'S Representative in writing when installation is complete and that a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection they shall be corrected to the satisfaction of the OWNER'S Representative before final acceptance can be issued.
6. List of spare fuses and locations identified by equipment name and building designation.
7. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, busways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed / connected and prior to energizing the equipment. The torque values shall comply with Manufacturer's recommendations.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit Product Data sheets for all Outlet Boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, transformers, and disconnect fuses.

B. Submit Detailed Shop Drawings including Dimensioned Plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts for relays, time clocks, and photocells.

C. Submit material list for outlet boxes.

PART 2 – PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

A. General

1. Flush or concealed outlet and junction boxes: Pressed steel, steel thickness not less than 0.062-inch, hot-dip galvanized, knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective outlet box. UL-514 listed and labeled. Minimum required box depth is exclusive of extension-ring depth.
2. Provide boxes of proper code size for the number of wires or conduits passing through or terminating therein, but in no case shall box be less than 4.0 inch square by 2.125 inch deep, unless specified elsewhere or noted otherwise on the Drawings. Two and a half inch minimum depth for box widths exceeding 2-gang.
3. Increase the minimum outlet box size to 4.69 inches square by not less than 2.125 inches deep, where one or more of the following conditions occurs:

    a. More than two conduits connect to the outlet box.
    b. Conduit “homerun” connects to outlet box.

4. Provide extension rings on flush outlets to finish face of extension ring flush with finished building surfaces. Extension ring shall match outlet box construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective outlet box and maintain "ground" bonding continuity.
5. Boxes installed in masonry or concrete shall be UL "concrete-tight" approved for installation in concrete, and shall allow the placing of conduit without displacing reinforcing bars.
6. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
7. Provide solid gang boxes for three or more switches, for mounting behind a common device plate.
8. Individual audio/visual, telephone, computer or data outlets: 4.69 inches square by 2.125 inches deep minimum with single gang extension ring on flush boxes.
9. Combination signal/telephone/data or computer outlets: 4.69 inches square by 2.125 inches deep minimum with single gang wide extension ring on flush boxes.

B. Surface Outlet Boxes

1. Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than required for “press steel boxes”, and “sheet steel boxes”. Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

C. Floor Boxes

1. Flush in floor single gang box:

   a. Single gang cast iron floor box, fully adjustable with brass flange, duplex receptacle and brass flip lid coverplate. Wiremold #880CS1-1 (box) #817T (flange), #828R (cover), or equal by Hubbell.
   b. Box shall be installed flush in floor. Coverplate shall not protrude above finish concrete floor.

2. Flush in floor two gang box:

   a. Four compartment cast iron floor box, fully adjustable, carpet flange with aluminum trim and cover doors with carpet inserts. Double duplex receptacle and space for two telecommunication jacks. Outlets to be recessed in floor box and accessed through cover doors. Wiremold #RFB4-C1-1 (box), #S36CCTCAL (flange and door).
   b. Box shall be installed flush in floor. Coverplate shall not protrude above finish carpeted floor.

3. Combination flush in floor three service floor box;

a. Flush floor box with double duplex receptacle, space for two telecommunication outlets, and space for audio visual outlets. Refer to Audio Visual Drawings for Additional Requirements:

2.02 PULL BOXES

A. Sizes as Indicated on the Drawings and in no case of less size or material thickness than required by the Governing Code. Exercise care in locating underground pull boxes to avoid installation in drain water flow areas.

1. General purpose sheet steel pull boxes: Install only in dry protected locations with removable screw covers. Manufacturer's standard baked enamel finishes.
2. Weatherproof sheet steel pull boxes: Fabricate of code gauge, hot-dip galvanized steel with gasketed weathertight cover of same material. Manufacturer's standard baked exterior enamel finish.
3. Concrete pull boxes: Furnish complete with pulling irons, hot-dip galvanized traffic cover with hot-dip galvanized frame and four galvanized cable racks with porcelain blocks. The box to be set on a pea gravel base 12-inches thick and as large as the bottom. Install a ¾-inch by 10-feet copper clad ground rod for grounding all metal parts. After cables have been pulled and inspected, seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal. Construction equal to prefabricated pull boxes as manufactured by Jensen or Brooks Products. Refer to Drawings for size. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide bead weld on cover to pull box to indicate services within pull box (i.e., "480/277-VOLT, 3-PHASE, 4-WIRE ELECTRICAL" OR "SIGNAL/TEL/P.A./CLOCK/ FIRE ALARM").

2.03 SWITCHES

A. Provide Circuit Switches Totally Enclosed, Bakelite or composition base, toggle type with 277 volt AC rating for full capacity or contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 amp only. Color shall vary depending on installation location and shall be selected by OWNER'S Representative.

B. Switches

1. Single Pole Switches

Make	Toggle Type	Lock Type
Hubbell	#CS1221	#CS1221-L
P&S	#20AC1	#20AC1-L
Sierra	#5021	#5071
Leviton	#1221	#1221-L

2. Double Pole Switch

Make	Toggle Type	Lock Type

Hubbell	#CS1222	#CS1222-L
P&S	#20AC2	#20AC2-L
Sierra	#5022	#5072
Leviton	#1222	#1222-L

3. Three-Way Switches

Make	Toggle Type	Lock Type
Hubbell	#CS1223	#CS1223
P&S	#20AC3	#20AC3-L
Sierra	#5023	#5073-L
Leviton	#1223	#1223-L

2.04 DIMMER SWITCHES

A. Dimmer Switches shall be as indicated herein unless specifically noted otherwise on the Drawings.

B. Dimmer Cover Plate shall be the same color as switch cover plates in the same area.

C. Dimmer Switches shall be self-cooling and shall not require forced air cooling when individually or gang mounted. All dimmers shall be by the same Manufacturer and the same appearance.

D. Dimmers shall include "RF" filters and is voltage stabilized.

E. Incandescent Dimmers shall be used for control of line voltage incandescent light fixtures except "low voltage" type lights. Lutron "Nova" series.

1. Dimmer wattage shall be rated 2000 watt unless noted otherwise on the Drawings.

F. Fluorescent Dimmers, Voltages as indicated on the Drawings.

1. Fluorescent dimmers (individual dimmers controlling less than 24 lamps per dimmer) Lutron "Nova" series.

G. Low Voltage (Transformer Type) Incandescent Light Dimmers shall be specifically designed for dimming low voltage light fixture transformers. Lutron "Nova".

H. LED Dimmer Controls shall be as noted on the Drawings.

2.05 RECEPTACLES

A. All Receptacles in Flush Type Outlet Boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except

isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Color shall vary depending on installation location and shall be selected by OWNER'S Representative.

B. Duplex Convenience Receptacles shall be grounding type, 120 volt, 15 ampere, and shall have two current carrying contacts and one grounding contact which is internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired:

1. P&S . . . . . #5262
2. Leviton . . . . . .#5262
3. Hubbell. . . . . .. #CR5252

C. Duplex 20-amp Convenience Outlets same as 15-amp Except Ampacity shall be used where duplex receptacles are supplied by separate 20-amp circuit:

1. P&S . . . . . #5362
2. Leviton . . . . . .#5362
3. Hubbell. . . . . #CR5352

D. Isolated Ground Receptacles

1. The receptacle insulation barrier shall isolate the receptacle ground contact system from ground. Connect the ground plug contact to a separate dedicated insulated ground-bonding conductor. The receptacle ground plug contact shall not be grounded to the raceway or outlet box. Duplex convenience receptacle 20 amp minimum, with two current carrying contacts and one grounding contact, or as noted on the Drawings.
2. Identify receptacle with an orange triangle on the receptacle face and orange receptacle body. Red body for receptacles connected to emergency power.

   a. P&S IG6300
   b. Leviton 5362IG
   c. Hubbell CR5252IG

E. Ground Fault Convenience Receptacles provide separate ground fault receptacle at each location indicated on Drawings.

1. Leviton . . . . . # 6398
2. Hubbell . . . . . # GFR5252

F. Weatherproof Receptacle: Ground fault type duplex receptacle, mounted in a flush hinged door enclosure with lock and key. Enclosure shall be a P&S #4600 with a #1591F46 receptacle. On exposed conduit runs, weatherproof ground fault type receptacle as herein before specified, installed in "FS" condulet with one of the following spring door type covers:

1. Hubbell . . . . . .#WP826 MP

G. Electric Circuit and Receptacle Outlet Automatic Control.

1. On-off switching control of 120 volt, 60Hz 15-amp and 20-amp electric convenience receptacle outlets. Automatic switching control by respective space occupancy motion sensor, in combination with “non-dim” relay(s). Integrated with respective local room-space lighting control system.
2. Configure the switch control duplex convenience receptacle with one of the following methods as follows:

    a. Provide split-wire receptacles and non-dim relay switch control of one-half (split-wire) of each duplex receptacle. The switched plug within the receptacle shall be imprinted “Controlled”.
    c. Refer to Drawings for additional configurations.

3. Electric duplex convenience receptacles automatic control, located in all of the following spaces:

    a. Private offices (full height walls)
    b. Open-plan offices (partial height walls or no walls) including modular partition receptacles.
    c. Reception-lobby areas.
    d. Conference rooms.
    e. Copy rooms.
    f. Kitchenettes in office areas.
    g. Additional locations described on the drawings.

H. Special Outlets shall be as indicated on the Drawings.

2.06 PLATES

Provide plates for every switch, receptacle, telephone, computer, television and other device outlets. All plates shall be nylon or high impact thermoplastic. Color shall vary depending on installation location and shall be selected by OWNERS Representative.

2.07 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, to be hot-dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.08 FLASHING ASSEMBLIES

Provide Semco Fig. #1100-4 non-lead metal flashing assemblies at all roof penetrations. Seal the joint between flashing and pipe with waterproofing compound.

2.09 RELAYS, CONTACTORS, AND TIMESWITCHES

A. Individual Control Relays (HVAC Plumbing of the Control Functions)

1. Individual control relays shall have convertible contacts rated a minimum of 10-amp, 600 volts regardless of usage voltage. Coil voltage, number and

type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the Electrical and Mechanical Drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type I enclosure unless indicated otherwise.

2. The following relays are approved:

Manufacturer	Type
Arrow Hart	IMP
General Electric	Class CR 2811
I.T.E.	Class J10
Square D Co.	Class 8501, Type A
Westinghouse	Bul. 16-321, Type NH
Allen Bradley	Approved Equal

B. Contactors and/or Relays

1. Contactors and/or relays for control of lighting shall be 600-volt AC, electrically operated, mechanically held units, open type for panel mounting with number of poles and of size as indicated on the Drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a two-wire control circuit.
2. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the Drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.
3. Contactors and/or relays shall be Automatic Switch Co. Bulletin #920 Series for 2-pole and 3-pole, Automatic Switch Co. Bulletin 917 Series with poles as indicated on Drawings. Coil control circuit shall be independently fused, sized to protect coil.
4. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

C. Timeswitches

1. All timeswitches shall have synchronous motor drive for operation on 120-volts or 277-volts, 60Hz, AC and shall be furnished with a 10-hour, spring-driven, reserve-power motor. Contacts shall be rated 40-amp per pole.

    a. Timeswitches for control of air conditioning or plumbing equipment shall have 7-day dial and shall be Tork WL Series or approved equal by Paragon or Intermatic.

2. All timeswitches shall be mounted in separate Section in top of panelboards under separate lockable door unless otherwise indicated on Drawings. Clear opening for timeswitch shall be a minimum of 12-inches x 12-inches.

D. Contactors and/or Relays/Timeswitch Cabinet

1. Contactors, relays, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.
2. Each contactor, relay or timeswitch mounted in the contactor cabinet shall be barriered in its own compartment, and shall be installed on Lord sound absorbing mounts.
3. Contactor cabinets shall be of the same Manufacturer as the panelboards.
4. Where relays and/or contactors occupy the same enclosure as timeswitches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by nonauthorized personnel.

2.10 DISCONNECTS (SAFETY SWITCHES)

Disconnect switches shall be rated 600 volt AC, NEMA Type HD, quick-make, quick-break, h.p.-rated, fused Class "R", in NEMA Type 1 enclosure, lockable with number of poles and amperage as indicated on the Drawings. Provide neutral bus and conductor landing lugs, size to match conductors shown on Drawings. Where enclosure is indicated W.P. (weatherproof) switches shall be rain-tight NEMA Type 3R enclosure, lockable. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.

2.11 TRANSFORMERS

A. General

1. Provide dry type transformers constructed to meet Underwriters' Laboratories Specification UL 506 and tested in accordance with USAS I and NEMA Standards. Performance on transformers equal to or better than ANSI, NEMA, IEEE and N.E.C. published criteria.
2. UL Class 220°C insulation with maximum winding temperature rise of 150°C in 40°C ambient at 100% continuous rated capacity with overload capacity per ANSI C57.12 and C57.96. Transformer efficiency shall meet or exceed NEMA-TP1 (latest revision) Requirements.
3. Transformers shall be equipped with five 2.5% full capacity voltage taps, two above and three below normal voltage. Line and load terminals shall be accessible, located behind removable front cover plate.
4. Transformers Manufactured by Westinghouse, General Electric, Square D Co., or Siemens.
5. Transformers mounted per Korfund Literature for weight of transformer. Connect transformers by one of the following methods:

    a. Underfloor conduit resulting in no rigid connections to transformer (use ground strap for equipment ground).
    b. Sealtite flexible conduit (use ground wire for equipment ground).
    c. Pullbox or wireways from transformer which are isolated from transformer with an approved sound absorbing neoprene gasket (use ground strap for equipment ground).

6. The physical dimensions of the transformer shall not exceed the size shown on the Drawings.

B. Bolt Floor-Mounted Transformers to Floor using Isolation Rubber Mount, on each floor contact location.

C. Test Requirements: The transformers furnished to this Specification shall be subjected to the following production tests:

1. Applied Potential
2. Induced Potential
3. No Load Loss.
4. Voltage Ratio.
5. Polarity
6. Continuity

D. Transformer Housing

1. Removable metal NEMA 1 enclosure, with screen protected ventilation for all openings, including bottom of housing.
2. Manufactures standard finish paint.
3. Removable lifting and skidding provisions.

E. The Manufacturer shall have performed the following additional tests on units identical to the design type being supplied to this Specification. Proof of performance of these tests in the form of test data sheets shall be provided at the Time Shop Drawings are submitted for approval.

1. Sound Levels
2. Temperature
3. Full Load and 50% Load Losses
4. Voltage Regulation
5. Impedance
6. Dry type transformers shall meet or exceed NEMA TP-1 (latest revision), Class-1 efficiency levels and shall be marked as energy efficient for United States Department of Energy and Environmental Protection Agency DOE/ EPA Energy Star.

F. Sound Levels: Transformer sound levels, between no loads to full loads shall be guaranteed by the Manufacturer not to exceed the following values:

9 kVA and below	40 dba
10 kVA to 50 kVA	45 dba
51 kVA to 150 kVA	50 dba
151 kVA to 300 kVA	55 dba
301 kVA to 500 kVA	60 dba

G. Transformer Windings shall be Copper or Aluminum.

H. Electrostatic Shield: Provide full width, copper, 100% electrostatic shield (Faraday Shield), between line and load transformer windings, on each transformer phase. Shield shall be low impedance grounded to the transformer metal frame and shall attenuate common mode electrical noise 120dB at 1-500Mhz range and transverse mode electrical noise. 30dB at 1-500 Mhz range. Average effective coupling capacitance of 30-picofarads between line and load sides.

I. Transformer shall be rated K4, for harmonic content electrical loads, in accordance with UL156 and IEEE C57.110 (latest revision). The transformers shall be specially designed and manufactured for non-linear electrical load which cause harmonic current and voltage distortion, with 3rd, 5th, 7th, 9th and 15th harmonic current and voltage distortion. Transformers, which are simply oversized larger than the specified kVA rating and then derated to the specified kVA rating to compensate for harmonic overloading, are not acceptable.

2.12 CONCRETE WORK

A. Portland Cement

1. ASTM C33-67, Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.

   a. Concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, concrete shall attain minimum 28-day compressive strength of 4000 psi, using not less than five sacks of cement per cubic yard of wet concrete.
   b. Concrete for underground duct/conduit encasement, the minimum 28-day compressive strength shall be 2000 psi. Provide a minimum of 10-pounds of red oxide concrete coloring per yard of concrete.
   c. Mix shall obtain a 6-inch slump, measured with standard slump cone per ASTM C145-58.

2. Coarse Aggregate: Uniformly graded between maximum size not over 1½-inch and not less than ¾-inch and minimum Size #4, crushed rock or washed gravel. For concrete encased conduit only, maximum aggregate size shall be ½-inch.
3. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing 3/8-inch screen, of which at least 12% shall pass 50 mesh screens.

B. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.

C. Reinforcement

1. Bars: Intermediate Grade Steel conforming to ASTM A15-66, with deformations conforming to ASTM A305-65, except #2 bars shall be plain.
2. Welded Wire Fabric: ASTM A185-64.
3. Bending: Conform to Requirements of ACI 318-63.

D. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1-inches x 6-inches boards. Forms for round lighting pole bases shall be sono-tube.

PART 3 – EXECUTION

3.01 GROUNDING (ADDITIONAL REQUIREMENTS)

A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State of California and Local Authorities Having Jurisdiction.

B. The Neutral of Each Transformer shall be grounded by individual separate ground conductors' individual conduits as follows:

1. Conductor and conduit shall be grounded to building main ground bus.
2. Conductor and conduit shall be grounded to nearest available effectively grounded building structural steel member or grounded metal cold water pipe.

C. The Transformer Neutral Ground Conductors for Secondary Side of the Transformers shall be copper and shall be sized according to the following table:

Secondary Total Equivalent Size Copper	Neutral Ground Wire Size Copper
#2 or smaller	#6-1-inch conduit
1 or 1/0	#4-1-inch conduit
2/0 or 3/0	#2-1¼-inch conduit
4/0 thru 350 MCM	#1-1¼-inch conduit
Over 350 MCM thru 600 MCM	2/0-1½-inch conduit
Over 600 MCM thru 1100 MCM	3/0-1½-inch conduit
Over 1100 MCM	4/0-2-inches conduit

D. Each Pull Box or any other Enclosure in which Several Ground Wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

E. The Maximum Resistance to Ground shall not exceed 5 ohms.

3.02 OUTLET AND JUNCTION BOXES

A. Accurately Place Boxes and Securely Fastens to Structural Members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together in a horizontal row as possible. Where the outlet boxes for switches and receptacles are shown at the same location and mounting height, mount in common outlet box with barriers between devices. Provide single piece multi-gang cover plate for close mounted outlet boxes. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.

B. Flush Mounted Boxes shall be attached to two studs or structure members by means of metal supports.

C. Boxes above Accessible Ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of hanger rods and/or preformed steel channels. Boxes shall be supported independently of all piping, ductwork, equipment, ceiling hanger wires and suspended ceiling grid system.

D. Surface Mounted Outlets shall be attached to concrete or masonry walls by means of expansion shields.

E. Floor Boxes shall be installed level with finish floor and within adjustable limits of floor ring. Where outlets are shown at same or adjacent location, use multi-gang boxes.

F. Outlet Box Horizontal and Vertical Separation: Outlet boxes and device outlet rings installed flush in walls shall be horizontally and vertically separated by not less than 24 inches (edge of box to edge of box) from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall.

1. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
2. The backing shall extend the width of the wall cavity (i.e. between "studs" or masonry cells) behind the box and 12 inches above and below the outlet box centerline, completely enclosing the outlet box.
3. The backing shall consist of the following:

    a. 5/8 inch thick gypsum board anchored in place for "stud" wall construction.
    b. Solid "mortar" to completely fill the outlet box "cell" behind the box in masonry construction.

G. In Fire Rated Walls and Ceilings provide fire rated "box-wrap" around the outside of each outlet box placed in fire rated wall or ceiling inside the wall, to maintain the fire rating of wall with the installed outlet boxes.

H. Plug-in Type Receptacle Installation Orientation:

1. The “ground-pin” shall face “up” at the receptacle top location (double duplex) 4-plex, individual and vertically mounted individual duplex receptacles.
2. The “neutral-blade” shall face “up” at the receptacle top location on horizontally mounted duplex receptacles.

3.03 DIMMER SWITCHES

A. Do Not Break Off Dimmer Cooling Fins.

B. Large Dimmers shall be surface wall mounted at the location indicated on the Drawings.

3.04 CONCRETE WORK

A. Form

1. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
2. Build in and set all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the Electrical Work. Place all items carefully, true, straight, plumb, and even.
3. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.

B. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1½-minutes.

C. Transit Mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90 minutes from time of introduction of cement and water to mixer.

D. Placing of Concrete:

1. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
2. Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 24 diameters, min; lap fabric one mesh minimum. Tie intersections, corners, splices with 16 gallon annealed wire, or as otherwise called for.
3. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting is used, avoid segregation. In placing new concrete against existing concrete, use bonding agent per Manufacturer's directions.
4. Give careful and thorough attention to curing of concrete. Keep concrete and forms wet for a minimum of 10 days, after placing concrete.

E. Concrete Finish

1. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.
2. Exposed lighting pole bases shall be filled and sack finished to a smooth finish.

END OF SECTION

SECTION 16111

CONDUIT AND WIRE

PART 1 – GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit Product Data Sheets for all Wire, Supports, Conduit, Fittings and Splicing Materials.

B. Submit Material List for all Conduit and Conduit Fittings.

C. Submit Details and Structural Engineering Calculations for Conduit Support Systems.

PART 2 – PRODUCTS

2.01 CONDUIT

A. General

1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer’s recommendations and based on applicable Codes.
3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable Code Requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:

    a. RMC and EMT conduit fittings.

1) 0.5 inch through 1.5 inch conduit/fitting size - 10,000 amp RMS.
2) 2.0 inch and larger conduit/fitting size - 20,000 amp RMS.

b. FMC and LTFMC Conduit Fittings

1) 0.5 inch through 1.25 inch conduit/fitting size-1,000 amp RMS (without external bonding jumper).
2) 1.5 inch through 4.0 inch fitting size-10,000 amp RMS with bonding jumper.

4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:

a. Clean all metal surfaces (including metal threads) with acid bath “pickle” prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
c. Threads shall be hot-dip zinc coated after machine fabrication.
d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/fitting.

5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
6. Metal conduit termination connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load “cycling” after installation is complete. The bushing shall comply with UL 94V-0 flammability.
7. Provide conduit bonding/grounding jumper from metal enclosures with “concentric ring” knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.

B. Rigid Metal Conduit (RMC)

1. Rigid metal, round tubing, machine threaded at both ends.

a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor, pursuant to applicable Codes.

2. RMC Raceway types shall be as follows:

   a. Rigid Galvanized Steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); UL 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
   b. Intermediate steel Conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).

3. RMC Fittings

   a. Fittings shall be compatible with RGS and IMC.
   b. Fittings shall be rated “liquid tight”.
   c. Fittings imbedded in concrete shall be rated “liquid tight” and “concrete tight”.
   d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.
   e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

4. RMC Fittings as manufactured by:

   a. For threaded enclosure, termination connection.

      1) Thomas & Betts - 106 Series bonding locknut, 5302 Series sealing ring with stainless steel retainer.

   b. For non-threaded enclosure, termination connector.

      1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 Series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.
      2) OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.

   c. For RMC to RMC conduit-to-conduit coupling

      1) Erickson - 674 (threaded) Series
      2) OZ/Gedney Type 4 (threaded) Series
      3) Threaded RMC conduit couplings, product of the same Manufacturer as the RMC conduit.

   d. For RMC Conduit Seals

      1) OZ/Gedney-EYA and EYAM (threaded) Series
      2) Appleton-EYF and EYM (threaded) Series

C. Electrical Metallic Tubing (EMT)

1. Rigid metal round tubing, “thin wall” steel construction, with non-threaded ends.

   a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor pursuant to applicable Codes.
   b. The conduit shall be watertight and airtight without cracks and pin-holes.

2. EMT shall be allowed for conduit size ranges from 0.5 inch through 4.0 inches.
3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).
4. EMT Fittings

   a. Connectors and couplings for terminating, connecting and coupling to EMT conduit shall be non-threaded steel fabrication.
   b. EMT termination connector fittings shall be as follows:

      1) Set screw type “concrete tight” when installed in dry interior locations.
      2) Compression types “raintight” and “concrete tight” when installed in wet or damp locations, outdoors and in concrete or masonry construction.

   c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.

5. EMT Fittings as manufactured by:

   a. For threaded and non-threaded enclosure, termination connector

      1) Thomas & Betts-TC5031 (set screw type) Series (with lock-nuts).
      2) OZ/Gedney-4000ST (set screw type) Series.
      3) Thomas & Betts-5123 (compression type) Series (with two locknuts).
      4) OZ/Gedney-7000ST (compression type) Series (with locknut).
      5) Thomas & Betts-4240 (compression type) Series (90 degree angle with locknut).
      6) OZ/Gedney-8000WT (compression type) Series (90 degree angle with locknut).

   b. For EMT to EMT conduit-to-conduit coupling:

      1) Thomas & Betts-TK121 (set screw type) Series (with locknut).
      2) OZ/Gedney-5000 (set screw type) Series (with locknut).
      3) Thomas & Betts-5120 (compression type) Series.
      4) OZ/Gedney-6000S (compression type) Series.

c. For EMT to RMC conduit to conduit combination coupling:

1) Thomas & Betts-HT221 (set screw type) Series.
2) OZ/Gedney-ESR (set screw type) Series.
3) Thomas & Betts-530 (compression type) Series.
4) OZ/Gedney-ETR (compression type) Series.

D. Flexible Metal Conduit (FMC):

1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock between steel strips and provide raceway flexibility.
2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.
3. FMC shall be allowed for conduit size ranges from 0.5 inch through 4.0 inch.
4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.
5. FMC Fittings

a. FMC fittings shall be malleable iron construction or steel construction.
b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.
c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and unthreaded enclosures.
d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.
e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.
f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); UL 514.

6. FMC Fittings as manufactured by:

a.

Straight Termination Connectors	45 & 90° Angle Connectors
Thomas & Betts-3110 Series (with locknut)	Thomas & Betts – 3130 Series (with locknut)

b. FMC to EMT conduit combination coupling:

1) Thomas & Betts 503TB Series.

E. Liquid Tight Flexible Metal Conduit (LTFMC)

1. The metal conduit core of LTFMC shall comply with the same Requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.

2. The exterior jacket shall be positively locked to the metal core to prevent jacket “sleeving”.
3. The LTFMC shall be rated for installation and operating service temperatures of between 0 degrees centigrade through plus 90 degrees centigrade.
4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.
5. LTFMC sizes from 0.5 inch through 1.25 inches shall include an additional internal ground conductor, fabricated by the Manufacturer, as an integral part of the conduit core.
6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.
7. LTFMC shall be allowed for conduit size ranges from 0.5 inch through 4.0 inches.
8. In addition to the Requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).
9. LTFMC fittings

    a. Fittings shall include an external mechanical ground/bond wire connector.
    b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent “sleeving” of the jacket.
    c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.

10. LTFMC Fittings as manufactured by:

    a. Termination connector fittings:

Straight	45 & 90 Degree Angle Connectors
♦Thomas & Betts-5331 GR Series.	♦ Thomas & Betts-5341GR and 5351GR Series.
♦Appleton-STB Series; STN-L Series for use with Preformed “knockouts”.	♦ Appleton-STB-L Series; STN-L Series for use with preformed “knockouts”.
♦ OZ/Gedney-4QLT Series.	♦ OZ/Gedney-4QLT Series

    b. LTFMC to RMC conduit to conduit combination coupling fittings:

        1) Thomas & Betts-5271 GR Series.
        2) OZ/Gedney-4QFML Series

F. Rigid Non Metallic Conduit (RNMC)

1. General

    a. Conduit and fittings shall be 90 degree centigrade conductor rated. Fabricated from homogeneous material, free from visible crack holes

or foreign inclusions, with integral “end-bell”. The conduit and conduit fittings shall be watertight and airtight.

b. Conduit, conduit fittings and conduit fitting assembly “solvent cement” shall all be the product of the same Manufacturer. Conduit fittings shall be solvent cement welded watertight.
c. Conduit and fittings shall be identified with legible markings showing ratings, size and Manufacturers name.
d. RNMC and fitting shall be corrosion resistant, watertight.
e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).

2. Polyvinyl Chloride (PVC) – RNMC

a. PVC-schedule 40 heavy wall construction.
b. PVC-schedule 80 extra heavy wall construction.
c. PVC-type EB.

3. RNMC fittings connecting to metallic raceways shall be provided with a ground/bond jumper connection.

G. Expansion Joint, Deflection Joint and Seismic Joint Conduit Fittings

1. Expansion Conduit Fitting - Fitting shall provide for a minimum of 2-inches straight line movement between two connecting conduits in each direction (total 4-inches conduit expansion and contraction) parallel to the respective conduit lengths. Fitting shall be watertight.
2. Deflection Conduit Fitting - Fitting shall provide for a minimum of 30 degrees angular deflection movement (“Shear” deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be watertight.
3. Combination Expansion/Deflection Conduit Fitting - Fitting shall provide the combined “expansion” and “deflection” movement capacity between two connecting conduits as described for separate “expansion” and “deflection” conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.
4. Fittings shall comply with UL.
5. Fittings as manufactured by:

a. Conduit expansion fittings exposed or concealed locations as manufactured by:

1) OZ/Gedney - AX8 Series for RMC conduit.
2) OZ/Gedney - TX Series for EMT conduit.
3) Appleton - XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.

b. Combination expansion/deflection conduit fittings exposed or concealed conduit locations as manufactured by:

1) OZ/Gedney - AXDX Series for RMC conduit.
2) OZ/Gedney - AXDX Series for EMT conduit. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.

c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.

1) Provide a minimum of 12 inches of “slack” LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.
2) Note: Each FMC “slack” expansion/deflection location, shall be considered as not less than a 90 degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.

6. Conduit Fitting Bonding Jumper

a. The grounding/bonding path of metal conduit shall be maintained by the fitting.
b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.
c. The jumper shall be a bare flexible copper “braid”. The copper braid electrical current carrying capacity shall be equal to the metal conduit.
d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connect to each respective conduit end.
e. The jumper braid length shall be 8-inches longer than the respective conduit fitting.
f. Bonding jumper for FMC and EMT fittings as manufactured by:

1) OZ/Gedney - BJ Series
2) Appleton - XJB Series

I. Conduit Bodies Conduit Fitting

1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
2. In-line form “C” conduit bodies shall be prohibited.
3. The interior space “length” of 90 degree “elbow” conduit bodies shall not be less than 6 times the diameter size of the largest conduit connecting to the conduit body.
4. Conduit body covers shall be removable, gasketed; watertight “domed” metal covers with threaded screw attachment to the conduit body.
5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire “pulling”.
6. Conduit body fittings shall comply with UL 514.

7. Conduit bodies as manufactured by:

   a. For RMC Conduit

      OZ/Gedney - LB 6X/Mogul (90 degree elbow) Series - threaded body.
      Appleton - LB/Mogul (90 degree elbow) Series - threaded body.

   b. For EMT Conduit

      1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.02 PVC COATING

A. PVC Coatings shall be provided as described for specified metal products.

B. PVC Coating shall be factory applied, to comply with NEMA-RN1 and 5-19.

C. The Adhesion of the PVC Coating to the Coated Metal shall exceed the strength of the coating itself, based on 0.5 inch “strip-pull” test.

D. Uniform Coating Thickness shall be continuous without “breaks” or “pinholes” and shall not be less than the following:

1. Exterior metal surfaces, 40 mil. coating thickness.
2. Interior metal surfaces, 10 mil. PVC or urethane coating thickness (i.e. interior of conduits, interior of conduit fittings etc.).

2.03 CONDUIT SUPPORTS

A. General

1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.
2. Conduit supports, hangers and fasteners for PVC coated conduit shall be PVC coated to match the conduit PVC coating.
3. Threaded hardware shall be continuous, free running threads.
4. Conduit support systems, including support channels, pipe clamps, braces, anchors, hardware, fasteners, shall be sized to support the full capacity circuit conductors weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300% additional weight capacity safety factor.
5. Provide lock washer at each “bolted”/threaded connection.
6. Conduit supports, fasteners, channels, braces, hardware, anchors, pipe clamps and hangers as manufactured by Unistrut or Kindorf.
7. Supports shall be free of “BURRS” and sharp edges.
8. Metal supports cut in the field shall be zinc galvanized after cutting to prevent rust.

B. Conduit Hangers

1. Threaded steel hanger rods.

   a. Hanger rods smaller than 0.375 inches in diameter shall not be used for support of individual conduits.
   b. Hanger rods smaller than 0.5 inches in diameter shall not be used for support of multiple conduits.

2. Conduit hanger wires shall be not less than 12 gauge steel.
3. Conduit hangers shall attach to structure fasteners with steel “Clevis” or “Swing” hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.
4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with “Clevis” type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.

C. Conduit Support Channels

1. “C” channels shall be factory preformed with a minimum 12 gauge thickness metal. The channel shall be factory “punched” with regularly spaced slotted holes for fastener attachments along the length of the channel.
2. The “C” channel shall not deflect more than 0.1 inches between channel supports at maximum installed design load, including required safety factor.
3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).
4. Channels shall provide “turned lips” at longitudinal edges to hold (lock-in) fasteners.
5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with treaded connections. Provide a minimum of two hangers (trapeze style) connected to each channel.
6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.

D. Fasteners

1. Channel Fasteners

   a. Channel fasteners shall “prelocate” and lock into the channel “turned lips” and channel “walls”.
   b. A separate metal strap shall “tie” each conduit to each channel with conduit channel fasteners.

2. Structure Fasteners

   a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.

b. Structure fasteners for wall and floor mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.
c. Structure fasteners shall attach to steel structural members with “swing-beam clamps”, with set-locking screw structure fasteners. Beam clamps shall include integral safety rod, strap or “J”-hook to secure the clamp to the beam flanges on both sides of the beam.
d. Structure fasteners for wall and floor mounted conduit attachments shall attach to wood structural members with flush “through-bolted” wood beam/wood framing stud structure fasteners.
e. Structure fasteners for wall mounted conduit attachments shall attach to steel framing studs and steel structural elements with spot welded steel structure fasteners or drilled and bolted structure fasteners.

E. Brace Connectors

1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.
2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, nonsuspended building “main” structural elements with fixed anchoring.
3. Brace attachment connectors and fasteners shall be rigid preformed steel channels or flexible #10 gauge steel hanger wire.
4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.04 WIRE AND CABLE

A. All Wire and Cable shall be copper, 600 volt, #12 AWG minimum unless specifically noted otherwise on the Drawings. Conductors #10 AWG and smaller shall be solid. Conductors #8 AWG and larger shall be stranded. Type of insulation as noted on Drawings as follows: Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90 degree rated insulation:

1. Type THHN/THWN insulation used for #4 AWG and smaller.
2. Type THW/XHHW or THHN/THWN insulation used for #2 AWG and larger.
3. Type THWN or XHHW insulation used for all panel feeders’ switchboard feeders, motor control center feeders, transformer feeders and service conductors.
4. Type THHN insulation used for circuit conductors installed in fluorescent lighting fixture raceways, for conductors connected to the secondary of fluorescent or mercury vapor fixture ballast or other hot locations.
5. Type XHHW or THWN insulation shall be used where conductors are installed in conduit exposed to the outdoor weather.

6. The following color code for branch circuits:
   Neutral . . . White (Tape feeder neutrals with white tape near connections)

   a. Normal Power

120/208 Volt	480/277 Volt
Ground Green	Ground Green
Phase A Black	Phase A Brown
Phase B Red	Phase B Orange
Phase C Blue	Phase C Yellow

   b. Isolated ground insulation shall be green with a longitudinal yellow stripe.

7. When individual neutral conductors are shown for each branch circuit, the color code for the neutral conductors shall be as follows:

   a. 120/208 volt; Phase A - White with Black stripe; Phase B - White with Red stripe; Phase C - White with Blue stripe.

8. Feeders identified as to phase or leg in each panelboard with printed identifying tape.
9. Fire alarm conductors: Use 600-volt, type THHN/THWN conductors and color-coded per equipment Manufacturer's recommendations and approved and listed for use on fire alarm systems by the State Fire Marshal.
10. Panel feeders, copper or aluminum: Wire size shown on the Drawings is for copper; if aluminum wire is proposed, increase wire size to ampere capacity of copper wire and voltage drop not to exceed that of copper feeders indicated on Drawings. Increase conduit size and quantity as required by Code. Provide feeder calculation sheet, eight copies, if aluminum wire is proposed, showing feeder number, length, size and voltage drop in percentage for original copper feeders and for equal aluminum feeders. Aluminum conductors smaller than #2 AWG shall not be used.
11. Color coding for mechanical and plumbing control wiring shall be an agreed upon color code between the Mechanical / Plumbing CONTRACTOR and the Electrical CONTRACTOR, and color code shall be submitted to the OWNER'S Representative in writing for approval prior to installation.

B. Aluminum Conductors (600 Volt or Less Only): CONTRACTOR has the option of using aluminum conductors in lieu of copper conductors for feeders only to panels, distribution boards/panels, transformers, motor control centers, and dimmer switchboard. If aluminum conductors are used, the following Requirements shall be followed:

1. Conductors shall be Aluminum Association 8000 Series Alloy, with the same (XHHW, THW or THWN) insulation as called for under copper conductors. Aluminum conductor larger than 500 MCM (CAUTION: feeder schedule allows 750) shall not be used, aluminum conductors smaller than #2 AWG shall not be used.
2. If the conductor termination is to be made on a bus bar or similar flat surface, a Burndy Type YA-A HYPLUG compression terminal intended for the specific conductor size, factory filled with oxide inhibitor compound shall be

used. Terminal must be installed using a hydraulic compression tool equipment with a die head for the particular terminal used. Only Burndy Hypress tools shall be used for compression.

3. If the conductor termination is to be made into a circuit breaker or similar insert compartment it shall be terminated by use of a Burndy AYP HYPLUG compression connector intended for the specific conductor size, factory filled with oxide inhibitor compound. Connector must be installed using only Burndy Hydraulic compression tool specifically approved for each respective connector.
4. Connector aid shall be used for all terminations and connections. Connector aid shall be Burndy Pentrox A, NO-OX-1D Grade "A".
5. When an aluminum lug is terminated to a copper bus with a steel or copper stud or bolt, place aluminum lug on stud or bolt followed by a flat steel washer, a Belleville washer, and steel or copper nut, in that order.

2.05 MC CABLE

A. General

1. Metal clad electrical cable type “MC”, UL listed and labeled; low smoke per IEEE-FT4 1212 procedure and UL-1685 and 1569. Fire stop penetration rated. Rated for installation in environmental air plenums.
2. The cable assembly shall be rated for continuous full load operation in ambient temperatures as follows:

    a. Dry locations 90 degrees centigrade.
    b. Wet locations 75 degrees centigrade.

3. The type of MC Cable, MC fittings and supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer’s recommendations and based on applicable Codes.

B. Conductors

1. Wire conductors shall be 600 volt 60Hz AC thermoplastic insulated, copper wire conductor.

    a. Wire sizes smaller than #8 AWG shall be solid conductors. Wire sizes #8 AWG and larger shall be stranded conductors.
    b. Copper conductor - soft annealed copper, ASTM-B3 or B8. Minimum wire conductor size shall not be less than #12 AWG.

2. 600 volt color-coded insulation phase wire conductors.
3. 600 volt white insulation neutral wire conductor.
4. A 100% coverage internal jacket binder tape shall enclose all conductors, located directly under the jacket armor. The binder tape shall provide isolation of “movement” (reduce friction contact) between the conductors and the metal jacket.
5. The insulation of each wire conductor shall be individually 100% enclosed in a continuous tape. The tape shall provide isolation of “movement” (reduce

friction contact) between individual conductors insulation and between conductor insulation and the internal jacket tape.

C. Jacket

1. Interlocking flexible metal armor shall be galvanized steel armor jacket. The armor jacket shall 100% enclose the insulated wire conductors inside the armor jacket.

2. PVC Overall Cable Jacket

   a. A continuous Polyvinyl Chloride (PVC) flexible jacket shall be applied over the armor jacket 100% enclosing coverage.
   b. The PVC jacket hall is impervious to water infiltration, free of cracks and “pin-holes”.
   c. The PVC jacket shall be provided on MC locations as described in the Contract Documents.

3. The interior surfaces of fittings shall be continuous and smooth, with a constant interior diameter. Fittings shall provide fully enclosed circular cross section. The interior surfaces of fittings shall be without ridges, burrs irregularities or obstructions. Fittings of the same type shall be of the same uniform weight and thickness.
4. Protective corrosion resistant finish for MC fittings fabricated from steel shall be as follows:

   a. clean all metal surfaces (including metal threads) with acid bath “pickle” prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
   b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
   c. Threads shall be hot-dip zinc coated after machine fabrication.
   d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
   e. The inner metal surfaces shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the fitting.

5. Threads for MC Cable fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
6. Terminal connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks, and abrasion during conductor installation and electrical load “cycling” after installation is complete. The bushing shall comply with UL 94V-0 flammability. The bushing shall be visible and provide physical isolation between the jacket metal armor and the internal conductor insulation.
7. Fittings connecting to MC Cable with PVC jacket coating shall be PVC coating to match the cable.

PART 3 – EXECUTION

3.01 TRENCHING, FOOTINGS, SLEEVES

A. Provide Trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable Sections of this Specification.

B. Provide Footings for all post and/or pole-mounted lighting fixtures: concrete shall conform to the applicable Sections of this Specification.

C. Sleeves

1. Provide sleeves for raceways and conduit passing through the following construction elements:

    a. Concrete and masonry foundations, floors, walls and slabs.
    b. Lath and plaster walls and ceilings.
    c. Building structures (i.e., foundations, walls, floors, ceilings, and roofs) with a fire rating exceeding 20 minutes.

2. Sleeves shall extend 1.5 inches above floors, except under floor standing electrical equipment. Sleeves shall be flush with wall ceiling foundations and partitions exposed to public view and extend approximately 0.5 inch past penetration in fire rated construction. Sleeves shall be installed at exact penetration locations and angles to accommodate raceway and conduit routings.
3. Joists, girders, beams, columns or reinforcing steel shall not be cut or weakened. Where construction necessitates the routing of conduit or race-ways through structural members, framing or footings, written permission to make such installation shall first be obtained from the OWNER'S Representative. Such permission will not be granted, however, if any other method of installation is possible.
4. The layout and design of raceways and conduits located in or routed through masonry or reinforced beams or the OWNER'S Representative shall review walls before any work is performed. All sleeving shall be accomplished according to the instructions of the OWNER'S Representative and shall be accepted before any concrete is poured.
5. Sleeves, raceways and conduit shall be located to clear steel reinforcing bars in beams. Reinforcing bars in walls shall be offset to clear piping and sleeves.
6. Provide a continuous clearance between the inside of a sleeve and exterior of conduits and raceways passing through the sleeve not less than the following:

    a. 0.5 inch clearance except as required otherwise.
    b. 1.0 inch clearance through outside walls below grade.
    c. 3.0 inch clearance through seismic joints.

7. Sleeves set in fire rated construction shall be caulked between sleeve and building structure, additionally sleeves shall be caulked between the sleeve and the conduits/raceways passing through the sleeve. The caulking shall

be a fireproof sealant, equal to the fire rating being penetrated. Clearance between conduits inside of sleeve and exterior of conduit(s) passing through sleeve and between conduits inside the sleeve shall comply with Fireproof Sealant Manufacturer's recommendations.

8. Sleeve Material:

   a. In floor construction: Schedule 40 black steel pipe, with upper surface to be sealed watertight.
   b. In concrete or masonry walls roofs or ceilings: Schedule 40 black steel pipe. When installed in roofs or outside walls, seal outer surface watertight.
   c. In fire rated construction; lath and plaster construction: 24 gauge galvanized iron or steel.
   d. Sleeves through waterproof membranes: Cast iron or Schedule 40 steel with flashing clamp device and corrosion resistant clamping bolts. Caulk space between pipe and sleeve and surfaces between sleeve and conduits sealed watertight.

3.02 GROUNDING

A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State and Local Authorities Having Jurisdiction.

B. Where Nonmetallic Conduit is used in the Distribution System, the CONTRACTOR shall install the proper sized copper ground wire in the conduit with the feeder for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.

C. The Maximum Ground/Bond Resistance to the Grounding Electrode shall not exceed 1 ohms from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5 ohms.

D. Ground/Bond Conductors

1. Provide an additional, dedicated, green insulation equipment ground/bond wire inside each conduit type as follows. The metal conduit shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:

   a. All types of nonmetallic conduit raceways including but not limited to: RNMC - Rigid Nonmetallic Conduit.
   b. FMC - Flexible Metal Conduit.
   c. LTFMC - Liquid Tight Flexible Metal Conduit.
   d. EMT - Electrical Metal Tubing when used to support receptacle power.

2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:

   a. Every conduit path containing any length of the above identified conduits.

b. Every conduit path connected to any length of the above-identified conduits.

3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the Drawings. Install equipment ground/bond wire in each conduit/raceway, with the respective phase conductors:

a.

Feeder, Subfeeders & Branch Circuit Protection	Minimum Equipment Ground Wire Size
15 amp	#12
20 amp	#12
30 to 60 amp	#10
70 to 100 amp	#8
101 to 200 amp	#6
201 to 400 amp	#2
401 to 600 amp	#1
801 to 1000 amp	2/0
1001 to 1200 amp	3/0
1201 to 1600 amp	4/0
1601 to 2000 amp	250 MCM
2001 to 2500 amp	350 MCM
2501 to 4000 amp	500 MCM

4. Isolated grounds - Raceways containing branch circuit or feeder phase conductors connected to panelboards equipment, or receptacles with isolated grounds or isolated ground bus shall contain a dedicated insulated ground conductor connected to the isolated ground system only. The isolated ground conductor shall be continuous the length of the raceways and connected only to the isolated ground terminals in addition to and independent of the equipment bonding/ground conductor. The isolated ground conductor shall be sized as indicated above, for equipment ground/ bond wire.

5. Splices in ground/bond wires shall be permitted only at the following locations:

a. Ground buses with listed and approved ground lugs.
b. Where exothermic welded ground/bond wire splices are provided.

6. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.

E. Where Conductors are run in Parallel in Multiple Raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.

F. Ground Conductors for Branch Circuit Wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.

G. Each Panelboard, Switchboard, Pull Box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

3.03 CONDUIT

A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the Drawings, but not less than the conduit size required by Code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed in/below floors and concealed above ceilings, except as specifically noted otherwise.
3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100 volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.
4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding / bonding for a complete and operating conductor/wire raceway system.
5. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
6. Individual conduit paths and home runs shown on the Drawings shall be maintained as separate individual conduits for each homerun and path.
7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable Code Class 1 Division 1 Requirements, unless specifically noted otherwise.
8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.
9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with “concentric.ring” knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/bonding lug integrated with the conduit termination conductor fitting construction, by the fitting Manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
10. The type of conduit, type of conduit fittings, and type of conduit supports and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the Manufacturer’s

recommendations; based on the applicable codes and based on the Requirements of the Contract Documents.

B. RMC Installation Locations

RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Embedded in floors, walls, ceilings, roofs, foundations, and footings constructed with concrete.
2. Embedded in walls and foundations constructed with brick and masonry.
3. Interior of buildings, within nine feet of finish floor lines for exposed conduit locations.
4. Exterior of building for exposed conduit locations.
5. Damp or wet locations, exposed or concealed locations.
6. Exposed on roofs.
7. In hazardous materials areas and locations; below hazardous materials areas and locations; above hazardous materials areas and locations.
8. Exposed on utility service poles, for pole risers less than 9 feet above finish grade.
9. RMC conduit and RMC fittings may be installed in any location where EMT and FMC conduit is permitted to be installed.

C. PVC Coated RMC Installation Locations

PVC coated RMC conduit and PVC coated RMC fittings shall be installed in the following locations:

1. Underground conduit locations for elbows and bends with a radius of less than 36 times the conduit diameter.
2. Underground vertical risers extending above grade.
3. Installed in contact with earth or corrosive materials.
4. Exposed conduit in interior locations.

D. EMT Installation Locations

EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry locations:

1. Concealed in hollow non masonry, metal stud frame and wood stud frame walls.
2. Concealed above ceilings.
3. Exposed inside interior enclosed crawl spaces.
4. Exposed interior locations placed 9 feet or higher above finished floors.
5. Exposed in the following dedicated function areas, interior enclosed room locations:

    a. Indoor enclosed electrical equipment rooms and closets.
    b. Indoor enclosed data and telecommunication terminal rooms and closets.

c. Indoor enclosed HVAC equipment rooms and closets.

6. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.

E. FMC Installation Locations

FMC conduit and FMC fittings may be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry, interior locations:

1. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
2. Concealed above fully enclosed ceiling spaces.
3. FMC conduit shall be installed in continuous lengths between termination points. FMC shall not be “spliced” or coupled directly to FMC or any other conduit type under any circumstance.
4. The maximum continuous length of FMC that shall be installed between termination end points is 15 feet. Circuits requiring continuous conduit lengths exceeding 15 feet between termination end points shall be installed using either RMC or EMT conduits. FMC lengths shorter than 16 inches are prohibited.
5. The minimum size FMC conduit shall be as shown on the Drawings but not be less than the following:

   a. FMC lengths of 6-feet or less, minimum FMC conduit size shall be 0.50 inches.
   b. FMC lengths exceeding 6-feet, minimum FMC conduit size shall be 1.0 inches.

F. LTFMC Installation Locations

LTFMC conduit and LTFMC fittings shall be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”:

1. Final electrical connection to vibrating or rotating equipment; control and monitoring devices mounted on vibrating and rotating equipment including the following. Minimum conduit length shall not be less than 24 inches:

   a. Motor, engines, boilers, solenoids, and valves.
   b. Fixed mounted “shop” (manufacturing) production equipment.
   c. Fixed mounted food preparation equipment and “kitchen” equipment.

2. All locations where exposed flexible conduit connections are required, both indoor and outdoor.
3. Final connection to indoors electrical transformers. Minimum conduit length shall not be less than 24 inches; maximum conduit length shall not exceed 72 inches.
4. Do not install LTFMC located in environmental air plenums.

G. RNMC Installation Locations

RNMC conduit and RNMC fittings shall be installed in the following locations containing only “non-hazardous material”:

1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
2. Exposed on utility service poles, for pole risers at 9 feet or higher above finish grade, schedule 80 PVC only.
3. RNMC type “EB” conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.

H. Conduit Installation

1. Conduit Supports

a. Securely and rigidly support all raceways/conduits from the building structure. Raceways/conduits shall be supported independent of all piping, air ducts, equipment ceiling hanger wires, and suspended ceiling grid systems. Secure conduit to structural element by means of UL listed and approved hangers, fasteners, “C” channels and pipe clamps.

b. Provide conduit supports spaced along the length of the conduit as follows:

1) RMC and EMT conduit, maximum not to exceed 96 inches on center; within 24 inches of each conduit bend and conduit termination location.
2) FMC and LTFMC conduit, maximum not to exceed 24 inches on center; within 6 inches of each conduit bend and conduit termination location.

c. Suspended Conduit Methods

1) Individual, suspended raceways/conduits separated by more than 12 inches from any other conduit and suspended from ceilings and roofs shall be supported as follows:

a) Conduits smaller than 1.5 inches by means of hanger rods or hanger wires.
b) Conduits 1.5 inches and larger by means of hanger rods.
c) The conduit shall attach to the hangers with pipe clamps.

2) Suspended raceways/conduits positioned within 24 inches of any other conduit shall be grouped and supported by hanger rods using trapeze type conduit support channels ("C" channels). Conduits shall individually attach to common channels side-by-side, with pipe clamps.

d. Non-Suspended Conduit Methods

1) Individual raceway/conduits placed against wall/ ceiling/ floors, placed inside hollow wall/ceiling construction or structure framing (i.e., “dry- wall” or plaster hollow wall construction), shall be secured by means of individual pipe clamps and fasteners attached to the framing studs or other structural members and the conduit/raceway.
2) Provide common “C" channel supports for all multiple race-way/conduits placed against vertical or horizontal surfaces and positioned within 24 inches of other raceways/conduits. Attach channels to the framing studs or other structural members. Attach the conduits/raceway individually to common channels, side-by-side, with pipe clamps.
3) The use of toggle bolts is prohibited.

e. Conduit rising from floor for motor connection shall be independently supported if extending over 18-inches above floor. Support shall not be to a motor or ductwork, which may transmit vibrations.
f. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Seismic Requirements. The conduit support/anchoring system capacity shall include the weight of the conduits, conduit fittings, conduit supports and conductors/wires/ cables installed in the conduits plus a 300% safety factor. Submit Shop Drawing details showing each typical conduit anchor, conduit support and conduit brace location. Submit structural calculations performed by and signed by a Professional Structural Engineer (P.E.) with a P.E. license, registered in the State of California, U.S.A.

2. Conduit Separation

a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e. signal to signal, data to data, power to power, control to control etc.) by a minimum of 3 inches. Conduits of non-identical systems (i.e. signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12 inches.
b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2 inches; conduits for non-power systems (100 volts and less to ground) shall be separated by a minimum of 6 inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3 inches.
c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60 inches of the termination or crossing points.
d. Conduits containing Utility Company service circuits (i.e. electrical power, telephone, or cable television) shall be separated a minimum of 12 inches from all other utilities and conduits, with or without

concrete encasement; metallic or non-metallic conduit, above grade or underground conduit locations.

e. Conduits shall be separated from hot water piping, exhaust flues/ chimneys, steam piping, boilers, furnaces, ovens by a minimum of 12 inches.

3. Conduit stubs

a. Branch circuit and telephone conduits turned up from floor at the following locations shall terminate each conduit in a flush conduit coupling at the floor and then extend into partition or to equipment. Refer to OWNER'S Representative's Drawings for location of walls and partitions.

1) Interior demountable partitions.
2) Below, into or adjacent to equipment not installed directly adjoining to a wall.
3) Up from below the floor into hollow stud frame walls.

b. From each panel, and signal cabinet which is wall mounted, stub up from top of the panel/cabinet a minimum of three 1 inch conduits to the nearest accessible ceiling spaces or other accessible location. Where the floor below the panel is accessible or is a ceiling space, stub an additional three 1 inch conduits from the bottom of the panel into the accessible space below the panel. Cap conduits for future use.

c. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of 5-feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stubout conduit shall be capped. Provide concrete monuments, 6-inches x 6-inches x 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inches square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).

d. Conduits stubbed into ceiling or floor spaces from outlets for telephone, video, computer/data or television shall be provided with an insulated throat bushing, on the end of each conduit stubout.

e. Conduit stubouts from outlet boxes and equipment located in hollow stud walls, into ceiling and floor spaces, shall be EMT or RMC conduit. The stubouts shall terminate into the ceiling and floor spaces with a conduit termination connector fitting.

f. Empty conduit stubs into building spaces and equipment shall be individually identified with an "ID-tag" located at each end of the conduit. The ID-tag shall state the origination point and termination point of the respective conduit (i.e., "from PNL-A/to Room #121"; "from outlet #24/to outlet #17 in Room #120"; etc.).

g. Provide a conduit termination fitting with insulated throat bushing and mechanical ground lugs at each conduit "stub-up" location.

4. Conduit concrete encasement:

   a. Conduits which are run underground exterior to building slab shall be continuously concrete encased except, 15 and 20 amp power branch circuit conduits underground do not require concrete encasement.
   b. PVC rigid-non-metallic-type EB conduit, of any size and any location shall be continuously concrete encased the full length of the conduit installation, including under building slab.
   c. Concrete for encasement of underground conduits shall be 2000 PSI 28 days cures strength with a maximum of ¾-inch gravel. Concrete encasement of conduits shall be continuous without voids. The encasement shall extend 3-inches past the edges of all conduits on all sides of the circuit. Provide 10-pounds of red oxide cement coloring uniformly mixed with each cubic yard of concrete for conduit encasement.
   d. Conduits located below or adjacent to structural foundations shall be separated from the foundation by a minimum of 12 inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottoms of the foundation to the bottom of the conduits. The concrete shall be 4000 PSI 28 day cure strength instead of 2000-PSI concrete.

5. Underground Conduits

   a. Three or more underground conduits larger than 1-inch in size and occupying the same trench shall be separated and supported on factory fabricated, non-metallic, duct/conduit support spacers. The spacers shall be modular, keyed interlocking type, "built-up" to accommodate quantity, size orientation and spacing of installed conduits.
      The spacers shall maintain a constant distance between adjacent conduit supports and hold conduits in place during trench backfill operations. Minimum support spacer installation interval along with length of the conduits shall be as follows:

      1) Concrete encased conduits, not less than 8 feet on center.
      2) Non-concrete encased conduits, not less than 5 feet on center.

   b. Provide trenching, excavation, shoring and Backfilling required for the proper installation of underground conduits. Tops of backfill shall match finish grade.
   c. Bottoms of trenches shall be cut parallel to “finish grade” elevation. Make trenches 12-inches wider than the greatest diameter of the conduit.
   d. Backfilling Trenches for Conduits without Concrete Encasement Requirements

      1) Conduits which are not required by the Contract Documents to be concrete encased and are located exterior to building slab, shall be set on a 3 inch bed of damp clean sand.

Conduit trenches shall be backfilled to within 12 inches of finished grade with damp sand after installation of conduit is completed. Remainder of backfill shall be native soil.

2) Conduits located under a building which are not required by the Contract Documents to be concrete encased, shall be completely backfilled and compacted with clean damp sand to the same level as the building foundation pad.

3) Provide a continuous yellow 12 inches wide flat plastic tracer tape, located 12 inches above the conduits in the trench. The tracer tape shall be imprinted with “Warning-Electric Circuits” a minimum of 24 inches on center.

e. Backfilling Trenches for Conduits with Concrete Encasement Requirements by the Contract Documents.

1) Trenches with all conduits concrete encased shall be backfilled with clean damp sand when located under building pads.

2) Trenches with all conduits concrete encased and not located under a building pad and not located under paved areas shall be backfilled with clean damp sand or native soil.

f. Backfill Material

1) Sand and native soil backfill of trenches shall be machine vibrated in 6-inch lifts to provide not less than 90% compaction of backfill.

2) Concrete and slurry mix shall be machine vibrated during installation to remove “air-voids”.

3) Soil shall have no stones, organic matter of aggregate greater than 3 inches.

4) The slurry mix shall consist of concrete, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.

g. Do not backfill until OWNER’S Representative has approved installation and As-Built Drawings are up to date. Promptly install conduits after excavation has been done, so as to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.

h. Install underground conduit, except under buildings, not less than 24-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.

j. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72 inches and the specified separation and depths are maintained when crossing over the top of

the existing underground utility, the conduit may cross above the existing underground utility.

k. Provide long radius horizontal bends (minimum radius of 36 times the conduit diameter) in underground conduits where the conduit is in excess of 100 feet long.

l. Conduits installed below grade and on grade below buildings, shall not be smaller than 0.75 inches. Conduits for circuits exceeding 600 volts shall not be smaller than 5.0 inches.

m. Underground conduits entering a building shall be sloped. The conduit direction of slope shall be away from the building, and shall prevent water in the conduit from "gravity draining" towards the building. The conduit slope "high point" shall originate from the building, out to the first exterior pullbox, manhole etc. exterior conduit termination "low point". The minimum slope angle shall be a constant 8 inches (or greater) of fall for each 100 feet of conduit length.

n. Dewatering

1) Provide pumping to remove, maintain and dispose of all water entering the excavation during the time the excavation is being prepared, for the conduit laying, during the laying of the conduit, and until the backfill at the conduit zone has been completed. These provisions shall apply on a continuous basis.

Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the construction. Groundwater shall not be allowed to rise around the pipe until joining compound has firmly set.

2) The OWNER'S Representative shall be notified 48 hours prior to commencement of dewatering.

5. Raceway/Conduits, which are installed at this time and left empty for future use, shall have 0.25 inch diameter polyvinyl rope left in place for future use. The pull rope shall be 500-pound minimum tensile strength. Provide a minimum of 5 feet of slack at each end of pull ropes.

6. Unless otherwise restricted by Structural Drawings and Specifications, the maximum size conduit permitted in slabs, wall ceilings and roofs constructed of masonry or concrete shall not be greater than 25% of the concrete/ masonry thickness. Conduits installed in these locations shall not cross.

7. Provide openings in building structures for conduit penetrations:

a. New construction shall be provided with conduit sleeves, to provide conduit penetrations.

b. Existing construction shall be drilled (core drill masonry and concrete) and provide conduit sleeves installed after drilling, to provide conduit penetrations.

c. Where the structure penetrations for underground conduits penetrating through foundations will not comply with the (restriction/ penetration) shown in the Contract Documents, install the conduits below and clear of the foundation lowest point.

8. Conduit Bends Risers and Offsets

a. The minimum bend radius of “factory or field” fabricated conduit bends shall not be less than the following. The bend radius shall be measured at the surface, inside radius of the conduit wall.

1) FMC and LTFMC conduit - conduit minimum bend radius 12 times the conduit diameter.
2) RMC and EMT conduit minimum bend radius - conduit for power circuits over 100 volts and less than 600 volts, 8 times conduit diameter. Conduit for power circuits over 600 volt, 12 times conduit diameter. Conduit for signal and fiber optic circuits, 10 times conduit diameter.
3) RNMC conduit - conduit minimum bend radius 36 times the conduit diameter. Under building reduce minimum bend radius to 10 times the conduit diameter. Conduit bends and offsets in RNMC with less than 36 times conduit diameter bend/offset radius shall be RNMC PVC schedule 80 or PVC coated RGS.
4) Conduits for Utility Company conductors. Conduit minimum bend radius shall comply with the respective Utility Company Requirements.

b. Bends and offsets in conduits shall be kept to an absolute minimum. The total summation of all bends and offsets permitted in a conduit segment, occurring between two conduit termination/connection end points, shall not exceed the following, including conduit fittings:

1) RMC and EMT conduit - 360 angular degrees
2) FMC and LTFMC conduit - 180 angular degrees
3) RNMC conduit - 270 angular degrees

c. Each field fabricated conduit offset, bend and elbow which are not the standard product of the Raceway/Conduit Manufacturer shall be mandrel tested. The test shall be conducted after the conduit installation is complete and prior to pulling-in any wire, in the same manner as for underground conduits.

d. Factory manufactured angle connector conduit fittings shall be installed in exposed conduit locations only. Installation in locations normally concealed from view shall not be permitted. Not more than one factory manufactured angle connector shall be permitted in any length of conduit between conduit termination end points.

e. RNMC conduit risers from below grade shall be PVC coated RGS. Conduit risers, bends or offsets entering into a building shall be PVC coated RGS.

f. If three or more conduit-bends of the same conduit size and same conduit material type, installed, as part of the Contract Work, fail to comply with the required minimum conduit bend radius or conduit angular degree limits. The following corrective actions shall occur:

1) The CONTRACTOR shall remove all the non-complying conduit bends and the respective wire in the conduit from the Project site. Provide new conduit and wire, complying with the Contract Documents.
2) Where the conduit bends similar to the non-complying conduit bends are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the conduit bends to allow visual observation.
3) The CONTRACTOR shall remove the non-complying conduit bends and dispose of the Project site. The CONTRACTOR shall provide new conduit bends and conductors complying with the Contract Documents.
4) All the costs to correct the deficient material and work along with costs to repair the direct, indirect, incidental damages and contract delays shall be the sole responsibility of the CONTRACTOR and shall be included in the bid price.

9. Expansion joint, deflection joint and seismic joint fittings.

a. Provide a conduit expansion fitting for each conduit length and conduit type as follows (Note - The installation of specified combination expansion/deflection fittings at seismic joints shall satisfy this Spacing Requirement also):

	Conduit Type	Conduit	Fitting Length Spacing
1)	RMC and EMT	Exposed exterior locations	200 feet
2)	RMC and EMT	Interior weather protected locations	400 feet

b. Provide a conduit combination expansion/deflection fitting for each conduit, crossing the following elements:

1) At each building or non-building structure seismic joint.
2) At each building on non-building structure expansion joint.
3) At each conduit penetration of a “sound-rated” wall, floor or ceiling.

10. Provide two locknuts and an insulated throat bushing at each metal conduit terminating at enclosures, including but not limited to outlet boxes, junction boxes, terminal cabinets, switchgear, transformers, distribution panels, switchboards and panelboards.
11. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.
12. Conduit run exposed, shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds, OZ or

equal. Conduits run on exposed beams or trelliswork shall be painted to match surrounding surfaces.

13. Conduit Exposed on Roof

    a. Conduits installed exposed on roofs shall be installed on conduit sleepers. Place the conduit sleepers a maximum 5-foot on center along the entire length of the conduit; under conduit expansion/ deflection fittings; under each junction box and within 24 inches of each conduit bend.
    b. Provide a conduit support “C” channel continuous along the top length of the sleeper and rigidly bolted to the sleeper. Conduits shall be loosely fastened to each sleeper “C” channel with pipe clamps to allow for relative movement between the sleeper and conduit.
    c. Conduits shall not block or interfere with roof hatches, doors, ventilation openings, dampers, equipment access panels/doors, roof water drainage.
    e. Conduit sleepers shall be fabricated from “clear” solid redwood 4 inches x 4 inches (nominal) size. Sleeper length shall extend a minimum of 9 inches past the conduits attached to the sleeper, but in no case shall the length of the sleeper be less than 24 inches.
    f. Provide a pad under each sleeper; sleepers shall not be installed in direct contact with the roofing. Sleeper pads shall extend a minimum of 6 inches past each side of the sleeper. The sleeper pad shall be semi-rigid mineral surfaced composition board, not less than 0.375 inch thickness, bituminous impregnated, manufactured for application on the specific roofing material. Remove roofing “ballast” (gravel) under pad, prior to installation of sleeper pad. Do not puncture roof membrane.
    g. Position the “length” of the conduit sleepers’ perpendicular to the roof slope, to prevent obstruction of roof drainage water flow. Where the conduit routing prevents placing the conduit sleeper parallel to the roof slope, provide two separate sleeper pads for the conduit sleeper, with a continuous 3-inches wide water drainage gap between the sleepers. Align the water drainage gap to allow unimpeded water travel along the roof slope drainage flow line between the pads.
    h. Sleepers and sleeper pads shall be set in nonhardening mastic, a minimum of 0.25 inch thickness. Mastic shall be inorganic, nonhardening, and complying with ASTM-D1227. Mastic shall be applied with continuous uniform coverage, minimum 0.25 inch thickness, on all the surfaces of each conduit sleeper and on the sleeper pad contact surface with the roof.

14. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.
15. RMC Conduit Threads

    a. Machine cut threads on RMC conduit required for field fabrication shall comply with NPS and ANSI-B1.20.1.
    b. The length of bare metal exposed during thread fabrication shall be completely covered by conduit couplings and fittings. Additionally, the

thread length shall insure that conduit joints will reach “torque” tightness and become secure before conduit ends “butt” together and before conduit ends “butt” into the “shoulders” of other conduit fittings.

c. Running threads or right/left handed threads shall not be used to connect RMC.

16. RNMC Conduit

a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.

17. Tighten each conduit fittings and fitting appurtenance, to the “torque” (allowable tolerance ±5%) value recommended by the Fitting Manufacturer and applicable Code. If three or more conduit fittings are found to not be in compliance with the Manufacturer’s “torque” (tightness) recommendations, the following corrective actions shall occur:

a. The CONTRACTOR shall tighten “re-torque” the defective fittings and all similar conduit fittings installed as part of the Contract Documents in the presence of the OWNER’S Representative.
b. If the respective conduit fittings similar to the deficient “torque tightness” fittings are installed concealed in walls, floors, above ceilings or below grade, the CONTRACTOR shall expose the fitting, to allow retightening each similar conduit fitting to the Manufacturers recommended “torque” values.
c. All the cost to repair the direct, indirect, incidental damages and contract delays resulting from complying with these Requirements shall be the sole responsibility of the CONTRACTOR and shall be included in the bid price.

K. Nailing Shields

1. Provide “nail” shields where FMC conduit and conductors not installed in a conduit are installed through wood stud and wood frame construction. The nail shield shall provide a barrier resistant to “nailing” fasteners through the stud, and penetrating into the FMC and conductors.
2. The nail shields shall be flat nominal 1.5 inch x 3 inches, 14-gauge steel and hot dip zinc galvanized with “nailing spurs”.
3. Provide nailing shields on the front face and rear face of each FMC penetration. The shield shall be centered on each penetration through the respective framing, stud framing blocking, and stud framing plates.

L. Conduit Bodies

1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.
2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
3. Conduit bodies shall not be installed inside enclosed walls.

3.04 WIRE AND CABLE

A. Branch Circuit and Fixture Joints for #10 AWG and Smaller Wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".

B. Branch Circuit Joints of #8 AWG and Larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5 times the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.

C. Use UL Listed Pulling Compound for Installation of Conductors in Conduits.

D. Correspond each Circuit to the Branch Number Indicated on the Panel Schedule shown on the Drawings except where departures are approved by the OWNER'S Representative.

E. Control wiring to conform to the wiring diagrams shown on the Mechanical Drawings and the Manufacturer's Wiring Diagrams.

F. All Splices in Exterior Pull Boxes and Light Poles shall be cast resins encapsulated.

1. Power conductor splices - 3M Scotchcast Series 82/85/90; Plymouth or equal.
2. Control and signal circuits 3M Scotchcast Series 8981 thru 8986, Plymouth or equal.

G. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inches on centers. Tag all spare conductors.

3.05 MC CABLE INSTALLATION

A. General

1. MC Cable shall not be "spliced" or coupled directly to any other conduit type under any circumstance.
2. MC Cable shall not be installed exposed. Where exposed installation occurs, provide a conduit to completely enclose and protect the MC Cable. The inside diameter of the conduit shall be sized 1.6 times the outside diameter of the MC Cable. The conduit type and installation methods shall comply with the Contractor Documents.
3. MC Cable shall be continuous length between end point terminations, without intermediate splices or junctions.

4. MC Cable shall be supported and attached. MC Cable supports and attachments shall be the same as Contract Document Requirements for conduit, with the following exceptions:

    a. Support at not more than 3-feet intervals along the entire length of the MC Cable.
    b. Support within 12 inches of each bend or change of direction.
    c. Support within 12 inches of each termination entrance.

5. The minimum installed bending radius shall not be less than eight times the outside diameter of cable assembly, as measured at the inside radius cable jacket surface.
6. Cable lengths of less than 6-feet shall not be permitted.
7. MC Cable shall be installed and terminated to comply with Manufacturer's recommendations.

B. Permitted Applications

1. MC Cable may be provided only for electric power circuits and where complying with all of the following conditions:

    a. Circuits operating on line to ground 60Hz, AC circuit voltages, exceeding 100 volts and less than 500 volts.
    b. The full load ampere rating and circuit conductor quantities of the proposed MC Cable shall be equal to or greater than the full load ampere rating for the conduit and wire conductors shown on the Contract Drawings.
    c. The electrical circuit voltage drop of the proposed MC Cable shall be equal to or less than for the conduit and wire conductor sizes shown on the Contract Drawings.
    d. The conductor sizes in MC Cable shall not be smaller than the conductor sizes described for conduit and wire installations.
    e. MC cable shall <u>not</u> be permitted on circuits with more than one phase conductor per phase.

2. MC type cable may only be installed in the following locations in areas that do not contain classified hazardous materials (MC Cables without PVC jacket):

    a. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
    b. Concealed above fully enclosed ceiling spaces.

3. MC Cables with PVC jacket may only be installed in the following locations:

    a. Underground installation locations.
    b. MC Cable installed below grade shall be not less than #4 AWG conductor size.
    c. The Underground Installation Requirements for MC Cable shall be the same as for conduit and wire systems including but not limited to

trenching, burial depth, circuit separation, supports, concrete encasement, etc.

d. MC Cables shall not be installed below areas with classified hazardous materials.

END OF SECTION

SECTION 16160

BRANCH CIRCUIT PANELBOARDS, DISTRIBUTION PANELS AND TERMINAL CABINETS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and drawings for related work required to be included as work under Division Sixteen.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide Manufacturers Catalog Data for Panels, Cabinets and Circuit Breakers.

B. Provide Shop Drawing Showing Panel Circuit Arrangements, Size, Voltage, Ampacity, Overcurrent Protective Devices, etc.

C. Provide Nameplate Engraving Schedule.

D. Short Circuit and Arc-Flash

1. Perform and submit engineered settings for each fuse and adjustable circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest applicable Standards of IEEE and ANSI. Provide Electric Arc-Flash calculations as part of the Coordination Study recommendations. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative, six copies.
2. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment, including but not limited to:

    a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
    b. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.
    c. CEC/NEC

3. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, disconnects, etc., shall each be labeled by the Manufacturer with “Electrical-Arc-Flash” warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by Personnel, to wear the correct Protective Equipment/clothing (PPE) when working “Live”, or operating “Live” equipment and circuits.

PART 2 - PRODUCTS

2.01 PANELBOARDS AND DISTRIBUTION PANELS

A. Shall be flush or surface mounting as indicated with circuit breakers as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.

B. Where indicated on the Drawings shall be furnished with subfeed breakers and/or lugs, split bussing, contactors, time switches, relays, etc., as required.

C. All Panels Shall be Keyed Alike.

D. Shall be finished with one coat of zinc chromate and coat of primer sealer after a thorough cleaning where exposed to public view (e.g., corridors, covered passages, offices, etc.) and gray in switchboard, janitor's heater and storage rooms. Prime coated panelboard shall be painted to match surroundings after installation. Shall be fabricated of sheet steel of the following minimum gauges: Door and trim #12; enclosure - code gauge steel.

E. Furnish all panels and terminal cabinets with the manufacturers flush locks and keys except where indicated otherwise herein. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.

F. Panels 208/120-volt, three phase, 4-wire, S/N or 120/240-volt, single phase, 3-wire, S/N.

Panel types as manufactured by:

1. Eaton ..... Type Pow-R-Line 1
2. General Electric ..... Type "A" Series
3. Square D ..... Type NQOD
4. Siemens ..... Type “S” Series

G. Panels for 480/277-Volt, Three Phase, 4-Wire, S/N.

Panelboard types as manufactured by:

1. Eaton ..... Type Pow-R-Line 2
2. General Electric ..... Type “A” Series
3. Square D ..... Type NEHB
4. Siemens ..... Type “S” Series

H. Distribution Panels Shall be as Manufactured:

		Narrow	Wide
1.	Eaton	Pow-R-Line 3	Type CDP
2.	General Electric		Type CCB or QMR
3.	Square D		Type HCN or HCM

4. Distribution panelboards for 208/120 volt three phase and 120/240 volt single phase shall be similar to the 480/277 volt panelboards.

I. Panels for bussing sizes through 400-amp shall be 20-inches wide. Surface or flush mounting as indicated. Recess mounted type shall have a 20-inches wide

(maximum) recess metal enclosure with trim plate cover extending 1-inch on all sides of enclosure. Depth shall be 5¾-inches nominal. Height of panel as required for devices.

J. Provide 6-inches additional gutter space in all panels where double lugs are required or where Cable Size exceeds Bus Size. Minimum bottom gutter space shall be 6-inches high. 12-inches additional gutter space may be required for aluminum feeders where used.

K. Panels with bus sizes greater than 400 ampere for 480/277-volt, three-phase, 4-wire, S/N or 480 volt, three phase, 3-wire shall be 24-inches (maximum) wide by 6½-inches (maximum) deep units and 30-inches to 40-inches (maximum) wide by 8-inches to 12-inches (maximum) deep units. The wider units shall be used only at locations where the narrow unit is not available with the number of 225-ampere frame branch circuits shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.

L. Panelboards shown on the Drawings with relays, time clocks or other control devices shall have a separate metal barriered compartment mounted above panel with separate hinged locking door to match panelboard. Panelboards with circuits controlled by low voltage remote control relays shall be provided with separate cabinets to contain the relays, adjacent to the panelboard. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

M. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have numbers imprinted to match circuit breaker numbers.

2.02 SHORT CIRCUIT RATING

A. Branch circuit panelboard circuit breakers and bussing shall be rated for short circuit interrupt and withstand symmetrical amperes as follows (but in no case less than shown on the Drawings):

	C/B and/or Bus Rating	Panel Voltage	Short Circuit Amp.
1.	400A and less	240V and below	10,000A
2.	400A and less	over 240V & below 600V	14,000A
3.	Over 400A & 800A & below	240V and below	25,000A
4.	Over 400A and 800A and below and below	over 240V 600V	18,000A

2.03 CIRCUIT BREAKERS

A. Manufacturer

1. Circuit breakers as manufactured by the following companies only are acceptable:

   a. Eaton
   b. General Electric Co.
   c. Square D Co.
   d. Siemens

B. Configuration

1. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the Drawings.
2. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
3. Panelboard circuit breakers shall be bolt on type.

C. Where 2-pole or 3-pole breakers occurs in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.

D. Lock-Off and Lock-On

1. All circuit breakers shall be pad-lockable in the "off" position. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval). Other means of attachment shall not be accepted without prior written approval of the OWNER'S Representative.
2. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall be furnished with lockout clips, mounted in the “on” position. The breakers shall be able to trip automatically with lockout clips in place.
3. Provide lock-on clips on branch circuit breakers supplying fire alarm equipment and fire alarm panels. Provide identification of the dedicated "fire alarm" circuit function and operation. Color-code the circuit breakers to comply with AHJ Requirements.

2.04 BUSSING

A. Bus Material

1. Bussing shall be rectangular cross section copper; alternately silver or tin-plated aluminum.
2. Bussing shall be full length of the enclosure.

B. Ground Bus

1. Each panel shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. Provisions

1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the Drawings.

2.05 TERMINAL CABINETS

A. Terminal Cabinets shall be fabricated of code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the Drawings, and complete with hinged lockable doors and the number of 2-way screw terminals required for

termination of all conductors. Terminal cabinet locks to operate from same key used for panelboards. The trim to terminal cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door to terminal cabinets. Terminal cabinets shall have 5/8-inch plywood backing. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning where exposed to public view (e.g., corridors, covered passages, offices, etc.) and gray in switchboard, janitors, heater, and storage rooms. Prime coated cabinets shall be painted to match surroundings after installation.

B. Terminals for Signal Systems Cabinets to Cannon Type “SS”.

C. Provide Engraved Nameplate on each Cabinet Indicating its Designation and System (i.e., “Life Safety System - Panel 2LS”).

PART 3 - EXECUTION

3.01 MOUNTING

A. Flush Mounted Panelboards and Terminal Cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.

B. Surface Mounted Panels and Terminal Cabinets shall be secured to walls by means of preformed steel channels securely fastened to at least two studs or structural members.

C. Panelboards shall be Installed to Insure the Top Circuit Protective Device (including top compartment control devices) are not more than 6-feet-6-inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on Shop Drawing submittals each panel where these conditions cannot be met.

3.02 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Provide a Red and White Bakelite Nameplate with ½-inch High Letters in each 277/480-Volt Panel Fastened to Face of Dead-Front Plate, to Read: “DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY”.

B. Panel Manufacturer shall stencil the panel number identification on the inside of panel door to correspond with the panel designation on the Drawings.

C. Identification Plates and Numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

3.03 SPARE CONDUITS (ADDITIONAL REQUIREMENTS)

Provide three 1-inch conduit only stubs from each panel and terminal cabinet into accessible ceiling space. Where floor below panel or terminal cabinet is accessible, provide three 1-inch conduit only stubs into accessible floor space.

END OF SECTION

SWITCHBOARDS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division Sixteen.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide Schematic "ladder type" logic control wiring diagrams and "point-to-point control wiring diagrams showing control and protective systems interlocks.

B. Provide Nameplate Engraving Schedule.

C. Submit Full-Scale Time/Current Transparencies on Log/Log Paper for all Fuses, circuit breakers, ground fault system devices, and relays.

D. Short Circuit and Arc-Flash

1. Perform and submit engineered settings for each fuse and adjustable circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest applicable Standards of IEEE and ANSI. Provide Electric Arc-Flash calculations as part of the Coordination Study recommendations. The information shall be submitted in tabular form with an engineering narrative, six copies. Obtain the necessary information to complete the calculations from the serving electrical utility company.
2. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract Equipment, including but not limited to:

    a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
    b. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.
    c. CEC/NEC

E. Factory Tests: Switchgear Tests - ANSI C37.20. Certified copies of design tests, production tests, and conformance tests of the switchgear shall be submitted and review comments shall be received before delivery of equipment to the project site. In lieu of the above tests, a report of these tests previously performed on identical units of each rating will be acceptable.

1.03 APPLICABLE STANDARDS

A. The Switchgear Equipment shall be Designed, Tested and Assembled to comply with ANSI, IEEE, and NEMA and UL.

B. Equipment Components/Devices, Switchboards, and/or Switchgear shall be manufactured by: General Electric, Eaton, Square–D, or Siemens.

PART 2 - PRODUCTS

2.01 BUSSING

A. Horizontal and Vertical Busses shall be full lengths in each Equipment Section. Buses shall have a minimum withstand rating equal to available fault current indicated on Drawings, but in no case shall the rating be less than 42,000-amp, symmetrical.

B. Provide Interconnected Full Capacity Neutral Bus in each Section with the same ratings and construction as the phase busses.

C. Provide Interconnected Ground Bus in each Section.

D. Provide Space and all Hardware and Mounting Attachments for future devices as indicated on the Drawings.

E. Main Horizontal Bussing shall be full capacity in all Switchboard Sections.

F. Vertical Buss may be Tapered, to not less than 1/3 the ampacity are of the Main Horizontal Buss; but in no case shall the vertical buss be of less capacity than the sum of the frame size ampacities of overcurrent devices mounted in the respective Sections including any indicated spares and spaces.

G. The Switchboard Bussing shall be of sufficient cross-sectional area to meet UL Standard 891 on temperature rise Bus shall be copper with silver plated bus joints or extruded aluminum with tin plated bus joints. The through bus shall have provisions for the addition of future Sections. The through bus supports, connections and joints are to be bolted with grade 5 hex head bolts and Belleville washers to minimize maintenance Requirements.

2.02 CIRCUIT BREAKERS

A. General

1. Circuit protective devices as indicated on the Drawings. All devices shall have an interrupting capacity not less than the maximum available fault current at the circuit breaker as indicated on the Drawings, but in no case shall the interrupting capacity be less than 65,000-amp symmetrical interrupting for 480/277 volt devices and 42,000-amp symmetrical for 240 volt or 208/120 volt devices.
2. Provide padlock-off devices on each device. Breakers shall provide time overcurrent and instantaneous circuit protection.

3. Circuit breakers shall employ a stored energy, quick make-quick break, and trip free operating system on each phase, with common trip. Breakers shall comply with UL 489 and NEMA AB1 latest revisions.
4. Circuit breakers noted as "100%" on the Drawings shall be tested and rated to carry the breaker full rated (100%) ampere load continuously including the assemblies the circuit breakers are installed into.
5. Provide conductor lugs on circuit breakers to accept conductor sizes and quantities shown on Drawings.
6. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with “Electric-Arc-Flash” warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by Personnel while energized. The sign shall instruct personnel to wear the correct Protective Equipment/clothing (PPE) when working “Live”, or operating “Live” electrical equipment and circuits.

B. Performance Requirements for Circuit Breakers Conforming to one or more of the following applications:

- 600-amp or larger frame size.
- Larger than 400-amp trip.
- Service entrance in main switchboard.
- Noted as main circuit breakers on the Drawings.

1. Circuit breaker shall employ current sensors and static electronic automatic trip system. Three phase or single-phase operation as noted on the Drawings. Current carrying components shall be completely isolated from the static trip units. The trip unit shall be independent of external power sources. Circuit breaker shall be UL listed for reverse connection.
2. Breaker solid state trip control functions shall provide the following field adjustable features;

   a. Adjustable ampere setting to vary the continuous current carrying capacity, minimum range of 80% thru 100% of full load trip rating.
   b. Adjustable long-time delay setting to vary the time the breaker will trip under sustained overload conditions. Minimum of three settings, "minimum - intermediate - maximum".
   c. Adjustable short-time pickup to vary the level of high current the breaker can carry for short periods of time, minimum range of 2 times thru 8 times of ampere setting.
   d. Adjustable short time delay to vary the time of the short-time pickup. Minimum of three settings "minimum-intermediate-maximum".
   e. Short time "I^2t" switch to allow a current-squared multiplied by time ramp function in the short-time system. Two position setting "in-out".
   f. Adjustable instantaneous pickup to vary the breaker ampere setting for immediate (instantaneous) interruption of severe overloads (short circuits). Adjustable minimum range of 2.0 times thru 9 times of circuit breaker ampere sensor rating (note where the coordination study requires a higher instantaneous setting, change the specified adjustable instantaneous trip to fixed instantaneous trip at 15 times the breaker ampere sensor setting).

g. Individual fault trip indicators shall provide local indication on the breaker for overload and short circuit (and ground fault where applicable) conditions.
h. Provide one Manufacturer standard test set for solid state trip circuit breakers.

3. Arc Energy Reduction

a. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1,200-amp or higher the following shall apply:

1) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s).
2) Method to Reduce Clearing Time. One of the following or approved equivalent means shall be provided:

a) Zone-selective interlocking
b) Differential relaying
c) Energy-reducing maintenance switching with local status indicator
d) Energy-reducing active arc flash mitigation system
e) An approved equivalent means

C. Performance Requirements for Circuit Breakers Conforming to one or more of the following applications:

- Smaller than 600 amp frame size.
- 400 amp and smaller trip.
- 225 amp and larger frame size.
- Larger than 100 amp trip.

1. Circuit breaker shall be molded case thermal-magnetic or solid-state trip. Thermal-magnetic circuit breakers shall be furnished with field adjustable, instantaneous magnetic trip element.
2. Solid state trip breakers shall conform to the Requirements described for solid state breakers larger than 400 amp trip except, only the following field adjustments are required;

a. Ampere setting adjustable minimum range of 80% thru 100% of full load trip rating.
b. Short time pickup adjustable minimum range of 2 times thru 8 times of the ampere setting.
c. Fixed or field adjustable instantaneous trip.

D. Performance Requirements for Circuit Breakers Conforming to the following applications:

- 100 amp frame size and smaller.
- 100 amp and smaller trip.

1. Circuit breaker shall be molded case thermal-magnetic trip.

E. Series Rated Circuit Breakers (SR)

1. Performance Requirements for circuit breakers conforming to the following applications:

- 400 amp and smaller trip and identified as Series Rated (SR) on the Drawings. Circuit breakers shall be UL listed for series rating with all downstream circuit breakers.

2.03 SWITCH AND FUSE FEEDER PROTECTIVE DEVICES

A. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses. Switches with ratings up to and including 100-amp at 240 volts shall be twins mounted. Switches rated through 60-amp and 480 volts shall be twins mounted. Switches shall be removable from front of switchboard without disturbing adjacent units or switchboard bus structure.

B. Fuses shall be time delay current limiting types, UL Class RK-1 unless otherwise indicated on the Drawings. Provide one spare set of fuses of each size and type in each switchboard.

2.04 MAIN SWITCHBOARDS

A. Switchboard shall be floor-mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more Vertical Sections with group mounted non-drawout circuit protective devices, instrumentation and control wiring as indicated on the Drawings and as specified herein.

B. Switchboard shall be designed, built and tested in accordance with applicable portion of the latest editions of NEMA PB-2, Underwriters Laboratories No. UL-891 and the National Electrical Code.

C. Switchboard Sections shall be floor standing self-supporting, of the universal frame type using die-formed, 12-gauge steel members bolted and welded together. Provide removable side and rear plates with formed edges all around. Provide ventilation openings required maintaining minimum operating temperature. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location. Bolt individual Sections together to form a single rigid switchboard assembly. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each Distribution Section of the switchboard, containing group mounted feeder protective devices.

D. Switchboard shall include, but not be limited to, the following:

1. Underground Pull Section as required by the serving utility incoming service.
2. Metering facilities as required by the serving utility.
3. Current transformer space.
4. Main disconnects.
5. Distribution and feeder circuit protective devices.
6. Owner metering (where indicated on Drawings).
7. Bussing, incoming utility compliant and distribution.

2.05 DISTRIBUTION SWITCHBOARDS

A. Switchboards shall be floor mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more Vertical Sections with group mounted circuit protective devices, instrumentation and control wiring as indicated on the Drawings and as specified herein. Switchboards shall comply with UL Standard #UL-891.

B. Distribution switchboards shall include but not be limited to the following:

1. Main disconnects (where indicated on Drawings).
2. Feeder protective devices.
3. Owner metering (where indicated on Drawings).
4. Bussing.

C. Switchboard Sections shall of the universal frame type using die-formed, 12 gauge steel members bolted and welded together. Provide removable side and rear plates with formed edges all around. Provide ventilation openings required maintaining minimum operating temperature. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location. Bolt individual Sections together to form a single rigid switchboard assembly. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each Distribution Section of the switchboard, containing group mounted feeder protective devices.

2.06 CONTROL WIRING

A. Terminal Blocks with Barriered Terminals shall be provided for all control wiring terminator points. Control wiring shall be run in horizontal and vertical, isolated, internal metal wireways and shall be carried across hinges in laced bundles. Wire terminators shall be crimp-on type spade terminal

B. Secondary Control Wiring shall be a minimum of 14 AWG stranded copper type SIS 600-volt insulation.

C. Control Circuits shall have circuit number tags at each termination or break in the wire to match circuit numbers on terminal strips and control wiring diagrams.

PART 3 - EXECUTION

3.01 INSTALLATION

Install switchboards in accordance with Manufacturer's written instructions and applicable portions of NECA's "Standards of Installations" for switchboards and motor control centers.

3.02 SWITCHBOARD ANCHORING

Bolt switchboards to floor and wall where wall exists. Where units are free standing provide preformed steel channel or angle iron bracing to nearest wall or building structural member. Switchboard anchoring shall be designed for a 1.0 gravity lateral acceleration of the equipment. Submit structural calculations and details.

3.03 TESTING (ADDITIONAL REQUIREMENTS)

Adjustable settings shall be set and tested after the equipment installation is complete, for proper operation at set pickup and/or drop-out points, by an independent Test Laboratory. Testing shall comply with the Equipment Manufacturer recommendations. Submit three copies of all test results to OWNER'S Representative. Correct any deficiencies and retest.

3.04 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Provide a Red and White Bake-lite Nameplate with ½-inch High Letters in each Section Fastened to Face of Dead-Front Plate, to Read: "Danger 480 (actual volts) volts, KEEP OUT, AUTHORIZED PERSONNEL ONLY".

B. Manufacturer shall stencil the equipment name on each device and equipment section to correspond to the identification of the Drawing.

C. Devices Mounted in Equipment Controlling Protective Devices shall be provided with nameplates indicating device controlled or monitored.

END OF SECTION

MOTOR CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for, and incidental to, performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division Sixteen.
2. General Provisions and Requirements for electrical work.

PART 2 - PRODUCTS

2.01 INDIVIDUAL STARTERS

A. Manual Motor Starters:

1. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4-inch square outlet box or the larger type requiring a special box and cover designed to accept the particular unit.
2. Unless otherwise noted on the Drawings, all manual starters for single phase motors, smaller than 1 h.p., shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p., and all three phase motors up to 5 h.p. shall be the heavy duty type.
3. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet, and engraved nameplate to indicate function of pilot light.
4. Motor starters as manufactured by the following:

Manufacturer	1 h.p. and Below	Single Phase Others
Arrow Hart	Type RL	Type LL
General Electric	CR 101	Class CR 1062
I.T.E.	Class C10, C11 or C12	Class C20
Square D Company	Class 2510, Type A	Class 2510, Type B & C
Westinghouse	Type MS	Type A100
Allen Bradley	Equal	Equal

B. Individual Magnetic Motor Starters:

1. Three phase magnetic motor starters NEMA Size 1 and larger controlling three phase motors 5 horsepower and larger shall provide integral motor single phasing protection. The starter shall automatically "open", turn off electrical power to the connected motor in the event of the loss of one or more circuit phases, lock out and require manual resetting of the single

phase protection to restart the magnetic motor starter. Provide single phase annunciator. Provide adjustable time delay, minimum range 0-3 seconds for initiating single phase shut down.

2. Magnetic motor starters shall be AC line voltage, across-the-line units in NEMA Type I enclosure, unless other types of enclosures are indicated.
3. All starters located outside of a building whether or not indicated shall be W.P. (weatherproof), and all starters noted W.P. shall be furnished in NEMA Type 4 cast or stainless steel enclosures.
4. Starters shall be horsepower rated for the motor controlled, and shall be equipped with properly sized overload elements. Every pole shall be with overload element.
5. Verify the exact motor current and voltage characteristics with the supplier of the motor before installation of a starter.
6. Each starter shall be equipped with "Hand-Off-Auto" switch or stop-start pushbutton as required.
7. Coils shall be designed to operate on voltage indicated on control diagrams and have built-in-under the voltage release for coil circuit to drop motor starter off the line when the line voltage drops below normal operating voltage.
8. The coil control circuit shall be independently fused, sized to protect coil.
9. Starters to be equipped with running pilot light indication with a "Push-to-Test" feature.
10. Magnetic starters shall have a minimum of two auxiliary contacts. Additional auxiliary contacts shall be provided as required to comply with the Requirements of the wiring diagrams on the Electrical, Mechanical and Plumbing Drawings and the description of the function in the Mechanical and Plumbing Sections of the Specifications.
11. Minimum starter size shall be NEMA Size 1 unless indicated otherwise.
12. Magnetic motor starters as manufactured by the following:

Manufacturer	Type
General Electric	Class CR 106
I.T.E.	Class A20
Square D Co.	Class 8536
Westinghouse	Type A200 (Size 4 Max.) or Class II-200 (Sizes 5 thru 8) Allen Bradley Equal

2.02 INDIVIDUAL COMBINATION MOTOR STARTERS

A. Combination starter shall incorporate fused disconnect switch and individual magnetic motor starter in a common enclosure. Combination starters shall be mounted in general purpose enclosures unless otherwise indicated on the plans. Provide oversized enclosures where required to accommodate the components and/or wiring indicated. Starters shall comply with NEMA Standards, size and horsepower as indicated on Drawings General Electric, Square D, Westinghouse or I.T.E.

B. The disconnect handle used on combination starters shall control the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "ON" or "OFF", and shall include a two-color handle grip, the black side visible in the "OFF" position indicating a safe

condition, and the red side visible in the "ON" position indicating an unsafe or danger condition.

C. Each starter shall be equipped with an integral control circuit transformer with secondary voltage or as indicated.

D. All starters used in combination starters shall be manufactured in accordance with the latest published NEMA Standards, sizes, and horsepower ratings. These starters shall be furnished with three melting alloy type thermal overload relays.

E. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed.

2.03 MOTOR CONTROL INTERLOCKS AND CONTROL DEVICES

A. Refer to Mechanical and Plumbing Drawings and Specifications and provide all control devices including timeswitches, relays and interconnection of starters as required.

B. Mount all relays and timeswitches in a separate NEMA 1 enclosure unless otherwise indicated.

C. Whether Shown on Mechanical and Plumbing Drawings or Control Center Schedules or not, where motors are controlled by external devices (i.e., thermostats, relays, float or pressure switches, etc.) or interlocked with other motors, each motor starter to be equipped with a "Hand-Off-Auto" selector switch in starter cover. Other starters equipped with a "Start-Stop" pushbutton station in starter cover.

D. Provide low voltage, 60Hz control power transformer(s), VA as required for HVAC and plumbing controls.

2.04 FUSES

A. Fuses shall be dual element, current limiting type, UL Class RK-5 unless otherwise indicated on the Drawings. Provide one spare set of fuses of each size and type in each motor control center.

B. Verify the full load amperes of all motors for which fuses are to be provided. Size fuses for the motor full load amps according to the recommendations of the Fuse Manufacturer.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. Manufacturer shall stencil the panel number or letter on each device and equipment section to correspond to identification on the Drawing.

B. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

END OF SECTION

SECTION 16500

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

A. Work Included:

All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 16.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Submit certification letter from Manufacturers of LED or lamps and ballasts and power/driver supplies, (or alternately, Manufacturer's published catalog data) stating/showing the specific LED or lamp, ballast, or power/driver supply combination comply with Manufacturer recommendation and approval for the combined use, shown on the Drawings.
2. Provide complete Manufacturers catalog data information for each light fixture (luminaire), ballast, power/driver supplies, LED or lamps, materials, auxiliary equipment/devices, finishes and photometrics.

B. Performance Certification

1. Submit Manufacturer's Certified LED or lamp and ballast tests report data showing compliance with Contract Document.
2. Submit Manufacturer's letter of Certification for each fixture type, confirming the proposed combination of specific LED or lamp, ballast, power/ driver supply and auxiliary components for each light fixture (luminaire) type will function together correctly and perform in compliance with the Requirements of the Contract Documents as follows:
"The proposed lamp(s), LED or lamp ballast(s), drivers, (where, applicable), lamp sockets and fixture have been tested as an assembly. The proposed fixture products assemblies are certified by the Manufacturer to function within the required temperature, lumen output, electrical characteristics and operational life described in the Contract Documents".

C. Light Fixture Samples

1. If requested by the OWNER'S Representative, provide a sample of each fixture proposed as a substitution for a specified fixture. Sample fixture shall be complete with specified lamps, 3-wire grounding "SO" cord and plug for

120-volt 60Hz, AC plug-in operation. Sample fixtures shall be delivered to the OWNER'S Representative's office for review, the samples shall be picked up within 10-working days after review comments have been received; any samples left beyond this time will be discarded by the OWNER'S Representative. Decision of OWNER'S Representative regarding acceptability of any lighting fixture is final.

1.03 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)

A. Work and Materials shall be in full accordance with the latest Rules and Regulations as follows. The following publications shall be included in the Contract Document Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:

1. UL – Underwriters' Laboratory:

   a. UL – 1572: HID Lighting Fixtures
   b. UL – 1570: Fluorescent Lighting Fixtures
   c. UL – 1029: HID Ballast
   d. UL – 935: Fluorescent Lamp Ballast
   e. UL – 542: Lamp Holders, Starters, and Starter Holders
   f. UL – 8750 and 1598C: Light Emitting Diode – LED Equipment for use in Lighting Products and Replacements

2. NEMA – National Electrical Manufactures Association:

   a. NEMA – LE4: Recessed Luminaries Ceiling Compatibility
   b. NEMA – SSL #1, #3 and #6: Electronic Drivers for LED; LED and Incandescent Lamp Replacement
   c. NEMA – LSD #44, #45, #49 and #51: SSL-Solid State Lighting

3. United States Federal Government:

   a. FCC – Part 18: EMI and RFI emissions limitations.
   b. EPA: Energy Conservation Publications and Waste Disposal Regulations.

4. ETL and C.B.M. Certified and Approved.
5. Electrical Installation Standards, National Electrical Contractors' Association:

   a. NEIS/NECA and IESNA – 500: Recommended Practice for Installing Indoor Commercial Lighting Systems.
   b. NEIS/NECA and IESNA – 501: Recommended Practice for Installing Exterior Lighting Systems
   c. NEIS/NECA and IESNA - 502: Recommended Practice for Installing Industrial Lighting Systems.

6. Illuminating Engineering Society – IES (IESNA):

   a. IES – LM41: Photometric and Reporting.
   b. IES – 587: Transient Surge Protection.
   c. IES – LM79:Solid State Lighting (SSL) Testing and Measurement.

d. IES – LM80: Testing for Lifetime of LED.

7. ANSI-American National Standards Institute:

a. ANSI – C81
b. ANSI – C82
c. ANSI – C62.41: Transient Withstand
d. ANSI – C78: Lamps

8. State California Code of Regulations - Title-24 Energy Code

PART 2 - PRODUCTS

2.01 GENERAL

A. Complete Fixture

1. Provide light fixtures complete including LED or lamps, ballasts, drivers, lamp holders sockets, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/lenses and outlet boxes.
2. Include an allowance of $300.00 to provide a light fixture for each lighting fixture outlet shown on Drawings without a fixture type designation.

B. Specific Fixture Requirements and Fixture Schedule Information

1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular Manufacturer only. The fixture length, number of lamps and lamp types, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other components required to fulfill the total description of the fixture based on all Drawing information, branch circuits, voltages, Specification information, and shall be included in the Contract Requirements regardless of whether or not the catalog number specifically includes these components.
2. Lighting fixtures shall be the types as indicated in fixture schedule on the Drawings and as described in the Specifications.
3. All fixtures of the same fixture type shall be the same Manufacturer and of identical finish and appearance, unless indicated otherwise on Drawings.

C. Manufacturer Certification of Operation

1. Lamps and lamp ballasts and power supplies (drivers) shall be recommended and certified by the respective Manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

2.02 BALLASTS AND POWER SUPPLIES (FOR HID LAMPS AND FLUORESCENT LAMPS AND DRIVER-POWER SUPPLIES FOR LED-SOLID STATE LAMPS)

A. General

1. All ballast, power supplies, lighting fixtures assemblies and components shall be ANSI, ETL approved C.B.M. Certified and UL labeled.
2. Ballasts shall provide Class "P" thermal protection.
3. Ballasts shall comply with FCC Part 18 Class-A and NEMA limits as to EMI or RFI and not interferes with normal operation of electrical or electronic data processing equipment.
4. Open circuit voltage, starting voltage, crest voltage and lamp-operating voltage shall comply with Requirements of the respective Manufacturer of the installed lamps.
5. Lamp ballasts, power supplies and transformers shall be for use with the specific lamps provided as part of the Contract.
6. Shall be suitable for use with automatic occupancy motion sensing type switching "on-off" control systems, with multiple "on-off" cycles per hour, on a 24-hours a day basis. Operation shall be without loss of performance in operating characteristics described in the Contract Documents.
7. Fusing

    a. Shall be independently fused on the incoming line side within the fixture compartment.
    b. Alternately the ballast Manufacturer may install the equipment fuse inside the ballast/power supply.
    c. Provide a label next to ballast cover reading: "Ballast (Power Supply) is fused, check fuse prior to relamping". Provide an additional quantity of 10% spare fuses and deliver to OWNER’S Representative.

8. Ballast sound rating Class-A or better. Where sound-rating classification is not published, the ballast sound rating shall be the best of product manufactured. Ballasts, which are judged by the OWNER'S Representative to be excessively noisy, shall be removed and replaced at the CONTRACTOR'S expense with low noise ballasts.
9. Electronic solid-state ballasts and power supplies shall be the product of Manufacturer that has been producing electronic ballasts/power supplies for a minimum of 5-consecutive years prior to the date of the Contract.
10. Shall be designed and supplied to operate on the incoming line voltage system circuits to which the respective light fixtures are connected.
11. Shall not contain any PCB (polychlorinated biphenyl).
12. Power factor shall be not less than 0.90, starting and operating. The input starting transient line input ampere should never exceed lamp normal operating ampere by more than 10%.
13. Ballast and power supply disconnect:

    a. Lighting Fixture Manufacturer factory installed and prewired inside each light fixture, for lamp-ballast or lamp-driver power supply.
    b. Shall comply with UL-2459 and CEC/NEC. Shall disconnect (load-break) energized or de-energized ballast/driver from respective line voltage circuit and dimming circuit. UL-94V-0 flame retardant.

c. Hot pluggable, multi-pole, insulated connectors, with strain relief and finger-safe squeeze-to-release latching function.
d. Suitable for available voltage and ampere dimming and non-dimming lamp-ballasts and lamp-power supplies.

14. Ballast and power supplies as manufactured by General Electric, Advance, Philips, Universal, Sylvania/Osram or equal.

B. Solid-State Electronic Fluorescent Lamp Ballast

1. Fluorescent ballasts shall be solid-state electronic type ANSI C82.11.
2. Ballast shall operate lamps at voltage frequency exceeding 40kHz, without visually detectable flicker, flicker index shall not exceed 3%. Shall deliver Lamp Manufacturers normal rated lamp life.
3. Ballast normal operations and life expectancy shall not be affected by lamp failure or sustained open circuit/short circuit.
4. Ballast shall be surge and transient protected to 6000 volts, ANSI-C62.41, Category-A.
5. Maximum Total Harmonic Distortion (THD) created by operation on the line (input) side of the ballast shall not exceed 10%.
6. The ballast shall provide an isolated output to the lamps. Metal ballast case shall be positively grounded to the light fixture metal housing.
7. The ballast shall incorporate surge protection device to prevent damage to the ballast due to line side transients.
8. The ballast lamp current crest factor shall be 1.7 or less (ratio of peak to RMS current).
9. The Ballast Factor (BF) shall be not less than the following unless indicated otherwise on the Drawings.

    a. 0.87 BF for normal light output.
    b. 0.95 BF for High light Output (HO) operation.
    c. 1.0 BF for dimming ballast.

10. Normal rapid start (continuous full filament voltage) Rapid Start - Rapid start ballast shall energize (preheat) the lamp cathode “heater” filament prior to establishing the lamp arc ignition, normal lamp operation shall occur within 1-second after starting. The ballast shall provide approximately 15,000-lamp start “on-off” cycles prior to lamp failure.
11. Instant start - Instant start ballast shall energize the lamp with an initial increased voltage to initiate the lamp arc discharge between the unheated (no preheat) lamp cathodes and ensure the lamps start without delay or flashing, eliminate lamp operating power required for cathode heating. Preheating the lamp cathodes shall not be performed by the ballast. The ballast shall control the lamp start “on-off” cycles to provide approximately 10,000 starts prior to lamp failure.
12. Program Start - Integrated Circuit (IC) program start ballast shall energize (preheat) the lamp cathode “heater” filament for a programmed time duration prior to transition phase to lamp arc ignition and immediately de-energize the cathode after arc is established and lamp is operational. The ballast shall precisely control the cathode temperature and duration to increase lamp start “on-off” cycles prior to lamp failure to approximately 35,000 starts. The ballast shall reduce the “black-end” lamp condition resulting from frequent

lamp “on-off” cycles. The Program Start ballast shall provide Automatic End of Life (EOL) lamp current shut-off, when a lamp fails.

13. DALI ballast, 1-lamp, 2-lamp, 3-lamp, or 4-lamp, dimming and switching capacity. Comply with DALI published control and communication protocol standards. Universal input line voltage operation.

C. Solid-State Electronic Metal Halide Lamp Ballast

1. Solid-state electronic for low wattage "pulse-start" metal halide type lamp operation.
2. Lamp current crest factor (ratio of peak to RMS current) shall not exceed 1.5.
3. Operate lamps at a frequency of less than 200 Hz to minimize acoustic resonance inside the lamp arc tube and minimize lamp flicker.
4. Ballast Factor (BF) shall be 1.0.
5. Automatic ballast thermal protection and automatic shutdown at End of lamp Life (EOL) protection.
6. Total Harmonic Distortion (THD) on the input line side shall not exceed 16%.

D. Dimming Ballasts and Lighting Control System Ballasts

1. General

a. The light fixture ballasts shall comply with the recommendations of the Lighting Control System Manufacturer, as to ballast type and Ballast Manufacturer sources. Provide documentation with Shop Drawings certifying compliance with the Requirements.
b. DALI ballasts shall comply with the recommendations of the DALI Lighting Control System Manufacturer. DALI ballast types and DALI Ballast Manufacturer sources shall comply with the recommendation with the Shop Drawings certifying compliance with these Requirements and recommendations.

2. Fluorescent lamp dimming

a. One or multi-lamp rated dimming ballast shall be provided for fluorescent lamp dimming systems, as recommended by the Lighting Control System Manufacturer.

E. Emergency Lighting

1. Light fixtures shown connected to both normal power and external emergency power branch circuits, shall be furnished with separate lamp ballasts for the normal and emergency power circuits.
2. The ballast(s) for the lamps connected to the external emergency branch circuit shall be in a separate wireway isolated and barriered from the ballast(s) for the lamps connected to the normal power branch circuits. The fixture shall be factory labeled "emergency" and "normal" on the respective wireways and ballasts.

F. Tandem Ballast Connections

1. Ballasts in 1-lamp or 3-lamp fluorescent fixtures, when fixture is recessed mounted and within 8-feet of each other, or if surface on pendant mounted

within 1-foot of each other, shall be furnished with a tandem wiring harness connected to inboard Ballasts of master fixture, to be field connected to inboard ballast of adjacent fixture. Night-light or emergency light fixtures shall be exempt from this Requirement.

2.02 LAMPS

A. General

1. Lamps shall be new, of wattage and type indicated. Each fixture or lighting outlet shall be supplied with the proper lamp(s).
2. Lamps shall comply with the characteristics as described in the lamp tables below, except where indicated otherwise on the Drawings.
3. Lamps shall comply with limits on mercury and classification as non-hazardous waste as follows:

    a. Federal EPA – Toxicity Characteristics Leaching Procedures (TCLP).
    b. State of California – Total Threshold Limit Concentration (TTLC).

4. Lamps shall be as manufactured by General Electric, Philips, Osram or Sylvania.

B. Incandescent Lamps

1. General-purpose incandescent "A" style lamps shall be inside frosted, medium base for 200 watts and smaller.
2. Reflector lamps shall be PAR-20, PAR-30 or PAR-38 as required, unless otherwise specified in fixture schedule.
3. Incandescent lamps in non-enclosed fixtures and fixtures without lens/ diffuser shall be rated for "open" fixture operation.

C. Fluorescent Lamps

1. Linear fluorescent shall be energy saving type and bi-pin operation. Rapid-start, Program Start or instant start as indicated in the Contract Documents.
2. Compact fluorescent lamps.
3. Average lamp life shall not be less than the following, based on 3 hours "on" operation and 20-minute "off" for each start cycle, when matched in combination with the specific lamp ballast and with the respective light fixture, unless noted otherwise:

    a. Linear fluorescent 20,000 hours.
    b. CFL – 20,000-hours and as noted in the lamp tables.
    c. HID – as noted in the lamp tables, based on 12-hours "on" operation for each start cycle.
    d. Incandescent – as noted in the lamp tables.

D. High Intensity Discharge Lamps HID

1. Mercury vapor lamps shall be Deluxe White or Brite White Deluxe phosphor coated Bonus-Line.

2. Provide proper base up, base down, horizontal, operating configuration for the fixture and lamps being furnished.
3. HID lamps (indoor or outdoor locations).

    a. HID lamps used outdoors or in damp/wet locations shall only be used in fully enclosed, lensed fixtures.
    b. Open type fixtures with HID lamps used indoors shall only be ANSI-"TYPE-0" protected lamps and protected lamp sockets or shall only be fully enclosed, lensed fixtures.
    c. Enclosed/lensed fixtures with HID lamps, shall be rated for "ARC-TUBE Containment"

4. Lamps in non-enclosed light fixtures shall be equipped with automatic switching device to de-energize the lamp when the lamp outer glass envelope is broken.
5. High-pressure sodium lamps shall be clear unless noted otherwise on Drawings.
6. Metal halide lamps shall be clear or coated as indicated on the Drawings.
7. Lamp socket and lamp "burning" position of operation rating (i.e., base-up, base-down, horizontal) shall comply with the actual lighting fixture installation location.

2.03 LIGHT FIXTURES (LUMINAIRES)

A. General

1. Lighting fixtures shall have all parts, ballasts, drivers, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.
2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing, but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.
3. Where fixture color is indicated to be selected by the ARCHITECT and/or OWNER'S Representative, provide two color chip samples for each color for review.
4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16 AWG "AF" or "CF" type fixture rated copper wires, high temperature wire insulation for not less than 600 volts AC. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.
5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finish painting of the adjacent surface is completed.

6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.
7. Light fixtures installed outdoors, in damp or wet locations shall be UL labeled for said location as "damp-location" and "wet-location" for the respective installation location.
8. Fixtures in contact with thermal/building insulation shall be UL listed and rated for direct contact installation in thermal insulation systems.
9. Lamp auxiliary support brackets shall be heat-resistant, non-dielectric. Alternatively, metal auxiliary lamp support brackets shall be electrically isolated from the fixture, to prevent glass decomposition.
10. Lighting fixtures installed in masonry and/or concrete construction. The fixture housing shall be rated for "concrete-pour" installation location.
11. Provide a permanent label inside each light fixture stating the following relamping information. Not less than 0.125-inch high black alphanumeric characters on white background.

    "Replacement lamp(s) installed in this light fixture must comply with the following criteria:

    **: CRI *: Lamp Watts*
    **: CCT-K *: Lamp Lumens*

    *Only lamp rated * type lamp ballast shall be installed in this fixture."*

    **Insert the value required for the specific lamp required by the Contract Documents for each light fixture.*

B. Lens and Diffusers

1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixture lenses shall be 100% virgin material.
2. Thickness of not less than 0.125-inch, as measured at the "THINIST" portion on the diffuser or lens. However, thickness shall be increased to sufficient construction and camber to prevent the lens and diffusers from having any noticeable sag over the entire normal life of the installation.
3. Diffusers shall be formed from cast sheet by a vacuum and/or pressure technique.
4. Lighting fixtures containing lamps with dichroic reflectors and light fixtures with non-dichroic lens/diffuser shall be rated for high temperature lamp operations resulting from lamp heat redirected (reflected) back into the fixture.

C. Fixture/Luminaire Internal Wiring

1. Provide wiring between fluorescent lamp holders and associated operating and starting equipment. Provide ballasts/transformers inside lighting fixture.
2. Where there are two or more fluorescent lamps in a single luminaire, and multiple level intensity control is indicted on Specifications or Drawings, multiple-lamp ballasts shall be used to the greatest extent possible and the following tandem wiring configurations shall apply:

    a. If "inboard-outboard" wiring or multi-intensity light switching controls are specified for (odd-quantity) multi-lamp luminaires, then the two

outboard lamps shall be connected to a single 2-lamp ballast within each luminaire. The inboard lamps of two adjacent luminaires shall be tandem wired, that is, connected to a 2-lamp ballast within one of the luminaires.

b. A 1-lamp ballast may be used if a luminaire with ballast is separated by more than 10-feet from any other same type luminaire with a ballast or if the nearest luminaire is on another control circuit. Otherwise, a lamp in one luminaire shall be tandem wired, that is, connected to a multi-lamp ballast in another luminaire.

3. Wire insulation for ballast/lamps employing igniters, shall be rated and UL listed for the igniter pulse voltage.
4. Light fixture internal lamp sockets; installation of lamp sockets and ballasts; grounding of lamp sockets and ballasts; and wiring connections, shall all comply with the recommendations of Ballast Manufacturer and Lighting Control System Manufacturer.

D. Lamp Holders (Sockets) and Supports

1. Provide fluorescent luminaire lamp sockets that are white, constructed of high temperature heat-resistant plastic or ceramic/porcelain.
2. When electronic solid-state ballasts are provided, fluorescent lamp sockets for 4-feet-0-inches lamps shall be of the "knife edge" type. The lamp sockets providing the tightest electrical connection shall be furnished.
3. Lamp supports shall be used as recommended by Lamp Manufacturer.
4. Rigidly and securely attach lamp holder to the luminaire enclosure.
5. Provide lamp holders and sockets suitable for specified lamps, and position the lamps in optically correct spacing and relationship to lenses, reflectors, filters, and baffles.
6. Lamp holder location shall provide properly located starting aid, as specified by the Lamp Manufacturer.
7. Lamp sockets in fixtures shall be compatible with the respective specified lamp(s), as recommended by the Lamp Manufacturer and shall provide specified lamp operational performance.
8. Provide horizontal position (±15-degree) lamp and lamp socket to automatically ensure lamp position, for lamps requiring horizontal only operation lamps, to ensure correct horizontal lamp install position.
9. Lamp sockets shall be rated for not less than actual volts of the igniter starting of the lamp.

2.04 SOLID STATE LIGHTING (SSL), LIGHT EMITTING DIODES (LED) LAMPS, POWER SUPPLIES, AND LIGHT FIXTURES (ADDITIONAL REQUIREMENTS)

A. General

1. Solid State LED light source (lamps), related control equipment (driver-power supply), and luminaire (light fixture) optics for light output distribution.
2. Shall comply with the US-DOE Energy Star Program for SSL-LED. Submit documentation with Shop Drawings.
3. Shall comply with the latest revision IESNA LM-79 and LM-80. Submit documentation with Shop Drawings.

4. SSL chromaticity shall comply with latest revision NEMA and ANSI – C78.377. Submit documentation with Shop Drawings.
5. Submit with Shop Drawings two samples of each light fixture type employing SSL, with prewired 120 volt, 60Hz AC “SO” cord and plug-in cap.

B. LED Lamps

1. Lamp lumen output and overall efficiency shall be based on the LED lamps installed in specified fixture and ambient operating temperature.
2. Lamp Color Rendition Index (CRI) shall equal or exceed CRI – 80, unless noted otherwise on Drawings.
3. Lamp color output shall be 4000-degree K (± 100K), unless noted otherwise on Drawings.
4. CRI and lamp color temperature shall be same for all light fixtures of the same fixture type.

C. LED Power Supply (driver)

1. Combination of power supply and SSL – lamp shall be tested and certified by respective Manufacturers for performance and proper operation.
2. Provide dimming type driver where indicated on Drawings. Driver and dimming equipment shall be tested and certified by respective Manufactures for performance and proper operation.

D. Self-contained LED Lamp and Driver, integral “Screw-Base” and/or “Pin-Connect”, replacement assembly for incandescent lamps.

1. Shall be dimmable. Dimmer and lamp shall be certified by respective Manufacturers for compatible correct operation with each other.
2. Optical system and operating temperature thermal performance shall be compatible with light fixture.
3. Comply with latest revisions of NEMA LSD-49 and SSL-6.

2.05 LIGHTING STANDARDS (SUPPORT POLES, POLE MOUNTED LIGHTING FIXTURES AND LUMINAIRES)

A. General

1. Lighting poles, pole bases, pole arms, lighting fixtures (luminaires), supports with all lighting pole attachments and anchors shall be designed and constructed to withstand not less than 100 miles per hour steady horizontal wind loading and 130 miles per hour horizontal wind gust loading, without any damage to the lighting standards.
2. Provide tamper-resistant "hand-hole" and cover on the pole, for access into wiring terminations inside the pole. Provide ground "lug" attachment for equipment bond conductor.
3. Provide factory applied weather protective base undercoat and final finish on all exposed and internal components. Color as indicated or as selected by OWNER'S Representative.

B. Base Plate

1. Provide a base plate at the bottom of each pole to attach and secure the pole to the pole anchor bolts. The base plate shall be permanently attached to the bottom of the pole.

C. Anchors

1. Anchor bolts shall be threaded the entire bolt length, not less than four bolts for each pole equally spaced around the pole base. Provide a minimum of two threaded nuts for each anchor bolt. Install a nut on the top and bottom sides of each base plate anchor bolt location. Not less than four threads shall be exposed after pole is installed and leveled.

PART 3 - EXECUTION

3.01 LIGHT FIXTURE INSTALLATION

A. General

1. The CONTRACTOR shall verify actual ceiling and wall construction types as defined on the Architectural Drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The CONTRACTOR shall verify depth of all recessed lighting fixtures with Architectural Drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall be reported to the OWNER'S Representative prior to release of order to the supplier of the fixtures.
2. On acoustical tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four corners or at the center of the joints of two tiles.
3. The CONTRACTOR shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the OWNER'S Representative.
4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the Site Plan and Floor Plan Electrical Drawings. The voltages shown on the fixture schedule are for generic fixture information only.
5. Install and connect lighting fixtures to the circuits and control sequences indicated on the Drawings and to comply with respective Manufacturer's instructions/recommendations.
6. Lighting fixtures in building interstitial spaces, in mechanical plumbing and electrical spaces/rooms, are shown in their approximate locations. Do not install lighting outlets or light fixtures until the mechanical, plumbing and electrical equipment/pipes/ductwork are installed; then adjust and install lighting in revised clear (non-interfering) locations to provide best even-illumination. Coordinate the locations with all other trades prior to lighting installation.

B. Lighting fixtures installed in ceiling support grids - suspended lay-in "T-bar" and concealed spline ceilings.

1. Provide two seismic clips at opposite ends of each recessed light fixture, the clip shall connect to the ceiling grid main runners and the light fixture. The light fixture with seismic clips and ceiling grid runner connections shall resist a horizontal seismic force equal to the total weight of the light fixture assembly.
2. Each light fixture weighing 40-pounds or less and where the respective ceiling grid system is "heavy duty" type, shall be suspended directly from the ceiling grid or shall be suspended independent of the ceiling grid support system as approved by the AHJ. Each light fixture weighing more than 40-pounds or where the ceiling grid system is not a "heavy duty" type shall be supported independent of the ceiling grid and independent of ceiling grid support system.
3. Each light fixture supported independent of the ceiling grid system shall be supported with a minimum of four taut independent support wires, one wire at each fixture corner.
4. Each light fixture supported directly from the ceiling grid or ceiling grid support system shall be additionally connected with a minimum of two independent slack safety support wires. One wire at each opposite diagonal fixture corner. Each 3-feet by 3-feet and larger light fixture shall be supported in the same manner, except provide a minimum of four independent slack safety wires, one at each fixture corner.
5. Light fixtures surface mounted to a suspended ceiling shall be installed with a 1½-inch steel – "C" channel which spans across and above a minimum of two parallel main ceiling grid "runners" and concealed above the ceiling. Each channel or angle member shall be provided with a minimum of two threaded studs for attaching to the fixture housing through the lay-in ceiling tile. Two steel "C" channel members shall be installed for each 4-feet (or smaller) fixture. Install the channels within 6-inches of each end of the light fixture to span a minimum of two ceiling grid parallel main runners. Provide two seismic clips connecting the ceiling grid main runners to each steel – "C" channel. Provide a not less than two taut independent support wires connecting to each channel. Bolt the light fixtures to the threaded studs on the channels or angles, to support the light fixture tight to the ceiling surface.

C. Fixture Supports

1. The support wires for light fixture support shall be 12-gauge steel (minimum). The wires including their building and light fixture attachments shall provide support capacity of not less than four times the weight of the light fixture assembly. Provide additional light fixture support wires and building anchors to meet these Requirements, as part of the Contract. The support wires shall be anchored to the building structural elements above the ceiling.
2. Pendant mounting fixtures shall be supplied with swivel hangers. Fixtures shall swing in any direction a minimum of 45 degrees of gravity, position. Fixtures shall have special stem lengths to give the mounting height indicated on the Drawings. Stem to be single continuous piece without coupling, and to be finished the same color as the canopy and the fixture, unless otherwise noted. The CONTRACTOR shall check all lock nuts and

set screws to rigidly secure the swivel socket to the stem, and the stem to the outlet box.

Fixtures shall be plumb and vertical. Where obstructions occur restricting 45-degrees free-swing of fixtures, the fixtures shall be "guy" wired to prevent fixtures from striking obstructions. The OWNER'S Representative shall approve method of guying. Swinging fixtures shall have an additional safety hanger cable attached to the structure and the fixture at each support, with the capacity of supporting four times the vertical weight of the light fixture assembly.

3. Suspended fixtures weighing in excess of 40-pounds shall be supported independently of the fixture outlet box. Provide "air craft" (minimum 12 gauge) steel hanger cable for suspended fixtures route cable concealed or in pendant where possible. Each cable attachments shall support four times the weight of the fixture assembly. Securely attach the cable to the building structure.
4. Surface mounted fixtures installed on drywall or plaster ceilings and weighing less than 40-pounds may be supported from outlet box. Provide structural supports above drywall or plaster ceilings for installation of fixtures weighing more than 40-pounds and secure fixture to structural supports. The use of toggle bolts is prohibited.

C. Recessed Lighting Fixtures - Fire Rated Building Surfaces

1. Lighting fixtures recessed in ceiling or wall which has a fire resistive rating of 1-hour or more shall be enclosed in a fully enclosed backbox (except over fixture lens/diffuser). The material used to fabricate the "enclosed backbox" shall have a fire rating equal to that of the respective ceiling or wall.
2. The space from the fixture to the box enclosure shall be a minimum of 3-inches.
3. The backbox shall be concealed behind the fire rated ceiling and wall finish surface. The light fixture shall be provided with lamp ballast rated for (normal light output) operation in a "high" ambient temperature.

3.02 LAMPS

A. Fluorescent and HID lamps controlled by dimming equipment shall be operated (aged) for 100-continuous hours without interruption, at 100% full lumen output prior to occupancy of the building by the OWNER.

B. Lamps shall be the type and Manufacturer as recommended by the Dimming System Manufacturer.

C. Install all lamps in each light fixture.

D. Lamp and light fixture use during construction:

1. All lamps in lighting fixtures that have been operated (ON) for a total of more than 300-hours prior to final completion of the Contract Notice of Completion shall be relamped by the Contractor. Remove the existing lamps with more than 300-hours of illuminated operation and provide new lamps of the type required by the Contract Documents, install lamps in respective light fixtures, typical for the following lamp types:

a. Linear fluorescent.
b. Compact fluorescent (CFL).
c. H.I.D.
d. Incandescent.
e. LED

3.03 LENS AND DIFFUSERS

Lens, diffusers, internal reflectors shall be completely cleaned of all dust, dirt and fingerprints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupancy of the facility by the OWNER.

3.04 BALLASTS

A. Ballasts remote from the lighting fixture, mounted as shown on the Drawings and designed for remote operation. Additional wiring and conduit shall be provided whether shown on the Drawing or not, between lighting fixture and remote Ballasts with required quantity of "THHN" wire installed in conduit to operate said fixture(s).

B. Provide proper type and quantity of conductors with conduit system for proper operation of dimming system, whether or not shown on Drawings.

C. CONTRACTOR shall tandem wire 1-lamp or 3-lamp fluorescent fixtures when fixture is recessed mounted and within 8-feet of each other or if surface or pendant mounted within 1-foot of each other. To accomplish tandem wiring, a tandem wiring harness shall be installed between inboard master ballast and inboard slave lamp located in adjacent fixture. Night-light or emergency light fixtures shall not apply.

3.05 FLUORESCENT LIGHT FIXTURE TANDEM WIRING CONNECTIONS

A. The Contractor shall provide tandem wiring whether or not shown on the Drawing for fluorescent lighting fixtures conforming to all of the following criteria:

1. Light fixture contains fluorescent lamp ballast.
2. Odd number of lamps in light fixture (i.e., one lamp, three lamps, five lamps, etc.).
3. Light fixtures are recess mounted within 10-feet of each other; light fixtures are surface mounted or suspended/pendent mounted within 1-foot of each other.
4. Light fixtures are located in the same room.

B. Provide the tandem wiring connections between respective light fixtures as follows:

1. The tandem wiring harness shall be the product of the respective Lighting Fixture Manufacturer.
2. The tandem connection shall provide pre-assembled wiring harness connecting two fluorescent lamps in adjacent lighting fixtures with a master lamp ballast, remote adjacent fixture slave lamp.
3. The wiring harness shall contain the wiring in flexible steel conduit or enclosed metal raceway/jacket for installation in an air plenum.

C. Delete tandem wiring Requirement and provide individual and multi-lamp Ballasts in each respective light fixtures under one or more of the following conditions.

1. Lighting fixtures are shown as night-light or emergency light type fixtures do not require tandem wiring.
2. Fluorescent dimming Ballasts do not require tandem wiring.

3.06 COMMISSIONING LIGHTING FIXTURES (ADDITIONAL REQUIREMENTS)

A. General

1. Verify correct lighting control configurations and operation in each room.
2. Simulate normal source power failure by "opening" (turn off) building main service disconnect and verify connections and operation of each emergency lighting fixture.
3. Confirm "EXIT" sign directional arrows are visible in each "EXIT" sign.
4. Verify light fixture support-hangers, ceiling grid clips and seismic restraints comply with the Contract Documents.
5. Remove protective shipping/installation shields on fixtures. Verify fixtures and lamps are clean and free of construction debris. Clean light fixtures found to be contaminated or dirty.
6. Setup, program, and function test lighting control systems to perform each of the indicated control functions, area/room zones and sequences.
7. Provide “aiming”, directional adjustment of light fixtures, both indoor and outdoor. Aiming shall comply with Manufacturer’s aiming diagrams, and as directed by Owner’s Representative.

B. Sample spot-checks in each room the following lighting fixture information:

1. Lamp type and performance data.
2. Ballast type and performance data.
3. Combined lamp/ballast certification of performance and compatibility by respective Manufacturer.
4. Verify instructional signage is placed inside each lighting fixture in compliance with Contract Documents.

END OF SECTION

SECTION 16722

FIRE ALARM

PART 1 – GENERAL

1.01 SCOPE

A. Work Included: All design, labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specifications Sections and Drawings for related work required to be included as work under Division Sixteen.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit State Fire Marshal and UL Listing numbers for each piece of equipment and component.

B. Submit Block Wiring Diagrams Showing Major System Components, alarm and signaling stations, battery load calculations, and circuit voltage drop calculations with interconnecting circuit conductors and conduits. Riser type diagram shall be provided if the building has more than one floor level with information shown on riser diagram on each respective floor.

C. Submit Redrawn Building Floor Plan for each building area, same scale as the Contract Drawing. Drawings shall be on reproducible sepias. Plans shall show walls, doors, room names and numbers, windows, fire and smoke barriers, and all fire alarm system equipment locations. Show interconnecting conduit, conduit sizes, wire size and quantity between all components.

D. Submit Manufacturers Standard Catalog Data for Fire Alarm Components. The submittal shall be arranged in the order of the Specification and shall list the Specification paragraph number, the name, the proposed model and Manufacturer for each item as well as a reference indicating the specific piece of data which can be easily located in the brochure. The Manufacturer's data sheets shall be marked to indicate the specific item being proposed in cases where the sheet covers several types or sizes of item. The data sheet shall completely describe the proposed item. Where modification to the equipment is necessary to meet the operational Requirements of the Contract Documents, the brochure shall include complete Mechanical and Electrical Shop Drawings detailing the modification. The brochure shall include a listing of the outlet rough in needed for every device and equipment item. The applicable symbol, which illustrates that rough-in item on the Job Plans, shall be drawn on the proposal, opposite the description of the rough in to facilitate locating the data by Field Personnel. Submit elevation and dimensional information.

E. Submit Battery Sizing Calculations.

F. Submit Voltage Drop Calculations on Worst Case Signal and Control Circuits.

G. After Review of Submittal by Architect, the Contractor shall submit to the local authorities for approval.

1.03 APPLICABLE STANDARDS

A. The fire alarm system devices shown on the Drawings do not include all of the devices/components/raceways/connections, etc., of a completely designed and engineered fire alarm system. The fire alarm system has not been submitted for review and approval by the AHJ as a complete system. The devices (if any) shown on the Drawings are to show additional devices that may exceed the minimum Requirements of the AHJ and to define locations of selected specific significant components. However, the Drawings do not represent all of the components and work required for a complete and operable fire alarm system.

B. The CONTRACTOR shall provide design engineering services and shall provide all material and labor for a complete and operable fire alarm system. The Contractor shall submit the fully designed and engineered fire alarm system to the AHJ for review and approval as a Deferred Approval fire alarm system. All of the costs for Design Engineering, AHJ review approval, material and labor for a complete and operable fire alarm system shall be included in the CONTRACTOR'S Contract.

C. The Requirements of Building Permits and Requirements of the AHJ to Proceed shall become a part of the Contract Documents. The Fire Alarm Building Permits and AHJ Approval to proceed shall be obtained by the CONTRACTOR.

D. Prior to Commencement of Work and After Completion of Work, the CONTRACTOR shall provide Written Notification to the AHJ.

1.04 APPLICABLE STANDARDS

A. The Equipment shall be listed, labeled, and approved for the application shown in Contract Documents, as fire alarm equipment complying with Requirements of

1. NFPA 72, National Fire Alarm Code.
2. NFPA, 90A. Installation of air conditioning and ventilating systems.
3. UL and the California State Fire Marshal.
4. Local Codes and authorities having jurisdiction.
5. N.E.C. Article 760.

B. Written certification by the Fire Alarm Equipment Manufacturer shall be submitted to the Architect, stating that the system and its component parts are listed and approved by the State Fire Marshal and the installation has been tested, is operational and conforms to the Requirements as set forth in Part 3, Article 24, Title 19, California Administrative Code.

1.05 EQUIPMENT QUALIFICATIONS

A. The Equipment shall be as manufactured Simplex Time Recorder Co., Notifier, Honeywell, Pyrotronics, or Gamewell.

B. The Supplier of the Equipment shall be the Factory Authorized Distributor and Service Facility for the brand of equipment provided.

PART 2 – PRODUCTS

2.01 GENERAL SYSTEM OPERATION

A. System shall be microprocessor-based, addressable, and power-limited with Class A or Class B supervised circuits.

1. The microprocessor shall execute all supervisory and control programming to detect, report the failure or disconnection of any system module or peripheral device and initiate programmed control sequences. An isolated supervision "watchdog" circuit shall monitor the microprocessor and, upon failure, shall activate the system trouble circuits.
2. The automatic fire detection and alarm system shall consist of main control panel, evacuation alarms, remote annunciator, automatic detection devices, and manual stations, installed and wired in accordance with the Drawings and shall function as specified herein.
3. The system shall be programmable in the field, by a non-computer-trained person. All programmed information shall be stored in non-volatile memory.
4. The system shall operate both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, water-flow switches, and external control modules.
5. The control panel shall provide power, annunciation, supervision and control for the fire detection and alarm system. The system shall be designed such that alarm indications override trouble and control conditions.
6. External circuit supervision shall not require additional wires other than the pair used for detection or alarm (only two wires shall be used from the control panel to each loop of initiating devices and two wires for the audible devices). These two wires shall provide both supervision and alarm signals. There shall be no loss of supervision for Class "B" wired addressable devices. Class "A" supervision may be provided by adding an additional pair of wires.

B. Alarm Conditions

1. Actuation of any manual or automatic alarm-initiating device, connected to the system shall cause the following automatic functions.

a. All alarm evacuation signaling units shall activate continuously.
b. The respective zone alarm lamp or annunciator alphanumeric readout on the central control panel, and remote annunciator panel, shall be activated.
c. Activate the central alarm system.

2. Actuation of HVAC air duct smoke detectors shall cause the designated fans and motors with HVAC air duct smoke detectors to stop, in the air distribution system of the building.
3. Actuation of automatic self-contained fire/smoke doors/hatches or of smoke detectors on either side of smoke/fire doors/hatches shall energize the release mechanism on the smoke door causing all fire/smoke doors to close.
4. Actuation of any fire sprinkler flow switch shall energize the release mechanism on all fire/smoke doors causing them to close and stop operation of all air distribution system equipment monitored or controlled by the fire alarm system.
5. Activate HVAC fire/smoke air dampers electrical release, causing all the fire/ smoke air dampers to close.
6. Perform any additional functions as specified herein, shown on the Drawings or required by the Fire Marshal.

C. Trouble Condition

1. A break or short in a manual or automatic fire initiating wiring circuit shall activate the respective zone trouble lamp or annunciator readout on the fire alarm control panel and sound a trouble signal at the control panel.
2. A break or short in the evacuation alarm signaling wiring circuit shall activate the trouble lamp or annunciator readout in the control panel and sound a trouble signal at the control panel.
3. 120 volt AC normal power shall be monitored with indication by a "power on" lamp. Upon normal power outage, the system shall activate a power trouble condition lamp or annunciator readout, and indicate a trouble condition.
4. The control panel shall monitor the standby batteries, upon a low battery condition, activate the low battery lamp or annunciator readout, and indicate a trouble condition.
5. System ground detection shall be provided for the entire system. Upon ground detection, activate the ground detection lamp or annunciator readout and indicate a trouble condition.
6. Actuation of any fire sprinkler shut-off valve tamper switch shall activate a separate zone trouble lamp or annunciator readout for each valve. The trouble zone shall be completely independent of the fire sprinkler flow switch zone, and completely independent of any other fire alarm zone.

D. Control Panels Employing Alphanumeric Readouts shall display the required data, along with a prompt to review the list chronologically. The end of the list shall be indicated.

E. Equipment shall be weatherproof gasketed where installed in locations exterior to the building, or where indicated on the Drawings. Weatherproof equipment shall be tamper resistant.

F. The Control Panel shall provide power, annunciation, supervise and control for the fire detection system. The system shall be designed such that alarm indications override trouble and control conditions.

2.02 FIRE ALARM CONTROL PANEL

A. General

1. The fire alarm control panel shall be software programmable, micro-processor controlled, solid state, electronic integrated system. The panel shall be the product of one Manufacturer. The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The detection system shall remain 100% operational, responding to an alarm condition while in the routine maintenance mode.
2. Addressable detection and control devices shall be individually identified by the system, and any quantity of addressable detection devices shall be in alarm and any quantity of addressable control units shall be operable at any time up to the total number connected to the system.
3. The microprocessor shall access the system program, which is stored in non-volatile programmable memory, for all Control-By-Event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Volatile memory shall not be acceptable.
4. A means shall be provided for acknowledging each abnormal condition. Each activation of the appropriate acknowledges button shall sequentially acknowledge every point in the system. After all the points have been acknowledged, the LEDs shall glow steady and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be so indicated.
5. An alphanumeric annunciator readout shall indicate on the control panel the activation by type, loop, and address of the specific device, sub-loop or alarm/monitor/control point via an alphanumeric display. An audible alert shall sound at the control panel and an alarm light shall flash.
6. If the microprocessor fails, the system shall execute a default-signaling program. This program shall enable the control panel to sound the audible signals and summon the Fire Department. In addition, a red LED shall light to indicate the communication loop wherein the alarm originated. Inability of the system to sound signals or summon the fire department during microprocessor failure shall not be acceptable.
7. Protected access to the system controls shall be provided to allow the user/ operator access to the following system functions:

    a. Status of all addressable points.
    b. Status of all events logged.
    c. Set/change the real-time clock and date.
    d. Perform an operational manual test of the system from the control panel, including actuation of any initiating device and trouble circuit without alarming the remote central station. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode.
    e. Retrieve from event logs the last 300 alarms, or control points and 300 trouble conditions.

8. Individual input (monitor) and output (control) device addressability shall all be performed on the same pair of wires. Wiring shall be Class "A" or "B". When Class "B" wiring is used, no special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision.

B. Cabinet

1. A metal tamper resistant cabinet shall contain the control panel components. Panel shall be surface or flush mounting as indicated on the Drawings. Provide a full height tamper resistant hinged locking cabinet door. The door shall have transparent, high impact windows to allow visual observation of all indicators and switches without opening the panel door.
2. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
3. All groups of circuits or common equipment shall be clearly marked and shall be expandable by inserting interchangeable units.

C. Provide a Floor Plan of the Facility Framed Under Acrylic and Mounted Adjacent to the Fire Alarm Annunciator. The floor plan shall be to scale and shall have room numbers clearly displayed on all rooms corresponding to the annunciator for the purpose of easily identifying the fire zones.

D. The Control Panel shall provide positive protection against the fire alarm system inadvertently being left in a non-operating status. The alarm system shall automatically restore and resound alarms and trouble signals, if subsequent alarm initiating or trouble signals are received under any of the following conditions:

1. After the alarm or trouble silence switch have been activated.
2. Prior to resetting system after previous alarm or trouble conditions.

E. The system indicating and operational control devices shall be mounted on the control panel face behind the panel door and shall provide the following minimum functions:

1. Individual visual indicating pilot lights annunciator or alpha numeric readout to monitor the following alarm system conditions:

a. Input power.
b. System common alarm.
c. System common trouble.
d. Alarm or trouble signal silenced.
e. Ground fault.
f. Battery conditions.
g. Each individual alarm, control or initiating zone-activation.
h. Each individual alarm, control or evacuation zone-trouble.
i. Report, by specific device number, any device removed from an addressable initiating circuit, all other devices shall continue to function.

2. Manual control switches to allow the following system controls:

    a. Alarm silence.
    b. Trouble silence.
    c. Test all indicating pilot lights and readouts.
    d. System reset, including remote devices connected to the alarm panel.
    e. Alarm test to initiate an alarm condition from the control panel.
    f. Central alarm disconnect for system testing without activating central alarm system.
    g. Changing the status of configured circuits (arming or disarming and changing status of relays). If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.
    h. Perform multiple operations at the same time. These operations shall include but not be limited to timed functions and multiple configured sequences.

3. Individual indicating meters for the following information.

    a. Battery ammeter.
    b. Battery voltmeter.

F. Alarm Initiating Zone Modules.

1. Shall supervise and accept remote alarm actuating device-input signals. An alphanumeric readout shall indicate separate zone alarm and trouble indicators for each zone.
2. Zones shall be compatible, and designed to operate with the connected initiating devices either addressable or non-addressable type.
3. A spare double throw set of software programmable auxiliary alarm relay contacts shall be provided for control of remote devices for each zone. Contacts shall be rated 120 volt, 60Hz, 3 Ampere.
4. The quantity of alarm initiating zones shall be provided as shown on the Drawings, but in no case shall the zoning be less than the following:

    a. Addressable manually activated alarm-initiating stations by individual station location. (I.e., pullstation #100 Room 100 1st floor; pullstation #300, corridor #300, 3rd floor north; etc.)
    b. Non-addressable manually activated alarm initiating stations by floor and building area. (I.e. pullstation #100 Room 100 1st floor; pullstation #300, corridor #300, 3rd floor north; etc.)
    c. Addressable and non-addressable automatic alarm initiating devices (ceiling or wall mounted heat, flame and smoke detectors) by individual device location. Except rooms with multiple automatic smoke alarm initiating devices shall be zoned by room location (i.e. smoke detectors Corridor #121 1st floor south; flame detectors shop 404 4th floor; etc.)
    d. Elevator lobby automatic alarm initiating devices by floor level and individual elevator lobby area.
    e. Air duct smoke detectors by individual location.

f. Smoke or heat activated fire doors/hatches by individual location.
g. Fire sprinkler water flow switch by individual location.
h. Fire sprinkler water shut off valve tamper switch by individual location. Activation of the tamper switch shall sound an independent trouble signal only. Activation of the tamper switch shall not cause a general fire alarm evacuation to be activated.
i. Smoke detectors for activation and control of fire/smoke air dampers by individual building room/space location.

G. Evacuation Alarm Signal Control.

1. Shall supervise and activate remote evacuation alarm devices.
2. Evacuation alarm shall be compatible and designed to properly operate with the connected audio and visual evacuation alarm devices, with no signal degradation. The alarm shall have spare capacity to allow the future addition of an additional 20% evacuation alarm devices, on any circuit.
3. The evacuation alarm shall provide group evacuation signal control of all evacuation zones.
4. The alarm modules shall be field resettable to provide either continuous or coded audio evacuation alarm signals. The Coded alarm signal shall provide an intermittent "on-off" pulsed sound activation of audible evacuation alarm devices.
5. A evacuation alarm circuit trouble indicating readout shall be provided for each evacuation zone.

H. Automatic Ground Detection shall detect either positive or negative voltages when earth connections of 50,000 OHMS or less occur, and activate the ground trouble signal.

1. A ground fault code shall provide indication of either a positive or negative ground fault and shall operate the general trouble devices as specified herein but shall not cause an alarm to be sounded.
2. A short circuit error message shall be a standard feature of the fire alarm control panel. Each communication loop shall be monitored for short circuits and shall have a distinctive error message for visual indication of circuits and operating trouble devices as specified herein but shall not cause an alarm to be sounded.

I. Power Supply

1. The power supply shall be adequately sized to properly operate the equipment, including remotely connected, spare and future indicated equipment with all alarm devices in alarm condition. Provide 20% spare power supply capacity for future expansion. Provide transfer modules and multiple power supplies as required for proper operation.
2. Input voltage 120/240 volt or 120/208 volt 60Hz AC.
3. Lightning protection, surge transient voltage and RF noise filtering protection on the input and output phases of the power supply shall be provided.

4. Supervised voltage types (i.e. 120V, 60Hz AC, 24 volt AC, 24 Volt D.C., etc.) required by special connected equipment shall be supplied, including but not limited to:

    a. Alarm initiating devices.
    b. Door or hatch hold-open or closing devices.
    c. Automatic fire/smoke doors and dampers.
    d. Evacuation alarm devices.
    e. Control and annunciator panels.
    f. Fire and smoke dampers.

5. A solid-state power transfer circuit shall provide (UPS) Uninterruptible Power supply between internal standby power and line power automatically and instantaneously if normal power fails or falls 15 percent of normal ("brown out" and overvoltage conditions).
6. Individual circuit fuses shall be provided for smoke detector power, main power supply signal circuits, battery standby power, and auxiliary output.

J. Battery Back-Up Operation

1. Internal batteries and battery power supplies shall be provided to allow 60 hours continuous automatic normal operation of the entire control panel and fire alarm system after the failure of the incoming utility power. Sufficient battery capacity shall remain at the end of 60-hour period to provide ten minutes of continuous operation of all connected evacuation alarm devices.
2. Batteries shall be sealed lead-acid. Batteries shall be earthquakes restrained.
3. The battery charger shall be automatic, dual rate with capacity to recharge completely discharged batteries in 18 hours. Charger shall be temperature compensated.
4. The battery backup system shall not be required to provide capacity to maintain the normal operation of the following devices during a failure of the incoming utility power. The automatic smoke detectors associated with these devices shall maintain operation during power failures:

    a. Automatic fire/smoke air dampers “hold open” and close devices.
    b. Automatic fire/smoke doors and hatches “hold open” and close devices.

K. Lightning and Transient Voltage Surge Protection shall be a standard feature of the fire alarm control panel and shall be incorporated in the power supply circuit, common control circuits, signal circuits, and telephone line circuit.

L. Central Station

1. Circuitry shall be provided in the control panel to permit transmission of trouble and alarm signals over leased or privately owned telephone cables to a remote-receiving panel. A reverse polarity and a “master box” circuit shall be provided in the control panel. There shall be a supervised disconnect

switch to allow testing of the fire alarm system without transmitting an alarm signal to the central station.

M. The Alphanumeric Annunciator shall List upon Request:

1. Alarms with time, date and location.
2. Troubles with time, date and location.
3. Status of output functions, "on" or "off".
4. Sensitivity of addressable smoke detectors.
5. Detection device number, type and location.
6. Status of remote relays, "on" or "off".
7. Acknowledgment time and date.
8. Signal silence time and date.
9. Reset time and date.

N. The System shall also provide the Following:

1. Counting the number of addressable detectors within a "zone".
2. Which are in alarm.
3. Counting "zones" which are in alarm.
4. Counting the number of addressable detectors, which are in alarm.
5. Alarm on the system.
6. Differentiating among types of addressable detectors such as smoke detectors, manual stations, water-flow switches, thermal detectors, flame detectors etc.
7. Assigning priorities to types of detectors, zones or groups of detectors.
8. Cross-zoning.

O. Control Functions:

1. Control functions shall be assigned on the basis of multi relational system initiation patterns of detection devices including full logic element equations using as "anding" zones, counting zones, counting devices, "anding" groups, conditional "if", "then", "or" programming and "anding" types of detection devices.
2. Control functions shall be assigned on the basis of, cycle, delay, count, time of day, day of week, day of month and with a holiday schedule of up to 30-holidays per year. Each addressable detection device shall report its condition to the system control unit not less than every 4-seconds in a manner such that failure of the connections to the internal electronics of the device will result in a trouble signal which identifies the specific device involved.
3. The system shall be field programmable for the response of control points to monitored devices.
4. The operating software program shall provide programmable control for the Event-Initiated-Programs (E.I.P.) which shall allow automatic operation of system control points in the event of an alarm condition. To program these E.I.P.'s, the system shall use a specifically designed user friendly programming language, which shall not require a knowledge of computer programming to learn and understand.

5. The operating software shall support the following additional capabilities:

   - Three levels of designated and unique Priority Alarms for each point.
   - Designated "Sense Mode" for status interpretation for each point.
   - Designated Print/No Print/Vectoring Mode for each point.

6. The input statement defines the conditions required to activate the associated output statement. The input statement shall consist of single or multiple monitor point status, subroutine status, time comparison and the utilization of AND, OR, NOT, COUNT, and DELAY logic functions.
7. The output statement defines the action to be taken by the control panel. The output statement shall consist of activation/deactivation of single or multiple control functions, subroutines, and remote Annunciator status LED's. Output statements shall also include the "Alert" messages.
8. The software shall provide an "alert" message, unique to each point in the system, which will provide specific instructions for the operator on duty. These messages shall be up to five lines with up to 70 characters in each line. Each system monitor point shall have five specific alert messages when in alarm. Control points shall also be assigned alert messages.
9. The hardware and software shall have the capacity to accept up to 64 independent programs. Each program shall have "Edit" or "No Edit" capability. Each program shall be written in an equation format comparable to ladder-logic equations. The Equations shall consist of an input and an output statement.
10. Provide initial programming services for coding, loading and debugging the initial OWNER specified programs, as part of the Contract.
11. Programming Command Definition

    a. Timing command shall provide time delay and time control functions based on internal clock/calendar by time of day; day of week; day of month; month in year.
    b. Count command shall provide a specific number of events to occur before a control action is initiated.
    c. Pulse command shall provide on control for a specific period of time.
    d. Cycle command shall provide on-off control for preset periods of time.
    e. Print command shall provide printing of specified information after an event occurs.

2.03 MANUALLY ACTIVATED ALARM INITIATING DEVICES

A. General

1. An electronic, digital multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
2. Devices shall be suitable for use on a Class "A" 4-wire (Class "B", 2-wire) supervised alarm-initiating circuit.

3. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
4. The face of the station shall have lettering indicating "fire" and operational instructions. Stations shall be tamper resistant, semi-flush mounting.
5. Auxiliary spare switch contact shall be provided for control of remote devices rated 120 volts, 60Hz, AC, 3-amp minimum.
6. Stations shall provide visual indication the station has been activated. A key (and/or special tool) shall be required to gain access into the station to reset the station after being activated.
7. Stations shall be "break-glass" or "non-break- glass" type as required by local Fire Marshal or indicated on the Drawings.
8. Stations installed outdoors shall be weather resistant construction, double action to activate the pullstation.
9. RF noise and transient voltage filtering shall be provided in the device electronics.

B. Pull Stations

1. Pull stations shall be non-coded single action, requiring a single manual "pulling" action to initiate the fire alarm.

2.04 AUTOMATIC ALARM INITIATING DEVICES

A. General

1. An electronic digital, multiplex, addressable module shall be incorporated into each device. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.
2. Devices shall be suitable for use on a Class "A", 4-wire (Class "B", 2-wire) supervised alarm-initiating circuit. Where initiating devices are shown connected to an existing system, devices shall operate on 2-wire or 4-wire circuits plus, 2-wire power circuit, or on multiplex circuit as required by the existing equipment.
3. Numbered screw type terminals shall be provided for "in-out" connectors of the alarm circuit wiring.
4. Auxiliary double throw spare relay contact shall be provided for activation of remote rated devices 120V, 60Hz, AC, 1-amp minimum.
5. RF noise and transient voltage filtering shall be provided in the initiating device electronics.
6. Initiating devices shall be reset from the fire alarm control panel and shall not require local individual resetting.

B. Smoke Detector

1. Detectors shall comply with UL Standard 268, 167 and 168, and shall use solid state electronic circuits throughout.

2. The smoke detector shall operate on a total of two circuit wires. Alarm signaling and detector power shall use the same conductors. Detector sensitivity shall be factory set at 1.5%.
3. A fine mesh insect screen shall be provided on all detector openings.
4. The detector shall lock-in on alarm and shall provide a visual alarm/ trouble indicator light. An electromechanical test feature shall provide functional testing of the unit without smoke.
5. The detector shall also incorporate a fixed temperature heat detector rated at 135 degrees F. The heat detector shall operate the alarm circuit and alarm/ trouble light.

    a. Photo electric type smoke detectors shall employ a Light Emitting Diode (LED) as the detector light source, activated by the presence of combustion smoke products. Failure of the LED shall activate the alarm/trouble light on the detector.
    b. Ionization type smoke detector shall employ the triple chamber (dual chamber) ionization principle, activated by the presence of combustion products. The ionization chamber shall be RF shielded.

6. Air duct smoke detector photo electric or ionization type for installation on a mechanical air ducts. Two air tubes shall extend into the air duct. The sampling tube shall extend across the entire width of the air duct. The second tube shall allow air to escape back into the duct. Omit fixed temperature heat detector in air duct smoke detectors.
7. Area protection smoke detector, photoelectric or ionization type, self-contained inside a protective housing/cover. Separate fixed mounting base with wiring terminations and removable “plug-in” twist locking type smoke detector head.

C. Fire Detector - Heat

1. Heat detectors shall be dual action electro-thermostatic combination rate of temperature rise and fixed temperature operation. An indicator shall be visible when detector has activated.
2. The rate of rise element shall be self-restoring, after activation.
3. The fixed temperature unit shall be set at 136 degrees F (190 degrees F for high temperature areas, i.e. areas over 110 degrees F ambient.)
4. Provide a wire guard cover for the detector.

D. Fire Sprinkler Water Flow Detector

1. Vane-type water flow detectors shall be provided on the sprinkler system piping as shown on the Drawings. Detectors shall be designed for mounting on either vertical or horizontal piping, but shall not be mounted in a fitting or within 12 inches of any fitting that changes the direction of water flow.
2. The detectors shall have a sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler head.
3. Detector switch mechanisms shall incorporate an instantly recycling pneumatic retard element with an adjustable range of 0 to 70 seconds. Switches shall have a minimum rated capacity of 7-amp, 125-volt AC, 0.25

amp 24 volt D.C. A D.P.D.T. switch shall be actuated by a polyethylene vane extending into the waterway of the piping.

4. Detectors shall be of weatherproof, dust tight construction and shall provide a ¾-inch conduit entrance. Detector shall be finished in red baked enamel.
5. Flow switch shall be sized to match the fire sprinkler riser pipe diameter.

E. Fire Sprinkler Valve Tamper Switch

1. Tamper switch shall monitor the position of the fire sprinkler shut-off valve. Operation of the valve shall activate the switch and activate a trouble alarm. The valve trouble alarm shall be a separate zone from the respective water flow alarm.

2.05 EVACUATION ALARM DEVICES

A. General

1. Evacuation alarm devices shall activate automatically from the control panel. Devices shall operate on a Class "A", 4-wire (Class "B", 2-wire) supervised alarm evacuation circuit. Series wired alarm devices shall not be used.
2. Numbered screw type terminals shall be provided for "in-out" connections of the alarm circuit wiring.
3. Devices shall be installed in a box, 3½-inch deep maximum, flush mounting unless indicated otherwise on the Drawings. Size as required for the audible alarm indicating device and wiring connections. Provide a trim ring and metal grill cover assembly. Cover assembly shall be a minimum of 1/16-inch minimum thick flat stainless steel or aluminum. Finish color as selected by Architect. The word "fire" shall appear on the grill minimum ½-inch letters. The grill shall be screw attached to the box.
4. The visual alarm-indicating device shall be an integral part of the audible alarm box assembly.
5. Each audible evacuation device shall incorporate an integral visual alarm indicator.
6. Alarm initiating devices, audible evacuation device and visual evacuation devices shall be connected to separate circuit conductors. Do not connect these devices to the same circuit conductors. The separate audible evacuation circuits shall provide coded or non-coded audible signaling independent of the visual evacuation alarms.

B. Audible Alarms

1. Vibrating Horns

a. Vibrating type horns shall be used where audible devices are shown on the Drawings for the following areas: Building egress pathways, exterior of buildings, stairs, corridors, lobbies, reception areas, shops, exercise areas, areas exceeding 300 square feet, and all other areas not specifically listed or identified.
b. Horn shall be heavy-duty electromagnetic vibrating type. Horns shall have field adjustable sound output level control.
c. Horn shall provide a minimum sound level of 95 dB at 10 feet, when installed in the field operating conditions shown on the Drawings.

2. Mini-Horns

   a. Shall be used in rooms smaller than 300 square feet. Mini-horns shall not be used as a substitute where vibrating horns are required.
   b. Mini-horn shall be electric-piezo electronic.
   c. Mini-horn shall provide a minimum sound level of 87 dB at ten feet, when installed in the field operating conditions shown on the Drawings.

C. Visual Alarm Indicator

1. Lamp/Strobe internally illuminated projecting lens assembly, with flasher system. Unit shall flash on and off to provide visual indicating of fire alarm.
2. The word "FIRE" shall appear on the lens or lens plate. The lens shall project beyond the face of the cover assembly.
3. Flash rate, 1-3 flashes per second, with approximately 0.001 second flash duration. Flash rate independent of audible device coded signal output.
4. Light source, Xenon high intensity flash strobe tube white/clear color.
5. 75-candelas minimum, 120-candelas maximum flash intensity, along the direct line perpendicular axis viewing angles. Average flash intensity shall not be less than 15-candelas from any viewing angle, to comply with 2017 NFPA 72 and UBC 1994.
6. Visual devices located in multipurpose room shall be provided with 10-gauge wire guard.

D. Door Magnetic Hold-Open and Release-Close

1. Combination electromagnet and separate “pivot” type magnet armature latch. The mechanism shall “hold-open” and “release-close” the door from the open position to the closed position when electric power is interrupted to the “hold-open” electromagnet. Door opening operation shall be unobstructed by the hold-open mechanism.
2. The “pivot” shall provide not less than 120 degree adjustment range hinged flat plate to align to the door leaf position when the door is open. Integral “pivot” mounting plate with threaded stainless steel through-bolt attachment to the door leaf. The pivot “armature” shall make “full face” contact with the magnet when the door is open and provide shock absorbing nylon “pivot” bearing. The length of the pivot assembly shall be selected to allow the respective door to be held in a 90-degree or greater open position.
3. The electromagnet shall create magnetic force when energized to retain the armature with a hold-open force of not less than 25-pounds, (111N) and suitable for continuous energized operation. Operating voltage shall match the respective electrical circuit connection. The electromagnet shall mount on and attach to surface or flush outlet box, “single-gang”, wall mounted or floor mounted.

2.06 REMOTE FIRE ALARM ANNUNCIATOR

A. General

1. The annunciator panel shall be powered and operated from the fire alarm control panel. "In-out" circuit conductors shall terminate on numbered screw-type terminals.
2. A metal tamper resistant weatherproof cabinet shall contain the annunciator components. The panel shall be surface or flush mounting as indicated on the Drawings. Provide a full height tamper resistant, hinged locking cabinet door. Door shall have transparent high impact windows to allow visual observation of all indicators and switches.
3. An electronic digital, multiplex, addressable module shall be incorporated into the annunciator. The module shall communicate the status and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Each Alarm Initiating Zone (including spares) shall be individually annunciated in the annunciator panel by a back lighted, translucent identification plate. The translucent plate size shall be 1-inch high by 2-inches wide. The plate shall be engraved (black letters on white) with the respective ZONE number and name to match the control panel (i.e. ZONE 1 - 1st floor pull station; ZONE 7 – 2nd floor - AHI - duct detector; ZONE 9 – 3rd floor east - smoke detector; ZONE 11 - fire sprinkler water flow; etc.). Minimum letter size 12-point characters. Provide space for a minimum of four future zone plates.

C. A Common Fire Trouble Alarm shall be annunciated in the annunciator panel from the fire alarm control panel. The trouble annunciator shall match the alarm zone annunciator. Plate shall be marked "fire alarm system trouble". 18 point letter size.

D. A Separate Trouble/Supervisory Alarm shall be annunciated in the annunciator panel from the fire alarm control panel for each fire sprinkler water valve tamper switch. The trouble annunciator shall match the alarm zone annunciator. Plates shall be marked "sprinkler tamper switch trouble-(location". "Location" shall be the shut off valve location being monitored.

E. Annunciator Lamp Circuits shall be automatically supervised. Provide lamp test switch in the annunciator panel.

F. An Audible Alarm/Trouble Buzzer with Silence Switch and Automatic Resound for Subsequent Alarm/Trouble Signals shall be provided. The annunciator panel shall be automatically reset when the control panel is reset.

G. Provide a Sign on each Remote Fire Alarm Annunciator. The sign shall describe the location of the fire alarm control panel(s) connected to the respective annunciator (i.e. Fire Alarm Control Panel (FACP) located in Art Building, 2nd floor, Room #226, etc.). Minimum size sign letters not less than 3/8-inch high, engraved plastic nameplate.

2.07 REMOTE EQUIPMENT MONITORING AND CONTROL (REMC)

A. An Electronic Digital Multiplex Addressable Module shall be provided at each device or equipment indicated to be controlled by the multiplex system. Multiple address-able control ports shall be provided in each module quantity as required for each point controlled or monitored. The module shall communicate the monitor status,

control action and trouble condition of each device with a unique address code. The module shall communicate with and be supervised and monitored by the fire alarm control panel.

B. Where Multiple Points are Monitored or Controlled, Provide Digital, Multiplex, Multi-points, Monitor, Control Panel (REMC). The panel cabinet shall be self-contained NEMA 1 indoor areas, NEMA 3R for outdoor areas, construction and hinged locking door. Provide tamper switch detection zone on the cabinet door; provide 60 hour battery UPS backup and power supply, the same as required for the fire alarm control panel. Panel shall be expandable using plug-in circuit monitor/control printed circuit cards. Provide barriered numbered terminal strips.

C. Each Control Point shall provide a Class-A or Class-B supervised "dry" relay contact single pole double throw maintained contact rated 10-amp, 120 volt, 60Hz AC.

D. Each Monitor Point shall provide not less than one of the following supervised methods of monitoring a remote device or equipment action or status.

1. Remote "dry" contact operation normal open, normally closed or momentary contact operation.

PART 3 - EXECUTION

3.01 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. The Inside Cover of Alarm Initiating Devices shall be marked with the zone initiating number corresponding to the zone number in the control panel. Marking shall be with a felt-tip pen.

B. The Door(s) into the Room or Closet containing the Fire Alarm Control Panel shall be provided with a sign stating "FIRE ALARM CONTROL PANEL INSIDE". Minimum 1-inch high "block" letters, white letters on a red background. Fasten sign to door with a minimum of four screws.

3.02 TESTING

A. The Entire Fire Alarm System shall be tested after the installation is complete.

1. Individually activate each manual initiating station and verify correct alarm operation and control panel response.
2. Individually test each automatic initiating device and verify correct alarm operation, control panel response and remote equipment operation.
3. Provide pressure differential testing for each air duct smoke detector.

B. Test the Battery Back-up System by disconnecting the incoming normal power and allowing this alarm system to operate 60 hours on battery power. Sound the alarm system for 5-minutes at the end of 60 hours on battery power.

C. Perform all Electrical and Mechanical Tests Required by the Equipment Manufacturer's Certification Form. Measure and adjust each automatic detection detectors to the maximum stable sensitivity setting. Detector tests shall be performed with the detector at its operational location and under normal operational

environmental conditions in the area. Bench settings are not acceptable. An operational checkout test and report shall be performed. Submit six copies of test report results. The tests and report shall include, but not be limited to:

1. A complete list of equipment installed and wired.
2. Indication that all equipment is properly installed and functions and conforms to these Specifications.
3. Test of individual zones as applicable.
4. Serial numbers, a location by zone and model number for each installed detector.
5. Voltage (sensitivity) settings for each ionization and photoelectric detector as measured in place with the HVAC system operating.
6. Response times on thermostats and flame detectors (if used).
7. Technician's name, certificate number and date.
8. The completed manual and automatic monitoring and control system shall be tested to insure that it is operating properly. This test will consist of exposing the installed units to a standard fire test.
9. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90-day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the CONTRACTOR shall readjust or replace the equipment and detector(s) and begin another 90-day test period. As required by the Architect, the CONTRACTOR shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the OWNER has obtained beneficial use of the building under tests.

3.03 WIRING (ADDITIONAL REQUIREMENTS)

A. Review the Total System Point-to-Point-Wiring Layout to assure that the correct number and type of wires and conduit sizes are installed.

B. Final Connections, Testing, Adjusting and Calibration shall be made under the direct Supervision of a Factory-Trained Technician of the System Supplier.

C. All Wiring shall be in Conduit.

D. All Wiring in Cabinets shall be neatly formed, laced and made up on bolt and nut terminal blocks. Tag all spare conductors. All conductors shall terminate on terminal strips with spade lugs, of adequate size for all incoming and outgoing conductors. The strips shall be labeled as to their use and wiring diagram shall be placed on the cabinet door showing connections of all related equipment to these strips.

E. Wiring Requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the Manufacturer's documentation. The quantity of raceways and circuit conductors shown on the Drawings is schematic. Provide all conduit, raceways and conductors per Manufacturers recommendations and include all material and labor costs in the Contract price.

F. The conductors used for digital, multiplex communication between the fire alarm control panel and external remote initiation devices, control points and annunciators, shall be twisted insulated pairs, each pair 100% metallic shielded, 4-pair multi-conductor jacketed cable, with a separate 100% metallic shield enclosing all conductors under the jacket, #16 AWG copper conductors minimum with a separate internal ground/drain conductor, UL listed for fire alarm system use, isolation rated for 600 volts AC, 60Hz. One spare multiplex conductor cable shall be provided in all main and branch device/equipment connections for future system use. "Tees" and taps at any junction box location in the communication lines, shall be permitted by the system to additional devices without affecting proper system operation.

G. WIRE SIZE: Wire shall be sized to insure installed circuit voltage drop does not exceed Manufacturer's recommendations, but in no case less than the following;

1. Wiring Requirements for shielding certain conductors from others or routing in separate raceways shall be as recommended by the Manufacturer's documentation. The quantity of raceways and circuit conductors shown on the Drawings is schematic. Provide all conduit, raceways and conductors per Manufacturer's recommendations and include all material and labor costs in the Contract price. The minimum insulated conductor size for fire alarm non-digital multiplex initiating circuits and control circuits shall be not less than #14 AWG (600 volt THHN/THWN) copper.
2. Conductors for evacuation alarm device circuits shall be insulated (600 volt THHN/THWN) copper conductors, quantity as recommended by Fire Alarm Manufacturer. Not more than a total of ten evacuation alarm devices shall be installed on any single circuit "run" extending from the fire alarm control panel, including "T" and "branch-tap" connections.
   The limit of ten devices shall count each horn or strobe as separate alarm devices (i.e. six-horns plus four strobes = ten alarm devices; five combination horn/strobe units' equals' ten alarm devices). Conductors smaller than #12 AWG shall not be used for evacuation alarm device circuits:

Total Circuit Conductor Length (Including "T" and "Branch" Connections)	Minimum Wire Size
Up to 300 feet and all device terminations	#12 AWG
301 thru 600 feet.	#10 AWG
601 thru 900 feet.	#8 AWG
Between Buildings and Over 900 feet.	#6 AWG

H. Air Duct Smoke Detector and Motor Controller Connections:

1. Provide a Remote Equipment Monitoring and Control REMC module for each air duct smoke detector location. Install the REMC at the respective motor control (magnetic motor starter) unit.
2. Provide connection for automatic airflow "shut-down" interlock, upon detection of smoke, by the respective air duct smoke detector from the REMC to the motor controller.
3. Provide software programming of the REMC from the fire alarm control panel to shut down all airflow control modules upon any fire alarm detection condition in the building when required by the Fire Marshal.

4. Provide ½-inchC.-2#12 (AWG) CU-THHN/THWN from the REMC to respective motor control unit.
5. Provide connection of the REMC to the fire alarm multiplex control system with ¾-inch minimum conduit and multiplex conductors.

I. Automatic Fire/Smoke Doors/Hatches

1. Provide a remote equipment monitoring and control module REMC located at each automatic fire/smoke door and hatch containing internal or external automatic closures and/or hold open devices for fire and/or smoke.
2. Provide connection from the REMC to the respective door or hatch fire/ smoke detection system. The REMC shall monitor and report the door/ hatch automatic detection of smoke/fire. The REMC shall provide activation of the door/hatch automatic closure mechanism upon any fire alarm detection condition in the building, with software programming from the fire alarm control panel.
3. Provide ¾-inch conduit 6#14 from the REMC to the respective door/hatch system controls and hold open devices.
4. Provide connection of the REMC to the fire alarm multiplex control system with ¾-inch minimum conduit and multiplex conductors.
5. Provide ¾-inch conduit with 2#10 homerun to the fire alarm control panel from each door/hatch location, for 24 volt D.C. or 120 volt 60Hz AC control power for the door hold open/closing system.

J. Fire/Smoke Air Dampers

1. Provide a remote equipment monitoring and control module REMC located at each building space/room protected by fire/smoke air dampers.
2. Provide connection from the REMC to each fire/smoke air damper for the respective building space/room. The REMC shall provide activation of the respective dampers closure mechanism, with software programming from the fire alarm control panel.
3. Provide ½-inch conduit 3#14 from the REMC to each respective fire/smoke air damper.
4. Provide connection of the REMC to the fire alarm multiplex control system with ¾-inch minimum conduit and multiplex conductors.
5. Provide ¾-inch conduit with 2#10 to the fire alarm control panel from the REMC for 24-volt D.C. or 120 volt AC control power for fire/smoke air damper operators.

K. Provide Smoke Detection per NFPA 72 throughout all 1-hour corridors to operate a control module and relay in localized electrical room. From relay provide 120 VAC to each combination smoke/fire dampers; do not exceed 16 dampers per circuit.

3.04 OUTLET BOXES (ADDITIONAL REQUIREMENTS)

Device outlet boxes shall be flush mounted unless indicated otherwise on the Drawings. Provide extension rings to finish flush with finish surface. Where the Drawings indicate surface mounted devices, outlet boxes shall be cast metal with threaded hubs. Where the conduit entrances are not exposed for surface mounted devices, provide flush outlet box behind the device box and omit the conduit hubs on the device box. Size device boxes and outlet boxes per Manufacturers recommendation and as required by Code for wire fills.

3.05 SPECIAL INSTALLATION REQUIREMENTS

A. General:

1. Whether or not shown on the Fire Alarm Drawings, the following systems shall be provided as part of the Contract. Provide fire alarm devices and connection of the systems to the fire alarm control panel including all material, labor and cost in the Contract.
2. Refer to Mechanical, Plumbing and Architectural Drawings for the location and quantity of these systems.

B. Air Duct Detectors:

1. Provide air duct smoke detectors in each supply air duct and return air duct with an air flow of 2000 CFM or greater. Coordinate with Mechanical CONTRACTOR. Sampling tube shall extend across entire duct width.
2. The air duct smoke detectors shall be provided on both the return and discharge sides of the air ducts of each unit.
3. Air duct smoke detectors shall be physically accessible for testing and maintenance after installation.
4. Install the air duct smoke detectors to provide the separation distance, recommended by the Manufacturer, from obstructions in the air ducts causing non-uniform air flow patterns, including but not limited to the following:

    a. Elbows/bends in the air duct.
    b. Fan/blower air source.
    c. Air discharge or air intake louvers.

5. Provide additional airflow control “vanes” inside air ducts and air duct length extensions, where airflow turbulence causes operation problems with the respective air duct smoke detectors. Coordinate installation with Mechanical CONTRACTOR.
6. Prior to installation of smoke detectors in “air ducts”, perform airflow velocity and airflow turbulence test measurements. The tests shall be conducted at each proposed smoke detector installation location in the respective air duct, with normal operational airflow velocities present in the air ducts.
7. The smoke detector type and installation location in the respective air duct shall comply with the Manufacturer’s recommendations to insure proper smoke detector operation. Adjust the smoke detector locations and provide smoke detectors with air velocity and air turbulence sensitivities compatible with respective air duct.
8. Air duct detectors malfunctioning or failing to function as a result of incorrect application or improper installation shall be removed. Provide proper air duct smoke detector locations and provide smoke detectors with airflow velocity and air turbulence sensitivities compatible with respective air duct.

C. Fire Sprinkler Water Flow and Shut-off Valve Tamper Switches:

1. Provide fire sprinkler water flow switches installed on each main fire sprinkler rise pipe, coordinate with the Fire Sprinkler Contractor.
2. Provide fire sprinkler water valve tamper switches installed on each main fire sprinkler shut-off valve, coordinate with the Fire Sprinkler Contractor.

D. Fire/Smoke Rated Door/Hatch Closures and Hold Opens:

1. Provide connection to the fire alarm control panel, of each fire/smoke rated door/hatch and damper with self-contained fire/smoke detection, hold open or closure devices.
2. Provide automatic smoke detectors installed within 3-feet of each side of a fire/smoke rated door/hatch and damper. Provide magnetic release hold open devices for each door/hatch. Provide connection to the fire alarm control panel.

E. Area Protection Automatic Smoke Detectors

1. Area protection smoke detectors shall be ceiling mounted unless noted otherwise on the Drawings.
2. Provide smoke detector quantities to insure a minimum of one automatic smoke detector for each 600 square feet of area, (and fraction thereof) for each building space where smoke detectors are required.
3. Provide smoke detector quantities to insure the centerline to centerline spacing of installed smoke detectors does not exceed 20 feet in the protected area.
4. Locate area protection smoke detectors a minimum of 48 inches horizontal distance from any air transfer grill, air intake grill and air discharge grill.

F. Fire/Smoke Air Dampers

1. Each room with HV/AC air supply and/or air return passing through one or more fire/smoke air dampers shall be provided with automatic smoke detector protection. The smoke detectors shall close the respective room Fire/Smoke dampers when smoke is detected by the room automatic smoke detector and activate the fire alarm control panel.
2. Provide automatic air duct smoke detectors or area protection automatic smoke detectors, for fire/smoke air dampers, based on the Requirements of Condition #1 or Condition #2 as follows:

    a. Condition #1 - Where all the following criteria are true for the respective room, provide air duct smoke detectors in each HVAC air duct connecting to the room:

        1) All the fire/smoke dampers for the room are located in HVAC air ducts for the respective room.
        2) All the air ducts exceed a cross sectional area of 64 square inches.
        3) The minimum air flow rate, during HVAC operation, in all the air ducts exceeds the Requirements of the Air Duct Smoke Detector Manufacturer’s recommendations.

4) The separation distance between the fire/smoke damper in each air duct and any air discharge louver, any elbow/bend in the air duct and any fan/blower, is greater than the minimum Installation Distance Requirements of the Air Duct Smoke Detector Manufacturer's recommendations.

b. Condition #2 - Where any of the criteria in Condition #1 are not true, provide area protection automatic smoke detectors in the respective room.

3. Provide power and control connections to the fire/smoke dampers, and respective fire/smoke damper smoke detectors. Connect all components to the fire alarm control panel.
4. Connection of fire/smoke air dampers shall comply with the Damper Manufacturer's recommendations, to insure proper damper and fire alarm system operation.

END OF SECTION

ELECTRONIC NETWORK SYSTEMS INFRASTRUCTURE
(Computer/Data, Telephone/Voice)

PART 1 - GENERAL REQUIREMENTS

1.01 OBJECTIVE

A. The purpose of this Performance Standards document is to enable consistency in planning, design, and installation of structured cabling systems for the City of Ontario facilities. Having consistent infrastructure at all our facilities that meet our goals and objectives for bandwidth, capacity and scalability is critical to the Information Technology Agency's strategic plan to support the mission of the City.

B. The City of Ontario will own the facilities being developed for their entire life cycle. They must provide an appropriate setting for their respective business purposes for decades. These facilities need to be built to minimize the total cost of ownership, and not simply the lowest initial cost.

C. Design and installation of Industry Standard high-performance cabling systems and technologies during building construction or renovation is significantly more cost-effective and less disruptive than after the building is occupied. The City of Ontario buildings undergo many changes during their lifetime. The flexibility to incorporate change needs to be built into the project.

D. Telecommunications design for renovation and new construction projects must be founded on standards-based principals and on an infrastructure distribution plan that will support changes and upgrades over the life of the facility. Program needs, space assignments, and the need for leading-edge technology environments and services drive renovation and reconfiguration needs. Information and communications technology (ICT) systems should be designed for efficient operation and configured to be accessible for maintenance with minimal disturbance to occupied spaces.

E. This Specification document will define the systems, products, installation practices and warranty support required of all Information Technology Structured Cabling Systems. This document is to provide guidelines to all Architects, Engineers, Consultants, Contractors, and Project Managers pertaining to the construction design, review, comments, and approval procedures for ICT infrastructure as required by the City of Ontario Information Technology (IT) Agency.

F. The Performance Standards are to be used for development of Communications Specifications for Contract Documents. The Design Professional shall be responsible for assuring the Specifications are compatible with the overall design and are coordinated with all other sections.

G. Product Specifications, general design considerations, and installation guidelines are provided in this written document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types for a specified City of Ontario facility will be provided as a separate submission for each specific project.

H. The City of Ontario Information Technology Agency shall review all technology designs at Schematic Design (SD), Design Development (DD) and Construction Documentation (CD) to ensure facilities will meet the City of Ontario IT Agency goals and objectives. All submittals for the IT Systems must be approved by the City of

Ontario Information Technology Agency prior to procurement of materials and any work commencing – these reviews include but not limited to:

1. A responsibility matrix provided by the contracted firm shall be reviewed and agreed upon by the City of Ontario IT and Stakeholders.
2. All product datasheet submittals affecting the Technology Systems.
3. Value Engineering (VE) Proposals affecting the Telecommunications Structured Cabling System (SCS).
4. Any RFI or change to the agreed project design affecting the SCS. Any product substitution must be approved prior to installation.
5. Conduit/tray fill calculations need to be submitted to the City of Ontario IT Agency to confirm fill ratios prior to ordering.
6. Shop Drawings of Telecommunications Spaces including Dimensions, Elevation Drawings, wall/rack mounting details, and TR (Telecommunication Room) layouts.

    a. Backbone and Horizontal Pathways
    b. Bonding and Grounding Riser Diagrams

7. Labeling scheme details that meet the City of Ontario IT Requirements and telecom room signage. All labeling details for faceplates, patch panels, surface mount boxes, etc. must be submitted for approval.
8. Any product substitutions that may affect SCS system warranties.
9. Proof of all design and installer certifications from BICSI (RCDD, OSP, DCDC, RTPM, INST1, INSTC, INSTF, TECH), Leviton Authorized Installers and other Manufacturer's that may be working on the SCS for the City of Ontario as detailed further in this Performance Specification.
10. The Design Architect/Engineer must provide a summary sheet detailing the telecom cable quantity schedule for the project. The schedule should include information such as telecom outlet counts, jack counts, cable types, device types, etc. Information should be listed by level and floor serving TR.

1.02 KEY CONTACTS

A. Client Contacts

1. Nino Dionaldo, Principal IT Analyst Information Technology at City of Ontario, ndionaldo@ontarioca.gov
2. Jerrod Lee, IT Manager at City of Ontario, jlee@ontarioca.gov

B. Leviton Contacts

1. John Cleary, Partner, WestCal Technologies, jcleary@westcaltech.com, M 909-717-7461
2. Larry Gillen, Leviton Network Solutions, Specification Engineer, larry.gillen@leviton.com, M 909-202-2031

1.03 CODES AND STANDARDS COMPLIANCE

A. All materials shall comply with the applicable sections of all Local Building Codes, Fire Safety Codes, Amendments, and Ordinances for installation of telecommunications cabling.

B. All materials shall comply with the applicable sections of the following Codes for installation of telecommunications cabling:

1. California Building Code
2. National Electrical Code – NFPA 70 (NEC)
3. National Fire Alarm and Signaling Code – NFPA 72
4. Federal Communications Commission (FCC) Part 15 and Part 68
5. National and Local Codes, amendments, and ordinances.

C. All materials and installation practices shall comply with the most current version of the applicable sections of the following Telecommunications Industry Standards and Manuals as appropriate.

D. Telecommunication Industry Association (TIA)

1. ANSI/TIA-568.0-E Generic Telecommunications Cabling for Customer Premises
2. ANSI/TIA-568.1-E Commercial Building Telecommunications Cabling Standard
3. ANSI/TIA-568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standards
4. ANSI/TIA-568.3-E Optical Fiber Cabling and Components Standard
5. ANSI/TIA-568.4-E Coaxial Components
6. ANSI/TIA-569-E, Telecommunications Pathways and Spaces.
7. ANSI/TIA-526-7-A, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
8. ANSI/TIA-526-14-D, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
9. ANSI/TIA-606-D, Administration Standard for Commercial Telecommunications Infrastructure.
10. ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
11. ANSI/TIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard
12. ANSI/TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points
13. ANSI/TIA-862-B, Structured Cabling Infrastructure Standard for Intelligent Building Systems
14. ANSI/TIA-942-B, Data Center Cabling
15. ANSI/TIA-5017, Telecommunications Physical Network Security Standard
16. ANSI/TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points
17. ANSI/TIA-1152-A, Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling
18. TIA TSB-184-A Power Delivery (4-pair)

E. BICSI

1. Telecommunications Distribution Methods Manual (TDMM), 15th Edition
2. Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition
3. Outside Plant Design Reference Manual (OSPDRM), 6th Edition
4. ANSI/BICSI 002-2019- Data Center Design and Implementation Best Practices

5. ANSI/BICSI 007-2020: Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises
6. ANSI/BICSI 008-2018: Wireless Local Area Network (WLAN) Systems Design and Implementation Best Practices
7. ANSI/BICSI N1-2019: Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure
8. ANSI/BICSI N2-2017: Practices for the Installation of Telecommunications and ICT Cabling Intended to Support Remote Power Applications
9. ANSI/BICSI N3-2020: Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure

F. This document does not replace any Code, local or otherwise. The Contractor must be aware of Local Codes that may impact this project. It shall be the responsibility of the Installing Contractor to verify the applicable Code version for all work performed with the authority having jurisdiction (AHJ).

G. All work shall comply with the latest revision of the Codes, Regulations or Standards. When conflict exists between local or National Codes, Regulations or Standards, the most stringent Codes, Regulations or Standards shall be followed.

H. Conflicts:

1. Drawings and Specifications are to be used in conjunction with one another and to supplement one another. In general, the Specifications determine the nature and quality of the materials and tests to give characteristics of performance that should be adhered to in the installation of the communications system components, the Drawings establish the quantities and details of installation.
2. If there is an apparent conflict between the Drawings and Specifications, between Specification Sections, or between the City of Ontario Standards, the Contractor and City of Ontario Representative shall jointly resolve any work that is in apparent conflict with applicable Codes.
3. Clarification with the City of Ontario IT Agency Representative about these items shall be made prior to ordering and installation of components.
4. All materials, installation and workmanship shall comply with the most recently approved applicable reference Standards and Codes addressed within each Specification document.

1.04 CONTRACTOR QUALIFICATIONS

A. The Contractor shall be a company specializing in the installation of Telecommunications Structured Cabling Systems.

B. The Contractor shall have total responsibility for the coordination and installation of the work shown and described in the Drawings and these Specifications.

C. The Contractor shall demonstrate the following Qualification Requirements:

1. Demonstrate that they have a minimum of 5 years' experience installing structured cabling for telecommunications.
2. Reference list of at least five previous successful projects of this scope, size and nature; including names and location of projects, description of work, time of completion and names of contact persons for reference.

3. Demonstrate that they are a current Leviton Network Solutions Manufacturer Certified Contractor.
4. Installers/Technicians working on this project will be able to produce documentation from the Leviton Network Solutions indicating that they have successfully completed the appropriate Copper and Optical Fiber Communications Cabling System training courses.
5. The Contractor must have a current BICSI certified Registered Communications Distribution Designer (RCDD) on staff as a full-time employee – copy of RCDD certificate required. It is the Owner's discretion, on a project by project basis, an RCDD consultant may be hired by the Owner to inspect work during and after completion. Based upon inspection by Owner's hired RCDD consultant or IT Staff the Contractor will be responsible for correcting any work that does not meet Requirements detailed in this document.
6. The Contractor must have a Supervisor on premises with the authority to act for the Contractor. The Supervisor must be a current Leviton Network Solutions Certified Installer. Copy of certificate required.

D. Bidding Contractor shall be licensed to install telecommunications systems in the locale where work will be performed.

E. Bidding Contractor shall be able to provide insurance on the types and values requested by the Owner.

F. Bidding Contractor shall be able to procure bonding in the type and values as required by the Owner.

1.05 QUALITY ASSURANCE

The Specifications contained herein are set forth as the minimum Acceptable Requirements of the Contractor's Quality Assurance Program. The Contractor is responsible for executing any other Quality Assurance measures necessary to ensure complete and fully functioning systems within the scope of this project.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Scheduling and Coordination with other Trades

1. The Contractor shall coordinate Structured Cabling Systems work with that of other trades as required ensuring that the entire communications work will be carried out in an orderly, complete and coordinated fashion.
2. Contractor shall attend project coordination meetings as necessary.
3. Upon Contract award Contractor shall provide a detailed construction schedule with hard dates for completion of cable placement, terminations, and testing and submit to Owner's Project Manager for approval.
4. Cabling schedule submittals shall be in a format as designated by the Owner's Project Manager.
5. Inform General Contractor and Owner's Project Manager immediately of any delays or potential delays related to material procurement, delivery or labor related issues.
6. Include premium time required to comply with the project scheduling and phasing.

B. Project Management

1. The Project Manager shall abide by these standards and allow no deviations without the consent of the City of Ontario IT Agency. All consultants shall incorporate this information into the design for all City of Ontario projects.
2. City of Ontario IT Agency and the City of Ontario Police Department shall be involved in the planning and design of all applicable security systems.
3. City of Ontario IT Agency shall be involved in the planning and design of all Audio-Visual systems

C. Site Investigation

1. Prior to submitting bids for the project, and where practicable, contractor shall visit the work site to become aware of any conditions that may affect the cost of the project.
2. Contractor shall obtain a complete set of Project Drawings and Specifications for coordination and to determine the full Scope of Work.
3. The Contractor shall submit the appropriate cabling, connectivity, materials, equipment, enclosures, and all structured cabling components for a complete and operational system for the interior and exterior environmental conditions of the project.

D. Permits

1. Contractor shall obtain all permits and required inspections for the installation of this work and pay all charges associated.
2. Deliver to the Owner all certificates, permits and inspection reports issued by Authorities Having Jurisdiction (AHJ).

E. Delivery, Storage, and Protection

1. Materials and equipment furnished shall be delivered in new condition and be of current production lots.
2. Contractor shall ensure that material deliveries to work site shall be coordinated with construction manager responsible for materials distribution to all trades. Handle in accordance with Manufacturer’s recommendations and instructions to avoid damaging equipment, installed devices and finish.
3. Contractor is responsible for all materials, tools and vehicles left on the job site.
4. Contractor shall coordinate for the removal of all rubbish and packing materials produced by the Contractor’s activities during the project.
5. Contractor shall ensure materials are stored according to Manufacturer’s recommendations. In addition, materials must be stored in a location protected from vandalism and weather.
6. Inspect and report concealed damage to carrier within specified time.

F. Project Conditions

1. Environmental Requirements

a. Contractor shall ensure that any rubbish produced by the structured cabling work is disposed of in accordance with Site, Local, State or National Regulations.

b. It is preferred that the Communications Contractor recycle any used or un-used components during the course of the construction project.

2. Telecommunications Bonding and Grounding System

a. Contractor shall confirm with electrical engineer on project that a Telecommunications Grounding and Bonding System meeting industry standards has been provided.
b. All relevant telecommunications equipment installed must be bonded to the Telecommunications Grounding and Bonding System per industry standards and Manufacturers recommendations.

1.07 SUMMARY OF WORK

A. Examine Construction Documents to determine the scope and extent of each technology infrastructure project. Technology infrastructure projects may include the following work:

1. Pathways: Backbone, Conduit, Handholes/Pull Boxes/Manholes as shown on Drawings.
2. Applicable Service Providers should be provided plans to their engineering group to review for service Entrance Conduit and Equipment Mounting Requirements.
3. Backboards: ¾" thick x 4' x 8' plywood, treated, flame resistant paint in a white light color. If ¾" fire rated plywood is used, fire-rated stamping should be kept visible but rest of board to be painted to match adjacent surface. Each board shall have its own stamp. Cover as much available wall-to wall space as possible in Main Equipment Rooms and Telecom Rooms.
4. Building entrance protectors, 110 block input/output, with 5-pin protector modules (gas or solid-state) with 26 AWG 18-in fuse link for added protection. As applicable to the project site.
5. Ladder Rack/Cable Tray: A system of ladder rack and/or cable tray shall be installed to bring incoming cables from the conduits and sleeves entering Telecom Rooms to the backboard and to the racks and cabinets that they serve.
6. Enclosures, Equipment Racks and Wire Management: Enclosures and equipment racks to facilitate the mounting of the technology equipment and termination shall be anchored accordingly to the project's respective seismic zone. Wire management, vertical and horizontal, shall be implemented in each project.
7. Conduit, Cable Trays, Sleeves and J-Hooks to distribute the structured cabling system throughout the building.
8. Firestop, smoke, and acoustical ceiling protection system.
9. Inter and Intra Building Cabling: Furnish and install Category 6A rated copper cable, multi-pair copper cable, optical fiber cable (OS2/OM4) and specialty cable for systems such as Electronic Safety and Security (access control, controllers, detectors/sensors, monitoring equipment, recorders/storage, video surveillance (CCTV), Audio Visual Systems (A/V), PoE/IoT Technology devices, life safety, mass notification, paging, cellular, radio and broadband/TV systems (Coaxial systems). All pairs are to be terminated on Contractor-provided hardware or City of Ontario IT Agency furnished products as detailed in the Construction Documents. Review all project specifications and Construction Documents for the various cabling systems required for a full functional and complete installation.

10. All construction projects shall include assessment of existing outside plant infrastructure and include the expansion of all telecom utilities in all areas and along all routes end-to-end that may currently be at capacity.
11. Work Area Outlets: Furnish and install all copper and fiber optic termination points in walls, ceilings, floor boxes, poke-thrus, office furniture, and other areas as noted on the Construction Documents.
12. Furnish and install appropriately sized category 6A and fiber optic patch cords in the Equipment/Telecom rooms, at the work area outlets, wireless access points, IP Cameras and other IoT devices.
13. Furnish and install all splicing and termination materials, frames, plates, cable supports, termination blocks, termination modules, wiring devices, wire management, labeling, and any other accessories or consumables needed for a complete and fully functional technology infrastructure.
14. Testing: Performance Certification Testing of Twisted-Pair Cables: (Note: Permanent Link Test results are recommended and are the expected norm). Test 100% of all cable runs for defects in installation and verify cabling system performance under installed conditions in accordance with most current ANSI/TIA-568 Series, BICSI TDMM, Manufacturer's recommendations, and best industry practices.
15. Operations and Maintenance Manuals to be supplied to the City of Ontario IT Agency for all the Technology systems implemented.
16. Training: Owner/City of Ontario IT Agency provided training for various installed technology systems for full function and operation as indicated in the Construction Documents.

B. City of Ontario IT Agency shall conduct progress site assessments during construction and utilize a Quality Inspection Report for all Telecom Rooms, Telecom Enclosures, Pathways and Spaces, Work Areas Horizontal (copper/fiber optic cables), and Backbone (copper/fiber optic) installations. See City of Ontario IT Agency Quality Inspection Report template for more details in Section 3 of this document.

1.08 SUBMITTAL REQUIREMENTS

A. Contractor shall submit with bid for approval, Specification sheets for all products to be furnished. Work shall not proceed without the Owner and/or the Project Manager's approval of the submitted items.

1. Contractor shall submit an accurate Bill of Materials (BOM) to ensure the correct quantities and products are acquired and delivered for each construction project.
2. Contractors wishing to approve a structured cabling solution or other products other than those specified in this document will be required to perform the following:

    a. Provide System Performance Specifications, data sheets for each individual product and Specification Section being addressed for all components for the new proposed solution/systems and/or products.

b. Provide an itemized comparison to each of the solution/system functions as described in this Specification. Include in the document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria:

1) "Exceeds"
2) "Equal"
3) "Unequal"

c. All products specifically addressed in the bid documents that the Contractor is seeking approval for substitution must be received by the Owner and/or Owner's Representative for evaluation no later than 15 business days prior to bid date. All Owner approved equals will be published in addendum prior to the bid date.

d. All proposed documentation must be sent to the Owner and/or Owner's Representative for evaluation.

B. In addition to individual product specification sheets Contractor shall submit Manufacturers Systems Data Sheets detailing overall systems performance.

C. Any materials and equipment submitted that are not in accordance with this Specification may be rejected.

1. Failure to receive written approval for products installed that deviate from the Performance Specifications and/or Drawings will result in the Contractor replacing the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.

D. Successful Contractor shall Generate Shop Drawings for approval prior to commencement of work. Shop Drawings shall include Cable Routes, Conduit Penetration Locations, Elevation Drawings of equipment racks, patch panels, termination blocks, connection details, rack mounting details and other relevant details not included in the Project Drawings.

E. Upon completion of project, the Contractor shall modify initially reviewed and accepted Shop Drawings to include revisions based upon change orders and approved field conditions and submit a Final Drawing as an as-built submittal.

1.09 END-TO-END SYSTEMS REQUIREMENT

All cables, connectors, patch panels, and patch cords provided must be manufactured by a single company to provide a complete end-to-end solution. Mixed manufacturer solutions will not be accepted. High pair count copper cable is excluded from this Requirement.

1.10 WARRANTY

A. Contractor warrants to the end-user that their installation practices and workmanship will adhere to all standards and Manufacturers Requirements. Contractor shall fix or repair any installation faults at their own cost. Should a defect or problem occur with any Manufacturers product the item(s) will be replaced by the certified Contractor or a Contractor approved by Manufacturer to perform warranty repair work.

B. A Leviton Limited Lifetime Product and Performance Warranty shall be obtained by the Contractor on behalf of the Owner covering all applicable structured cabling components of the installed system. It is the responsibility of the contractor to provide all forms/documents necessary to obtain the system warranty. Evidence of such warranty will be provided by Contractor as part of their contractual obligation and final retainage payments are contingent upon delivery to Owner of Manufacturer's site warranty certificate.

C. System performance margin guarantees must be representative of the specific components and topologies listed in this document.

D. The Low Voltage Contractor is responsible for documenting workmanship that adheres to the Standards and Manufacturer Requirements to ensure that other Trades have not compromised their installation.

1.11 BACKBONE CABLING

A. A minimum of 24 Strands OS2 single-mode fiber optic cable shall be installed for LAN backbone applications. See specific site Requirements to confirm fiber type and strand count.

B. Each Telecommunications Room (TR) shall be cabled to the MER with a minimum of 12 Strands of OS2 single mode and 12 Strands OM4 multimode fiber optic cabling.

C. The fiber optic cable shall be terminated in rackmount fiber optic patching enclosures located in cable racks at their respective TR. Fiber strands shall be terminated with LC duplex connectors mounted into LC duplex shuttered splice modules and shuttered adapter plates installed in the fiber enclosures.

D. Fiber optic cable terminated in wall mount enclosures must be confirmed with owner prior to ordering and installation.

1.12 HORIZONTAL CABLING

A. All Wireless Access Points (WAP's), Security Cameras, Access Control devices, etc shall be cabled with a minimum of two Category 6A UTP horizontal cables or as indicated on the communications plans.

B. All Workstations shall be cabled with a minimum of three Category 6A UTP horizontal cables or as indicated on the communications plans.

C. Three horizontal cables terminated onto Category 6A jacks shall be run to each endpoint (faceplate, modular furniture faceplate, surface mount block, etc.) unless indicated otherwise in this document and/or on the communication project plans.

D. Horizontal Cables shall be terminated with their respective Category 6A UTP RJ45 connector modules installed at the appropriate wall-plate or surface mount box (SMB) at the equipment outlet location and in Angled 48-port 2RU, field configurable QuickPort, 19" rack mounted patch panels located in the Telecommunications Room (TR) or Telecommunications Enclosure (TE).

1. Each floor shall have its own dedicated Angled 48 port field configurable QuickPort patch panel(s) with adequate room for growth within racks or enclosures.

2. No mixing of floors on the same Angled 48-port field configurable QuickPort patch panels is allowed.
3. If a TR serves multiple floors, each floor shall have its own dedicated 2-post rack and dedicated patch panels.

E. Category 6A UTP cable jacket color shall match the RJ45 connector modules. Any deviations shall be approved by City of Ontario IT.

1. Data Workstations – Blue
2. Wireless Access Points – Yellow
3. Security Cameras – White
4. IOT – Red

F. Telecommunications signal and power needs and distribution methods must be coordinated with the selected furniture layout.

1.13 ELECTRONIC SAFETY AND PHYSICAL SECURITY REQUIREMENTS

A. Coordinate with IT Agency and reference the City of Ontario “Physical Security Standards Document” to meet the Electronic Safety and Physical Security Requirements to ensure effective surveillance, security, and safety of all premises.

1. At a minimum, every project shall account for the installation and integration of all security infrastructure including pathways and cable necessary to support the security system as defined in this document and the “Physical Security Standards Document”.

B. The City of Ontario Electronic Safety and Physical Security Standards are based on the DORI standard for cameras and incorporate the use of Axis cameras for surveillance and HID Signo readers for access control.

C. All camera systems are managed via Genetec Omnicast, and all access control systems are managed via Genetec Synergis, ensuring seamless operation and advanced functionality.

D. Compliance with local building codes is essential to ensure safety and regulatory adherence.

E. Due to the evolving nature of technology, all Requirements are subject to change without notice and shall be verified with all parties prior to procurement and installation on all projects.

F. Physical Security Definitions

1. Detect: Ability to notice something without being able to detail what it is.
2. Observe: Ability to see the activity of interest.
3. Recognize: Ability to distinguish a person or object within a general category.
4. Identify: Ability to clearly identify a person or an object in detail.

G. General Requirements

1. All security cameras installed must be from Axis Communications, equipped with the latest Axis chipset featuring AI capabilities to ensure compatibility and standardization.

    a. All Security Camera Locations shall have a single 1-¼" conduit, homerun directly to a telecommunications space, cable tray or main cable pathway is required for each safety camera location. Each location shall have a 5S by 3" deep gang box terminating the conduit. The box shall be mounted to support the weight of the camera.
    b. Affix label to camera housing. Label to match serving telecom outlet label.

2. All access control systems must use HID Signo readers and integrate with the Genetec security system via Synergis Cloud Link G2 to ensure seamless operation and advanced functionality.

    a. Fully functional system will include card readers, electrified door hardware, door controllers, integrated wired/wireless locks, and a server to audit and control the system.
    b. Related accessories and system components may include conduit, raceways, cables, back boxes, ID badge, and access cards, alarm contacts, help buttons, local exit alarm, local door propped alarms, and electrified locking door hardware.
    c. At a minimum, card access systems will include conduit infrastructure and back boxes for perimeter doors and Telecom Rooms for future use.

        1) Interior door conduit infrastructure shall be determined during project planning.
        2) All planned systems shall be wired.
        3) No wireless systems shall be allowed for new construction unless otherwise noted.
        4) Minimum Pathway Requirements shall include conduit from the ceiling space to the center hinge, conduit and back box to card reader location and conduit to the top frame for door contacts.
        5) Conduits should be consolidated in ceiling space with an appropriately sized junction box. The junction box should have a min. 1-¼" pathway to the nearest Telecom Room.

3. All cameras and access control systems must support high-definition video recording and encrypted communication capabilities for secure data transmission and low-light conditions.
4. All installations must comply with Local Building and Safety Codes to ensure the integrity and legality of the installation.
5. Electronic Safety and Physical Security Equipment should be purchased at the last responsible moment, which is typically during the later stages of Construction. This will avoid choosing part numbers too early in the project and equipment installed at end of life or when newer models are available.

H. Camera Standards

1. The total number of surveillance cameras and their locations cannot be finalized until a security analysis has been conducted and approved by the IT Agency and/or Owner's Security Integrator.
2. Perimeter Doors

    a. Location: All entrances/exits around the perimeter.
    b. DORI Standard: Identify Level
    c. Description: Cameras must be able to identify individuals clearly. This requires cameras with high resolution, facial recognition capabilities, and adequate frame rates to capture clear images of any individual entering or exiting the premises.
    d. Installation: Cameras should be mounted at a height that captures face- level imagery, typically between 2.5 to 3 meters.

3. Parking Lots

    a. Location: All parking areas.
    b. DORI Standard: Recognize Level
    c. Description: Cameras installed must provide coverage sufficient to recognize individual and vehicle details. Additionally, all entrances and exits from the parking area should be equipped with LPR cameras from Flock Safety to monitor and record all vehicle traffic.
    d. Installation

        1) LPR Cameras: Positioned to capture clear images of license plates on vehicles entering and exiting the parking lots.
        2) Non-LPR Cameras: Strategically placed to cover the entire parking lot area, ensuring there are no blind spots. These cameras should be positioned at high vantage points to provide wide coverage and capture activities throughout the parking area. Placement should allow for overlapping fields of view to ensure comprehensive surveillance.

4. Exterior Building Coverage

    a. Location: All exterior sides of the building.
    b. DORI Standard: Recognize Level
    c. Description: Cameras must be capable of providing a continuous and clear view of all exterior building surfaces. The objective is to recognize any unauthorized individuals or activities surrounding the facility. The cameras should be capable of handling varying light conditions and weather.
    d. Installation: Cameras should be mounted to cover every side of the building without blind spots, with special attention to potential entry points and vulnerable areas.

5. Public Interior Areas

    a. Location: All publicly accessible interior areas including lobbies, hallways, and main corridors.
    b. DORI Standard: Identify Level

c. Description: Cameras in these areas must be capable of clearly identifying individuals. High-resolution cameras with facial recognition capabilities are required to capture detailed images that allow for clear identification of faces and other identifiable markers.
d. Installation: Cameras should be strategically placed at key points within these areas to ensure comprehensive coverage, particularly in high-traffic zones.

6. Exterior Gathering Locations

a. Location: Courtyards, gardens, and other designated outdoor gathering areas.
b. DORI Standard: Observe Level
c. Description: Cameras should provide a general observation of the area to monitor activities and gather situational awareness. This level allows for the monitoring of crowd movements and behaviors without the need for individual recognition.
d. Installation: Cameras should be positioned to cover large fields of view, including entrances and central areas where gatherings are likely to occur.

I. Access Control Standards

1. Exterior Building Doors

a. Door Type: All exterior building doors.
b. Access Control: HID Signo Readers with Keypads
c. Description: All exterior building doors should utilize HID Signo readers equipped with keypads to enhance security. These readers offer versatile, powerful technology and advanced security features, suitable for exterior door security.
d. Additional Components

1) Door Contact Sensors: Installed to monitor the open/close status of doors.
2) Request-to-Exit Switches or Sensors: Installed to allow for the safe and secure egress of individuals.

e. Installation: Ensure that the readers, door contact sensors, and request- to-exit switches or sensors are positioned at an optimal height and location for easy access while maintaining security.

2. Interior Doors (Public to Non-Public Areas)

a. Door Type: All interior doors leading from public to non-public areas.
b. Access Control: HID Signo Card Readers
c. Description: These doors should utilize HID Signo card readers to control access. These readers provide a secure and efficient way to manage entry into restricted areas, ensuring that only authorized personnel can access sensitive locations.
d. Additional Components

1) Door Contact Sensors: Installed to monitor the open/close status of doors.

2) Request-to-Exit Switches or Sensors: Installed to allow for the safe and secure egress of individuals.

e. Installation: Install readers, door contact sensors, and request-to-exit switches or sensors at appropriate positions to facilitate quick and secure access verification.

J. Installation Requirements

1. Cameras and access control systems must be installed by certified technicians to ensure they meet Operational Requirements and Standards.
2. All installations must comply with Local Building and Safety Codes to ensure the integrity and legality of the installation.

K. Adherence to Standards

1. Adherence to these standards is mandatory for all current and future installations of security cameras and access control systems. This will ensure that the surveillance system is effective in identifying potential security threats and in enhancing the overall safety of the premises.

1.14 PATHWAYS

A. Horizontal Pathways and Cable Runway – Telecommunication Rooms: Within the TR's, cable runway shall be mounted both horizontally and vertically to form a continuous runway from all pathways entering the space, to all equipment racks. All cable runways are grounded as specified in ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises and ANSI/BICSI N3-20: Planning and Installation Methods for the Bonding and Grounding of Telecommunications and ICT Systems and Infrastructure.

1. Every TR must provide a minimum of twice the amount of horizontal pathway access as is required to support the initial installation.

a. Conduit/cable tray fill calculations need to be submitted to City of Ontario IT Agency to confirm fill ratios during design phases of the project and prior to ordering and install.
b. When determining pathway sizing, it is important to note that there is a difference between calculated fill and actual fill. Calculated fill assumes all space is used (i.e. – no space between adjacent cables) and cables are routed perfectly parallel. There is always space between cables and cable lay is typically random along the pathway. For example, a calculated fill ratio of 50% for a cable tray can be expected to fill physically and visually 100% of the entire cable tray due to spaces between cables and random placement.

2. Any outlet separated from the main horizontal support system (such as cable tray) by a fire or smoke partition must have a rated pathway, such as a sleeve that can be fire-stopped after cable is installed or an enclosed conduit or raceway directly from the outlet to the tray side of the partition.
3. Every room must be provided a specific pathway (i.e., sleeve, minimum 4" inside diameter) from the false ceiling area (used to access user jack locations) to the main horizontal distribution pathway (such as the cable tray).

4. Inaccessible ceiling areas, such as lock-in ceiling tiles, drywall, or plaster, shall not be used as a horizontal or backbone cable support system pathway.
5. All station conduits, except as otherwise specified, must be at least 1-¼" diameter.
6. All station conduits are to have no more than 180-degrees of bend before the placement of a pullbox.
7. Unless specifically allowed by City of Ontario IT Agency, on a case-by-case basis, non-continuous support (J-Hooks, Bridle Rings, and Saddles) are not allowed in new construction and open ceiling environments.
8. Open ceiling environments require cable tray or conduit, and no j-hooks are allowed.

B. Horizontal Pathways – Cable Tray and J-Hooks: The main horizontal pathways shall be Cable Tray. Where the cable bundles branch off the main tray, corridor or "main-run", J- Hooks on 3-5' centers may be used in the ceiling, where accessible. J-Hooks may be used for all types of horizontal cabling. J-Hooks are only allowed with small cable bundles (less than 25 cables) in accessible ACT ceilings (drop ceiling, push-out, T-bar, etc.). The intent of the design and build is to not have visible cable in line of site.

1. Where cable tray is placed in open ceiling construction, a solid bottom insert with sides shall be used.
2. J-Hooks are not allowed in open ceiling construction.

C. Horizontal Pathways - At a minimum, conduit pathway infrastructure shall be installed for door access control systems with or without a specified access control system.

1. Coordinate specific Requirements with City of Ontario IT Agency and Security Representatives.

D. Horizontal Pathways – Conduit to Backbox: Conduit is used where the cable is permanent or is run in an area that will not be accessible (hard lid). Additionally, conduit is used from inside the wall, from the work area outlet to the cable tray, J-hook bundle, or nearest accessible ceiling. No station conduit is less than 1-¼" diameter unless otherwise specified for a specific application.

1. Division 26 specifications shall match Division 27 specifications for conduit sizing and backboxes for voice and data cables.

    a. Minimum conduit size is 1-¼" for voice and data cables unless specifically noted otherwise in these documents.
    b. Minimum backbox size is 5S by 3" deep for all voice and data cables unless specifically noted otherwise in these documents.

2. All Cat 6/6A runs require a pull string remain in the conduit.

E. Roof Entrance Pathway - A minimum of two 4" conduits from the roof to the upper TR-Telecommunications Room shall be provided for satellite and other aerial communications services within each building.

F. All low voltage conduit sleeves shall be a minimum of 4" inside diameter.

1. All other non-IP based low voltage systems shall have their own sleeves and pathways.

2. All conduits leaving the Telecom Space for other portions of the building shall be fire-stopped after the installation of cable.

G. Backbone (Inter-building) Conduits: Minimum of four to twelve 4-inch conduits are required to feed typical buildings depending upon size and functionality.

1. Pathways must be designed with no more than two 90-degree bends, with a maximum distance between pullboxes of 100 feet.
2. Pullboxes must be located to provide free and easy access, in straight sections of conduit only (pullboxes should never be used for a right-angle bend) and must be installed to allow cable to pass through from one conduit to another in in a direct line.

    a. Pullboxes must have a length at least eight times the trade-size diameter of the largest conduit.

3. Entrance conduits should enter the entrance facility space either directly from outside, perpendicular to the outer wall at a level above 8-feet, or through the floor, parallel with the outer wall (keeping the conduit bend radius greater than 48-inches) sloped away from the structure to prevent water intrusion.
4. Redundant pathways are required into a building where the building will house a law enforcement facility, a campus data center, or serve as a fiber aggregation point.
5. Minimum number of vertical backbone (riser) conduits between TR's is three.

    a. All new buildings require telecommunications pathways from the ground floor TR to the exterior of the building to allow for expansion of outdoor technologies near and around the new facility.
    b. See construction Drawings site plans, floor plans, and Drawing details for pathway Requirements.

6. All backbone conduits and sleeves must be four inches in diameter.
7. A plenum-rated pathway is required between all telecommunications spaces within a building.

H. Conduits for Fiber Optics – Inter-building, underground, conduits carrying the fiber optic backbone cables will contain a multi-cell fabric innerduct – furnish and provide three 3x3 Cell MaxCell fabric innerducts shall be available within each 4" Fiber Optic conduit.

1. All copper and fiber cabling in tunnel systems shall be supported with wall mount cable racking or cable tray. If existing cable racking and tray are at capacity, new cable racking and cable trays shall be provided as part of the project.

I. All telecom pathways shall be routed in a logical, shortest distance methodology back to the main cable tray or Telecommunications space.

J. Telecommunications pathways and spaces are to be designed for the life of the building, not for a specific system or technology.

1.15 TELECOMMUNICATION ROOM REQUIREMENTS

A. General Contractor shall be responsible for the provisioning of all walls, flooring, ceiling, lighting, HVAC, fire detection and suppression and related general room ready construction.

1. General contractor shall provide for the installation of AC-rated plywood, fire-retardant treated, ¾-inches by 48-inches by 96-inches (19 by 1220 by 2440 mm) for all open wall fields (sound masking, security, and any additional equipment).

B. Cabling Contractor shall provide and install all appropriate equipment racks, cabinets, ladder racks, cable trays and supports, and wire management accessories necessary to fit-out a complete IT Equipment Room/Telecommunications Room.

1. Cabinets, Racks and Vertical Cable Management:
2. Telecommunications rooms shall be fitted out with a minimum of:

a. MER: Three cabinets and/or racks.
b. TR's: Two cabinets and/or racks.
c. Server Equipment shall be housed in cabinets/enclosures.
d. Network Equipment shall be mounted in 2- or 4-post racks.
e. Racks shall be fitted with a minimum of 6" wide double sided vertical cable managers on all sides.

3. Horizontal Cable Managers and Blanking Panels:

a. 2RU Horizontal cable managers at the top of each rack.
b. Two 2RU Banking panel to be installed after the last patch panel in a rack.
c. 2RU Horizontal cable manager above and below each network switch.

C. Rack Mount PDU's:

1. Furnish and install horizontal rack mount PDU's as indicated on the Construction Drawings.

a. At a minimum provide one horizontal PDU 120V 20A L5-20P with (10) 5- 20R receptacles for each rack.

2. Contractor shall confirm power cord lengths will extend to electrical outlets mounted above racks without extension cords.

D. Rack Mount UPS:

1. Furnish and install horizontal rack mount UPS as indicated on the Construction Drawings.
2. Contractor shall confirm power cord lengths will extend to electrical outlets mounted above racks without extension cords.
3. Furnish and install a minimum 3000VA (2700W) UPS per rack.

4. Receptacles for equipment racks and cabinets shall be mounted to the side of the ladder rack and at the rear of the equipment racks/cabinets.

1.16 HORIZONTAL CABLING GUARANTEED SYSTEM PERFORMANCE

A. Manufacturer to provide internal testing data that demonstrates typical Category 6A Plenum UTP channel performance margins above ANSI/TIA-568-D standards as listed below.

Insertion Loss	3%
NEXT	2 dB
PSNEXT	3 dB
ACR-F	8 dB
PSACR-F	8 dB
Return Loss	3 dB
ACR-N	3 dB
PSACR-N	4 dB
PSANEXT	3 dB
PSAACR-F	5 dB
TCL	3 dB
ELTCTL	10 dB

B. Manufacturer to provide internal testing data that demonstrates typical Category 6A Plenum Indoor/Outdoor UTP cable channel performance margins above ANSI/TIA-568-D standards as listed below.

Insertion Loss	0%
NEXT	2 dB
PSNEXT	2 dB
ACR-F	6 dB
PSACR-F	6 db
Return Loss	2 dB
ACR-N	2 dB
PSACR-N	2 dB
PSANEXT	1 dB
PSAACR-F	7 dB
TCL	2 dB
ELTCTL	2 dB

1.17 MANUFACTURER SPECIFIC DECLARATION

A. The City of Ontario has specified Leviton Network Solutions as the product brand required to meet their design Requirements. Product support questions can be directed to Leviton contacts below:

1. Leviton Network Solutions, www.leviton.com/ns
2222 - 222nd St SE, Bothell, WA 98021-4422 Customer Service 1-800-722-2082, 1-425-486-2222
Product Support 1-800-824-3005
Larry Gillen – Specification Engineer, 909-202-2031, larry.gillen@leviton.com
USA Specifications

B. Cabinets and Racks

1. RXL USA

C. PDU's and UPS

1. Xtreme Power Conversion

PART 2 PRODUCTS - LEVITON PRODUCTS ORDERING GUIDE

2.01 COPPER HORIZONTAL CABLING

A. Category 6A Cable

1. High Performance UTP Plenum Category 6A, 4-pair cable with an internal divider and cable core surrounded by an insulated metallic isolation wrap and jacketed with a flame-retardant polymer alloy.
2. Cable shall have an advanced polymer jacket compound that creates a flexible cable at room and cold temperatures, exhibit less recoil memory, and fewer stress marks during installation for plenum cables.
3. Cable shall provide 10dB PSANEXT and PSAACRF margin to Cat 6A Requirements.
4. Cable shall have 4dB ACRF and PSACRF margin to Cat 6A Requirements.
5. Cable shall meet fire rating appropriate to Local Building Codes.

Category 6A Plenum UTP Cable		
Part Number	Description	Comment/Attribute
11140627	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Blue	Data/Workstations
11140630	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Yellow	Wireless Access Points (WAP's)
11140628	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, White	Security Cameras
11140632	Leviton SST Plenum Category 6A cable, 1000ft reel in a box, Red	IoT Devices

B. Category 6A Indoor/Outdoor Plenum Cable

1. Reduced Diameter UTP Plenum Indoor/Outdoor Category 6A, 4- pair cable core surrounded by an insulated metallic isolation wrap with no internal divider and gel-free construction.

2. Cable shall have an advanced polymer jacket compound that creates a flexible cable at room and cold temperatures, exhibit less recoil memory, and fewer stress marks during installation.
3. Cable shall provide 8dB PSANEXT and PSAACRF margin to Cat 6A Requirements.
4. Cable shall have Flame Rating of Plenum-NFPA 70, CMP as well as CMX for outdoor applications.

Category 6A Indoor/Outdoor Plenum UTP Cable		
Part Number	Description	Comment/Attribute
11142753	Leviton LM-RDT-I/O Plenum, Category 6A cable, 1000ft reel, Black, Indoor/Outdoor rated, gel-free, UV resistant jacket.	Indoor/Outdoor Plenum where applicable – Black Only

C. Category 6A Connector Modules

1. The modular connector shall be independently tested and verified by a Nationally Recognized Testing Laboratory to meet or exceed the Category 6A Performance Requirements.
2. The connector module shall utilize an engineered tine geometry to prevent POE arcing damage due to plug removal cycles from occurring at the critical contact-mating zone between the plug and connector module tines.
3. The connector module will exceed IEEE 802.3bt standard to support up to 0.5 amps per conductor (100 watts) continuously.
4. Connector Module shall comply with UL 2043 as suitable for installation in plenum spaces. All plastics used in construction of connector bodies shall be fire retardant with a UL flammability rating of 94V-0.
5. Shuttered Jacks shall be used in dusty environments like woodshops, metal shops, automotive shops, etc. See Drawings for specific callouts.

Category 6A connector modules		
Part Number	Description	Comment/Attribute
6110G-RL6	EXTREME Cat 6A UTP QUICKPORT Jack, Blue	Data/Workstations
6110G-RY6	EXTREME Cat 6A UTP QUICKPORT Jack, Yellow	Wireless Access Points (WAP's)
6110G-RW6	EXTREME Cat 6A UTP QUICKPORT Jack, White	Security Cameras
6110G-RR6	EXTREME Cat 6A UTP QUICKPORT Jack, Red	IoT Devices
	*Colors: (W) White, (E) Black, (L) Blue, (Y) Yellow, (O) Orange, (C) Crimson Red, (V) Green, (G) Gray	

D. Copper Patch Panels

1. Patch panels shall be field configurable angled QUICKPORT style jack panels with rear management.

Patch Panels with Rear Cable Manager		
Part Number	Description	Comment/Attribute
49256-H48	2RU 48-Port Angled QUICKPORT Patch Panel, black	

49006-AMB	Rack-Mounted Rear Cable Management Bar	Use with patch panels that have no rear cable management bar included

E. Category 6A Patch Cords

1. 26 AWG Category 6A UTP patch cords shall be used at work area outlet locations.
2. 28 AWG "Hi-Flex" Category 6A patch cords shall be used at the TR patch panel locations to reduce congestion.
3. NFPA-70 Plenum Rated Category 6A patch cords to be used in above ceiling applications. Coordinate color with the City of Ontario for applicable devices.
4. Right size patch cord length to eliminate excessive slack. Oversized patch cords will not be accepted.
5. Confirm with IT if patch cords are Contractor or Owner furnished for project.

Category 6A Copper Patch Cords		
Part Number	Description	Comment/Attribute
6AS10-##*	Category 6A 26 AWG FTP Standard CMR patch cord, ##- any standard length in feet.	Work Area Patch Cords
H6A10-##*	Category 6A 28 AWG Shielded Hi-Flex Dual Rated CM/LSZH patch cord, ##- any standard length in feet.	Telecom Room patch cords
H6A1i-##*	Category 6A 28 AWG Shielded Hi-Flex Dual Rated CM/LSZH patch cord, ##- in inches (ie: 6" H6A1i-06* or 8" H6A1i-08*)	Telecom Room Patch Cords
6ASP0-##*	Category 6A, 26 AWG, Plenum/CMP patch cords (* Colors: White, Blue, Gray only) – ## any standard length in feet.	Plenum above ceiling applications
	## - 03, 05, 07, 10, 15, 20-foot standard lengths	
	*Colors: (W) White, (Y) Yellow, (R) Red, (L) Blue, (G) Green, (S) Gray, (E) Black	
	Blue = Data/Workstations; Yellow = WAP's, White = Security Cameras, Red = IoT	

F. Wallplates, Surface Mount Boxes and Coupler/Assembly

1. Match type to back-box standards.
2. Match style and color to work area décor.
3. Blank all empty ports with matching color blanks as applicable.
4. Use above ceiling bracket to secure SMB as needed.
5. Use VXC coupler or VXC assembly as needed for Modular Plug Terminated Link (MPTL) applications.

Wallplates, SMB's, Coupler/Assembly		
Part Number	Description	Comment/Attribute
42080-#*S	Single-Gang QUICKPORT Wallplate with ID Windows	#- Port count 2,4,6
42080-#*P	Double-Gang QUICKPORT Wallplate with ID Windows	#- Port count 2, 4, 6, 8, for 12-Port use color code in place of "P"
43080-1L#	Single-Gang Stainless Steel Wallplate with ID Windows	#- Port count 1,2,3,4,6

4108W-1SP	Single-Gang Recessed Stainless Steel Telephone Wallplate	
41089-#WP	surface mount box, Plenum Rated, White	#- Port count 1,2,4,6, 12
49223-CBC	QUICKPORT In-Ceiling Bracket with Drop Ceiling Clip	
49223-CB0	QUICKPORT In-Ceiling Bracket	
SBCPI-00S	VXC Coupler	
SBCPI-XX*	VXC Plenum Assembly with Patch Cable,	XX- (06) 6", (12) 12", (18) 18", *Color – (W) White, (L) Blue
	*Wallplate Color: (W) White, (T) Lt. Almond, (I) Ivory, (G) Gray, (E) Black	

2.02 FIBER BACKBONE PRODUCTS

A. Single Mode Fiber Optic Cable – Tight Buffered Indoor/Outdoor

1. Fiber optic cable shall be suitable for installation in plenum and riser horizontal environments and interbuilding backbone structures.
2. The fiber optic cable design shall have tight buffered optical fibers within a dry water blocked cable core. No buffer tube fanout kits are required.
3. Sheath shall be flame-resistant plenum, fungus resistant and sunlight resistant jacket per UL 444 clause 7.22. Suitable for use in conduit below frost line.
4. Refer to Drawings for interlocking armor call-out and details.

Bulk Tight Buffer Fiber Cable		
Part Number	Description	Comment
PDP012AB0707-I/O-C4(YEL)	12F OS2 SM tight buffered Indoor/Outdoor Plenum fiber optic cable	
PDPK012AB0707-I/O-C4(YEL)	12F OS2 SM tight buffered interlocking armored Indoor/ Outdoor Plenum fiber optic cable	
PDP024AB0707-I/O-C4(YEL)	24F OS2 SM tight buffered Indoor/Outdoor Plenum fiber optic cable	
PDPK024AB0707-I/O-C4C5(YEL)	24F OS2 SM tight buffered interlocking armored Indoor/ Outdoor Plenum fiber optic cable	
11140671	Armor-Tek Ground Strips	

B. Multimode OM4 Indoor/Outdoor Tight-Buffer Fiber Optic Cables

1. Fiber optic cable shall be suitable for installation in plenum and/or riser horizontal environments and interbuilding backbone structures.
2. Fiber optic cable design shall have tight buffered optical fibers within a dry water blocked cable core. No buffer tube fanout kits are required.
3. Sheath shall be flame resistant plenum, fungus resistant and sunlight resistant jacket per UL 444 clause 7.22.
4. Cable shall comply with EN 50173; ISO/IEC 11801, ANSI/ICEA S-104-696; ANSI/IDEA S-83-596; ANSI/TIA-568.3-D; NFPA 130; and Telcordia GR-409.
5. Cable construction shall be, tight buffered, 900-micron from 6-144 fibers, sub-unitized and color coded per ANSI/TIA-598-D with aramid yarn strength member.
6. Cable shall meet fire rating appropriate to local building codes.

7. Utilize Premise Distribution Tight Buffered Fiber-Optic for all applications where conduit is below frost line.

Multimode OM4 Indoor/Outdoor Premises Distribution Tight-Buffered Fiber Optic Cable		
Part Number	Description	Comment/Attribute
PDP012FB3010/F5-I/O-C4(AQU)	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDPK012FB3010/F5-I/O-C4(AQU)	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Armored Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDP024FB3010/F5-I/O-C4(AQU)	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable
PDPK024FB3010/F5-I/O-C4(AQU)	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Plenum Tight Buffer, Aqua	Indoor/Outdoor Plenum tight-buffer fiber-optic cable

C. Single Mode Fiber Optic Cable – Loose Tube Indoor/Outdoor

1. Loose tube cable construction, water blocked, plenum rated jacket for installation in any outside plant to riser or through plenum spaces.
2. Cable buffer tube construction shall be dry water-blocked color-coded loose tubes containing up to 12, 250 micron, individually colored fibers.
3. Cable shall have a sunlight resistant outer jacket that protects the cable in outside plant installations.
4. Refer to Drawings for interlocking armor call-out details.

Single Mode Bulk Loose Tube Fiber Cable		
Part Number	Description	Comment
LTP012AB0403	12F OS2 SM loose tube Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTPK012AB0403	12F OS2 SM loose tube interlocking armored Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTP12B024AB0403	24F OS2 SM loose tube Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
LTPK12B024AB0403	24F OS2 SM loose tube interlocking armored Indoor/Outdoor Plenum fiber optic cable, Yellow jacket	
11140671	Armor-Tek Ground Strips	

D. Multimode OM4 Indoor/Outdoor Loose Tube Fiber Optic Cables

1. Loose Tube Plenum Fiber Optic cables shall be compact, water blocked, plenum rated, flexible loose tube design of all dielectric construction allows for installation in any outside plant to riser or through plenum spaces.
2. Cable buffer tube construction shall be dry water-blocked color-coded loose tubes containing up to 12, 250 micron, individually colored fibers.
3. Cable shall have a sunlight resistant outer jacket per UL 444 clause 7.22 that protects the cable in outside plant installations.
4. Cable shall comply with EN 50173; ISO/IEC 11801, ANSI/ICEA S-104-696; ANSI/IDEA S-83-596; ANSI/TIA-568.3-D; NFPA 130; and Telcordia GR-409.
5. Refer to Drawings for fiber strand count and details.

6. Cable shall meet fire rating appropriate to Local Building Codes.

Multimode OM4 Indoor/Outdoor Adventum Loose Tube Fiber Optic Cable		
Part Number	Description	Comment/Attribute
LTP012FB3010/F5	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight- buffer fiber-optic cable
LTPK012FB3010/F5	Berk-Tek 12F Multimode OM4 Bend Insensitive laser optimized optical fibers, interlocking armor Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight- buffer fiber-optic cable
LTP12B024FB3010/F5	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight- buffer fiber-optic cable
LTPK12B024FB3010/F5	Berk-Tek 24F Multimode OM4 Bend Insensitive optical fibers, interlocking armor Indoor/Outdoor Adventum Plenum Loose Tube, Aqua	Indoor/Outdoor Plenum tight- buffer fiber-optic cable

E. LC Shuttered Molded Splice Modules

1. Fiber pigtail fusion splice modules shall be offered in 12 and 24-fiber LC (PC, UPC, and APC).
2. Construction of module shall be 16-gauge sheet metal faceplate for robustness and the chassis and cover shall be polycarbonate for overall light weight.
3. LC splice modules shall be pre-loaded and routed with respective one-meter, color-coded individual 900 um pigtail assembly.
4. Individual pigtails shall have maximum insertion loss of 0.40 dB for OM3/OM4 and 0.35 dB for OS2 fiber types.
5. Return Loss shall be greater than 25 dB (for OM3 and OM4), 55 dB (for OS2/UPC), and 65 dB (for OS2/APC).
6. LC adapters shall use ceramic ferrules and they shall provide IP5x-rated internal shutters compliant with IEC 60529.

LC Shuttered Splice Modules		
Part Number	Description	Comment
SPLCS-2LL	12-Fiber, OS2, Duplex LC Shuttered (Blue)	
SPLCS-4LL	24-fiber, OS2, Quad LC Shuttered (blue)	

F. Fusion Splice-On Connectors

1. Fusion splice-on fiber optic connectors shall meet or exceed the Requirements described in ANSI/TIA-568.3-E, ANSI/TIA-604, Fiber Optic Connector Intermateability Standards and RoHS 2 per 2011/65/eu.
2. All plastic components shall be molded of 94 V-0 rated plastic.
3. The connectors shall be factory-polished and field installable.
4. Maximum insertion loss shall be = 0.25 dB per connector and return loss shall be ≥ 65 dB for single-mode APC connectors, ≥ 55 dB for single-mode UPC connectors.
5. The connectors shall support 900-micron buffered fiber or 250-micron coated fiber with appropriate fanout kit or furcation tubing.

6. LC connectors can be joined using optional duplex clips.

Fusion Splice-On Connectors		
Part Number	Description	Comment
499LC-GN9	LC SM APC OS2 Green 900 µm	
499LC-BL9	LC SM OS2 Blue 900 µm	

G. Pre-Polished LC Fiber Connectors PC

1. The mechanical fiber optic connector shall meet or exceed the Requirements described in ANSI/TIA-568.3-D and ANSI/TIA-604 standards.
2. Connector shall be pre-polished and field-installable to eliminate the need for hand polishing, bonding, or epoxy in the field.
3. Connector shall be available in LC Laser Optimized 50/125µm configurations terminated on 250 or 900µm buffered fiber and/or 2 or 3mm jacketed fiber.
4. Maximum connector insertion loss shall be no greater than 0.5dB, with an average of 0.1 dB and 0.2 dB Single Mode.
5. Typical connector return loss shall be 25 dB Multimode and 55 dB Single Mode.
6. LC connectors require a 0-degre cleave with a maximum angle of 2 degrees for Multimode and 1 degree for Single Mode fibers.
7. Termination method shall allow continuity to be verified by use of a visual fault locator (VFL) prior to crimp.

Field Installable Single-Mode/Multimode Pre-Polished UPC LC Fiber Connector		
Part Number	Description	Comment/Attribute
49991-LLC	Leviton FastCAM Multimode LC Pre-Polished Connector	Standard connector for Multimode applications
49991-SLC	Leviton FastCAM Single Mode LC Pre-Polished Connector	Standard connector for Single Mode applications

H. Fiber Optic Pigtails and Fiber Fan Out Kit

1. Pigtail's insertion loss shall be a maximum of 0.25 dB Single Mode.
2. Pigtails return loss shall be greater than 50 dB Single Mode.
3. Pigtails shall be available in singles or 12-fiber kits available in TIA color sequence.
4. All pigtails shall be 100% optically tested and serialized for traceability.
5. Fanout kit shall separate 250-micron fibers and route them into color-coded 900- micron buffer tubes, via a protective housing, allowing cable to be easily terminated.
6. Fanout kit shall use "Hytrel Furcation Tubing" and be available in either six or twelve fiber capacity in 24" or 36" lengths.

Pigtails and Fanout Kits		
Part Number	Description	Comment
UPPLC-KIT	12-Fiber Pigtail Kit, Single-Mode UPC Polish OS2, LC, 3m	Fusion splice method
49887-12S	12 Position Fan-Out Kit with 24" Fan-Out Tubing	

49887-12L	12 Position Fan-Out Kit with 36” Fan-Out Tubing	

I. Fiber Optic Injection-Molded Splice Trays for Enclosures

1. Fiber splice trays shall be offered in mini and high-density versions with removable clear covers for viewing and inspection of fibers.
2. The trays shall accommodate slack management of both single mode and multimode 250 um or 900 um fiber and protection of up to 12 or 24 fiber heat-shrink fusion splices.

SDX Injection-Molded Splice Trays		
Part Number	Description	Comment/Attribute
T5PLS-12F	Leviton SDX 12-Fiber Mini Injection-Molded Splice Tray	Splice Trays for SDX Enclosures
T5PLS-24F	Leviton SDX 24-Fiber High Density Injection-Molded Splice Tray	
SPLMT-HKT	Leviton Splice Tray Mounting Hardware Kit	

J. Fiber Optic Rack Mounted Enclosures

1. Choose an appropriate size enclosure to match fiber count at TR.
2. Enclosure with sliding tray shall be available in 1RU, 2RU and 4RU versions that accommodate termination and splicing of fiber.
3. Adapter bulkhead shall accept a variety of modular adapter plates and Plug-n- Play MTP modules/cassettes including 24 strand MTP.
4. The rack mount optical fiber Enclosure shall be capable of terminating tight-buffered or loose tube optical fiber cable and support either direct connectorization or fusion splicing.
5. Splice trays shall be available to support 12 or 24 strands per tray, heat shrink or bare fiber splicing and be available in metal or molded plastic design.
6. Blank filler adapters to be installed in empty positions.

SDX Fiber Enclosures		
Part Number	Description	Comment
5R1UH-S03	Leviton SDX 2000i 1RU Fiber Enclosure with Sliding Tray, Black.	TR locations
5R2UH-S06	Leviton SDX 2000i 2RU Fiber Enclosure with Sliding Tray, Black.	
5R4UH-S12	Leviton SDX 2000i 4RU Fiber Enclosure with Sliding Tray, Black.	

K. Fiber Optic Wall Mount Enclosures

1. Wall-Mount Enclosures shall be available in multiple sizes to accommodate field connector termination, heat-fusion splicing, and plug-and-play MTP® cassettes for up to 288 fibers (LC), as well as copper connectivity up to 72 ports.
2. Enclosures can be oriented for left- or right-side patching to provide added flexibility.
3. Adapter bulkhead shall accept Adapter Plates, Splice Modules, and MTP® Cassettes in LC, SC, ST, and MTP connectivity.

4. Fiber cable management for routing, storage, and protection shall accept tight-buffered fiber and loose tube backbone cables.
5. Wall-mount fiber enclosures shall be provided with lock and key kit.
6. Confirm with Owner when using wall mount enclosures in place of rack mount enclosures.

SDX Wall-Mounted Fiber Optic Panels		
Part Number	Description	Comment/Attribute
5WMNT-1C	Leviton SDX Mini Wall-Mount Fiber Enclosure, Black	
5WSML-02C	Leviton SDX Small Wall-Mount Fiber Enclosure, Black	
5WMED-04C	Leviton SDX Medium Wall-Mount Fiber Enclosure, Black	
5WLRG-12C	Leviton SDX Large Wall-Mount Fiber Enclosure, Black	
5L000-KAL	Leviton SDX Wall-Mount Lock and Key kit	

L. Fiber Optic LC Adapter Plates for Rack Mount and Wall-Mount Enclosures

1. The adapter plate shall be modular and functional for use in panel or Panel (rack- or wall-mount) specified.
2. The adapter plate shall be offered in Shuttered LC connectors in 12 or 24 fiber configurations.
3. The adapter plate shall be compliant to ANSI/TIA-568.3-D and ISO 11801 (for performance) and respective ANSI/TIA-604-X and applicable IEC (for intermateability) standards.
4. Entire adapter plates shall be color coded, not just feed-thrus, to identify performance grade. OS2 (Blue).
5. Adapter plates shall use zirconia ceramic sleeves and be offered in standard fiber type colors pursuant to ANSI/TIA-568.3-D and appropriate IEC standards.
6. The adapter and plate shall be integrated to eliminate “rattle” and loose fit.

SDX Precision Molded Fiber Optic Shuttered LC Adapter Plates		
Part Number	Description	Comment/Attribute
5F100-S2L	Leviton SDX Precision Molded OS2 SM Laser Optimized, Duplex LC, 12- fibers, zirconia ceramic sleeve, Blue	
5F100-S2M	Leviton SDX Precision Molded OM4 MM Laser Optimized, Quad LC, 12- fibers, zirconia ceramic sleeve, Aqua	
5F100-S4L	Leviton SDX Precision Molded OS2 SM Laser Optimized, Duplex LC, 24- fibers, zirconia ceramic sleeve, Blue	
5F100-S4Q	Leviton SDX Precision Molded OM4 MM Laser Optimized, Quad LC, 24- fibers, zirconia ceramic sleeve, Aqua	

M. Fiber Patch Cords

1. Patch cords shall meet or exceed the Requirements of ANSI/TIA- 568.3-D.

2. Patch cords shall meet an optical return loss equal to or better than 50 dB Single mode.
3. Insertion loss shall not exceed 0.35dB for Single mode.
4. The optical fiber cord connectors shall have precision pre-radiused zirconia ferrules.
5. The fiber cord assembly shall be dual zip, OFNR rated with a yellow jacket for Single mode.
6. Duplex LC fiber patch cords shall be A-B polarity.
7. Standard stock lengths of 1m, 2m, 3m, 5m, and 10m shall be available. Custom lengths shall be available through a made-to-order program.
8. Right size patch cord length to eliminate excessive slack. Oversized patch cords will not be accepted.

Fiber Optic Patch Cords		
Part Number	Description	Comment/Attribute
UPDLC-SXX	Leviton LC to LC OS2 Duplex Fiber Optic Patch Cord	
	XX – length (in meters) 01, 02, 03, 05 and 10	

2.03 TELECOM ROOM AND PATHWAYS AND SPACES

A. J-Hooks

1. Furnish and install J-Hooks as indicated in plans for horizontal cable runs.
2. The Contractor shall calculate proper J-Hook sizing throughout the project to properly support horizontal cables.

J-Hooks		
Part Number	Description	Comment
BEJH21W	Bascor 1-5/16” Batwing J-Hook, Size 21	Confirm Drawings for locations and calculate proper J-Hook sizing
BEJH32W	Bascor 2” Batwing J-Hook, Size 32	
BEJH64W	Bascor 4” Batwing J-Hook, Size 64	

B. Wire Mesh Cable Tray

1. UL Certified wire mesh cable tray, fully bonded and grounded.
2. Tray elevation, brackets, plates, junction, splice, support, bracing, radius bends, radius drops, divider, retaining posts, endcaps, closing and hardware kits shall be furnished and installed for a full and complete system.
3. Confirm with City of Ontario IT Agency on the number of tray dividers required to separate different systems if applicable.

4. Seismically brace cable tray to building structure.

Wire Mesh Cable Tray		
Part Number	Description	Comment
BF2R 6x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 06"W x 2"H Basket Tray with Speed Splice	Confirm Drawings for required widths, depths & mounting details.
BF2R 12x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 2"H Basket Tray with Speed Splice	
BF2R 18x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 2"H Basket Tray with Speed Splice	
BF2R 24x2 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 2"H Basket Tray with Speed Splice	
BF2R 6x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 06"W x 4"H Basket Tray with Speed Splice	
BF2R 12x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 4"H Basket Tray with Speed Splice	
BF2R 18x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 4"H Basket Tray with Speed Splice	
BF2R 24x4 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 4"H Basket Tray with Speed Splice	
BF2R 8x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 08"W x 6"H Basket Tray with Speed Splice	
BF2R 12x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 12"W x 6"H Basket Tray with Speed Splice	
BF2R 18x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 18"W x 6"H Basket Tray with Speed Splice	
BF2R 24x6 EZ	Basor Wire Basket Cable Tray, Electro Zinc, 24"W x 6"H Basket Tray with Speed Splice	
SB6	Basor 6” Solid Bottom Insert	
SB12	Basor 12” Solid Bottom Insert	
SB18	Basor 18” Solid Bottom Insert	
SB24	Basor 24” Solid Bottom Insert	
	Furnish and install all wire mesh cable tray and accessories required for a complete system	

C. Cable Runway (Ladder Rack)

1. Made of 3/8-inch x 1-1/2-inch x .065-inch wall rectangular tubing, Cross members welded at 12-inch intervals, and length 119.75”.
2. UL Listed.
3. Runway elevation, brackets, plates, junction, splice, support, bracing, radius bends, radius drops, divider, retaining posts, movable cross members, endcaps, closing and hardware kits shall be furnished and installed for a full and complete system.

4. Seismically brace ladder to racks, cabinets and to building structure.

Ladder Rack - Runway		
Part Number	Description	Comment
1050-BK12	RXL 12-inch-wide global cable runway, Black	Confirm Drawings for required widths and mounting details. USA
	Review Drawings for all runway accessories required for a complete system	

D. Bonding and Grounding

1. BICSI and ANSI/EIA/TIA Bonding Busbars, UL Listed.
2. Hole patterns on Busbars accommodate two-hole lugs per ANSI/BICSI N3-20 and ANSI/TIA-607 standards.
3. Furnish and install all required 2-hole lugs, clamps, terminal blocks, taps, ground wire, bonding strap, and jumper kits for a complete install. #4/0 copper insulated green ground conductor for ground wire to building service ground and all required hardware.

Bonding and Grounding		
Part Number	Description	Comment/Attribute
GBI14420TMGBKT	Harger Primary Telecommunications Main Grounding Busbar (TMGB/PBB) shall be a ¼" x 4" x 20" copper bus bar with tapped connections	See Construction Documents and Drawings for exact Specifications. USA
GBI14412TMGBKT	Harger Primary Telecommunications Main Grounding Busbar (TMGB/PBB) shall be a ¼" x 4" x 12" copper bus bar with tapped connections	
GBI14212TGBKT	Harger Secondary Telecommunications Grounding Busbar (TGB/SBB) shall be a ¼" x 2" x 12" copper bus bar with tapped connections	
RGBHKIT14119.25	Harger ¼" x 1" x 19.25" Horizontal width rack bonding bus bar	
RGBVKIT145836A	Harger ¼" x 5/8" x 36" Vertical rack bonding busbar	
RGBVKIT145872A	Harger ¼" x 5/8" x 72" Vertical rack bonding busbar	
67G	Harger 6 AWG 7 Strand Green THW-2 Insulated Conductor	
RGJ67G1082AKIT	Harger Two-hole compression lug rack ground jumper kit, 9'	
GJ67G102A1/4	Harger Two-hole compression lug end bonding jumpers, 10"	
IP0621520.5MOTO	Harger Rack Isolation Pads	

E. Adjustable Four Post Server Racks

1. 7' x 19" 4-post server racks, 12 Gauge Steel, with 12-24 tapped or square punched adjustable mounting rails with RU markings. Black.
2. Depth can be adjusted with 6" range.
3. Integrated grounding on rails with grounding terminal block included.
4. 2000lbs load capacity.

5. Seismically brace four post server racks according to AHJ Requirements.

Adjustable Four-Post Server Rack		
Part Number	Description	Comment/Attribute
2410-BK7042T	RXL 7' X 19"45RU Adjustable Four-Post Rack, 12-24 Tapped Rails, 36"- 42" Depth	See Drawings for details

F. Two Post Server Racks

1. 7' x 19" 2-post server racks, Aluminum, with 12-24 tapped mounting rails with RU markings. Black.
2. 1000lbs load capacity.
3. Seismically brace two post server racks according to AHJ Requirements.

Two Post Server Rack		
Part Number	Description	Comment/Attribute
2200-BK-70-T	RXL 7' X 19"45RU Adjustable Two-Post Rack, 12-24 Tapped Rails	See Drawings for details

G. Wall Mount Enclosure

1. Three-part, swing-out design allows access and service to the front and rear of equipment.
2. 250-lbs load rating.
3. Front door shall be available in solid or tempered glass.
4. Available in 12RU, 18RU and 25RU heights; 23" depths.
5. Confirm final cabinet dimensions and color prior to ordering.
6. Confirm approval on all wall mount enclosures – only to be used when there is no option for a dedicated TR.

Wall Mount Cabinet		
Part Number	Description	Comment
4500-BK1223GT	RXL 12 RU x 24" x 23" CUBE Wall Mount, 12-24 tapped rails, Black	Confirm Drawings for required height, depth, and mounting details.
4500-BK1823GT	RXL 18 RU x 24" x 23" CUBE Wall Mount,12-24 tapped rails, Black	
4500-BK2523GT	RXL 25 RU x 24" x 23" CUBE Wall Mount,12-24 tapped rails, Black	
	Review Drawings for all accessories required for a complete installation	

H. Floor Mount Cabinet

1. Made from welded heavy-duty steel with a load capacity of 3000lbs.
2. Adjustable mounting rails are made from 12GA sheet metal and RU marked for securing and simplifying mounting equipment.
3. Locking front/back doors, side panels (removable).
4. Ships fully assembled for fast installation.

5. Seismically brace floor mount cabinets according to AHJ Requirements.

Floor Mount Cabinet		
Part Number	Description	Comment
RXL-5550	RXL Nemesis Cabinet Series	Confirm Drawings for required height, width, depth & mounting details.
	Review Drawings for all accessories required for a complete system	

I. Horizontal Cable Managers with Snap on Covers

1. 19-inch universal horizontal cable managers with covers and bend radius compliant router to transition between horizontal and vertical slotted ducts.
2. Furnish and install a 2RU manager at the top of each rack.

Horizontal Cable Managers and Blanking Panels		
Part Number	Description	Comment/Attribute
491RU-HFR	Leviton 1RU Horizontal Slotted Duct (front and rear) with cover	
491RU-HFO	Leviton 1RU Horizontal Slotted Duct (front only) with cover	
492RU-HFR	Leviton 2RU Horizontal Slotted Duct (front and rear) with cover	
492RU-HFO	Leviton 2RU Horizontal Slotted Duct (front only) with cover	
49254-BP1	Leviton 1RU Flat Blanking Panel	

J. Vertical Double-Sided Cable Managers with Covers

1. 8-inch and 5-inch-wide vertical cable managers with radius finger edges to protect cable routing and passthrough space that aligns with rack units. Black.
2. Dual hinged, cable concealing covers included.
3. Channels kitted with cable retainers, slack loop organizers, mounting brackets and covers.

Vertical Double-Sided Cable Managers with Covers		
Part Number	Description	Comment/Attribute
8980L-VFR	Leviton Versi-Duct Vertical 80”L x 8”W x 8”D channel w/standard hinged black cover	
4980L-VFR	Leviton Versi-Duct Vertical 80”L x 5”W x 4”D channel w/standard snap on black cover	

K. Power Distribution Units (PDU’s)

1. Unmetered Horizontal 120V 20A PDU with a minimum of ten 5-20R receptacles.
2. Feature circuit breaker protection to prevent current overloads.

3. LED indicators for power and grounding/polarity.

Part Number	Description	Comment/Attribute
P1021-12S	Leviton horizontal PDU 120V 20A 5-20P plug, (10) 5-20R receptacles, 12' cord length	Minimum one required per rack or cabinet

L. Lithium-ion UPS

1. 3000VA (2700 Watts) Rack Mount UPS. Black.
2. Hot swappable battery design.
3. 3 Year full warranty.

Part Number	Description	Comment/Attribute
P91g-3000	XTREME Power Conversion, 3000VA (2700W) Rackmount UPS	Minimum one required per rack or cabinet

M. Five Square Backbox

1. 5 Square Backbox x 2.875" Deep Metal Outlet Box
2. Supply appropriate extension / reducer rings for faceplates.
3. Confirm all final sizes with Owner.

5 Square Backbox		
Part Number	Description	
R-55014	Randl Industries, Inc. 5 Square x 2.875" Deep Metal Outlet Box. Side KO's: (1) ½" & (2) 1" each side. Back KO's: (3) ½" & (2) ¾".	See Construction Documents and Drawings. USA

2.04 NETWORK CHANNEL EXTENDER SYSTEMS

A. Extender Systems

1. The Network Extender System shall provide the capability to upgrade a channel of a standard ethernet switch to deliver IEEE 802.3 Type 1 – Type 4 Power over Ethernet (PoE) over a composite fiber/power cable for Owner Approved locations.
2. The PoE extender system shall support auto-negotiated 10/100/1000BASE-T over a standard 4-pair Ethernet cable, Cat 6 or higher.
3. System shall be able to deliver a PoE port up to:

    a. 5,000 ft from source to remote with up to a 100 m (328 ft) Category 6/6A copper channel.
    b. 10,000 ft with up to 10 m (32 ft) of Category 6/6A copper patch cords.

4. The system shall utilize an external power injector at the source end; no other power inputs are needed.
5. The PoE extender system shall be a transparent Layer 1 device, shall require no MAC or IP address, and shall be fully transparent to Layer 2 devices with no restriction on network traffic.

6. The system shall provide power that is compliant with the Requirements of a Class 2 Power Source per NFPA 70 or CSA C22.1 and be listed as such.
7. Power injectors and remotes shall utilize TVSS.
8. The system shall provide options that allow for redundancy of the DC power used for the system for certain configurations.
9. OneReach is an Engineered Solution and all projects must have a OneReach Input Worksheet completed for each separate head end location and submitted to Leviton Applications Engineering Group to calculate a complete bill of materials for each project.

Network Channel Extender System-OneReach		
Part Number	Description	
81001531	Leviton OneReach 2RU Power Injection Chassis	
81001536	Leviton OneReach 1RU Power Supply Module 250 W	
81001262	Leviton OneReach Media Module, 4-port duplex LC, Single Mode	
81000413	Leviton OneReach Media Module, 4-port duplex LC, Multimode	
81000190	Leviton OneReach Chassis 1RU Blanking Panel	
81000463	Leviton OneReach 1RU Mounting Bracket for (2) 1- Port Power Source	
81001514	Leviton OneReach 1-Port Power Source, LC Duplex Multimode	
81001515	Leviton OneReach 1-Port Power Source, LC Duplex Single Mode	
TBD	Leviton OneReach Pre-Terminated Composite Cable Assemblies	Made to order
TBD	Leviton OneReach Bulk Composite Cable	
11097538	Leviton OneReach Duplex LC Pigtails, Mulitmode – TR/Headend	
11097539	Leviton OneReach Duplex LC Pigtails, Mulitmode – Remote End	
11101278	Leviton OneReach Duplex LC Pigtails, Single Mode- TR/Headend	
11101279	Leviton OneReach Duplex LC Pigtails, Single Mode- Remote End	
11099456	Leviton OneReach Copper M8 Pigtails, 2 x 18 AWG conductor, 36”	
11099453	Leviton OneReach Copper M8 Pigtails, 4 x 20 AWG conductor, 36”	
81001512	Leviton OneReach 1-Port Remote, PoE++, LC Duplex, Multimode	
81001513	Leviton OneReach 1-Port Remote, PoE++, LC Duplex, Single Mode	
81001534	Leviton OneReach 2-Port Remote, PoE++, 2 x LC Duplex, Multimode	
81001535	Leviton OneReach 2-Port Remote, PoE++, 2 x LC Duplex, Single Mode	

81001532	Leviton OneReach 4-Port Remote, PoE++, 4 x LC Duplex, Multimode	
81001533	Leviton OneReach 4-Port Remote, PoE++, 4 x LC Duplex, Single Mode	
DTK-2MHLP48BWB	DITEK Surge Protection Data & Signaling Circuit Surge Protector with Snap-Track Base	
DTK-MRJEXTS	DITEK POE Extender Surge Protector, (1 & 2-port remotes)	
DTK-WM4NETS	DITEK POE Extender Surge Protector, (4-port remotes)	
11099858	Leviton Industrial Patch Cordset - Cat 6A, RJ-RJ, IP20 - Rated, 2-meter	
11099858	Leviton Industrial Patch Cordset - Cat 6A, RJ-RJ, IP20 Rated, 5-meter	
11142753	Leviton LM-RDT-I/O Category 6A, Plenum	

PART 3 – EXECUTION

3.01 HORIZONTAL CABLES

A. Cable shall be installed in accordance with most current ANSI/TIA, BICSI, ISO/IEC, and CENELEC standards, manufacturer's recommendations, and best industry practices.

B. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.

C. Cable raceways shall not be filled greater than the maximum fill for the particular raceway type.

D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for approved connection points.

E. Where consolidation/connection points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

F. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to Manufacturer's Requirements.

G. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 1.2 to 1.5 m (4 – 5 ft) intervals and be randomly spaced. J-Hooks shall be properly sized to accommodate the immediate need and future growth of the cable pathway. J-Hooks shall be designed to control bend radius Requirements of the cable categories being installed.

H. Cable support shall be self-supporting and utilize independent wires, support rods and associated hardware for suspension. At no point shall cable(s) rest on acoustic ceiling grids, T-bars, ceiling support wires, acoustical panels or other components of the suspended ceiling.

I. The bundle size recommendations of ANSI/TIA TSB-184-A and/or ISO/IEC 29125 shall be followed as it pertains to current or future support for POE applications.

J. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

K. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.

L. When cables are installed, slack (service loops) shall be provided to accommodate future changes in the structured cabling system. Slack should be included in all length calculations to ensure that the permanent link does not exceed 90 m (295 ft). The amount of cable slack required will depend on the size and layout of the connecting hardware at the TR, TE or TO.

1. The recommended amount of cable slack shall be:

a. 3m (10 ft) in telecom spaces (ER, TR, TE) and ceiling above TO
b. 1m (3 ft) – 3m (10 ft) in the ceiling above the outlet
c. 30cm (12-inches) at the work area outlet

M. Cables shall be neatly bundled and dressed to their respective termination device. Each terminating device shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

N. Cable bundles shall not be painted.

O. Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.02 EMI/RFI AVOIDANCE

A. Cables shall be routed such that the minimum separation distances from EMI/RFI and electrical power sources, as detailed in, are maintained and in accordance with most current ANSI/TIA-569-E-1 and or ISO/IEC 11801, BICSI TDMM, Manufacturer's recommendations, and best industry practices.

B. Telecommunication cables shall cross electrical cables/conduits at 90 degree angles.

3.03 VOICE AND DATA MODULAR JACKS

A. 8-position, 8-contact (8P8C) modular jacks shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.

B. Pair untwist at the termination shall not exceed 6.35 mm (0.25 inch).

C. Data jacks, unless otherwise noted in Drawings shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

D. Voice jacks, unless otherwise noted in Drawings, shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.04 PATCH PANELS

A. Cables shall be dressed and terminated in accordance with the recommendations made by Manufacturer's recommendations and best industry practice.

B. Cables shall be separated into groups of twelve and routed symmetrically from both sides of the patch panel (e.g., split panel)

C. Cables shall be properly supported vertically in the rack or cabinet and supported at the rear of the patch panel using a cable management bar or a rear horizontal cable management to retain terminations.

D. Pair untwist at the termination shall not exceed 12.7 mm (.5 inch) for Cat 5e cabling.

E. Bend radius of the cable in the termination area shall not exceed four times the outside diameter of the cable.

F. All patch panels shall be bonded to grounding system according to Local Code Requirements.

3.05 PATCH CORD INSTALLATION

A. Patch cords shall be installed at IT room end and at workstation end with cords of appropriate length such that cables are routed through proper cable management ducts and patch ways in a consistent manner. Cords should be routed so as not to block panel labels where possible.

B. Patch cords shall be installed with the proper color to match the adopted color scheme for the organization.

C. Patch cords shall be labeled at both ends according to the adopted labeling scheme for the organization. Labeling scheme shall adhere to most current ANSI/TIA-606 standard.

D. Patching schedules and or records shall be updated by the Structured Cabling Plant Administrator after patching has been completed.

E. Patch cords that are no longer in use shall be removed from the patching frame and properly stored. Patch cords to be harvested for reuse shall have unique ID labeling removed and be retested prior to being made available for re-use.

F. Patch cords installed in plenum air handling spaces must meet appropriate Fire/ Building Codes.

3.06 FACEPLATES

A. Blank inserts shall be installed where ports are not used.

B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.

C. Faceplates shall be installed straight and level.

D. Faceplates shall be installed at the same height as electrical faceplates or as designated on architectural and construction plans.

3.07 SURFACE MOUNT BOXES

A. Blank inserts shall be installed where ports are not used.

B. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.

C. Surface mount boxes shall be installed straight and level.

D. Surface mount boxes shall be secured with screws to appropriate building structure or support bracket.

E. Plenum rated surface mount boxes shall be used for in ceiling and raised floor applications where required.

3.08 CATEGORY 6A FIELD INSTALLABLE MODULAR PLUG

A. Modular plugs shall be installed in accordance with Manufacturer's recommendations and installation guides, and best industry practices.

B. 100% of all installed cable segments shall be tested, partial or sample testing shall not be acceptable.

C. Test procedure shall adhere to the method for testing a Modular Plug Terminated Link as described in ANSI/TIA-568.2-D Annex F.

D. The MPTL shall be tested with a Permanent Link Adapter on the Main Unit and a Patch Cord Adapter Suitable for the Category being tested on the Far End or Remote Test Equipment. Channel adapters shall not be used.

E. Test limits shall be set to meet the MPTL Performance Requirements defined in ANSI/TIA-568.2-D Annex F.

F. The patch cord adapter used on the far end of the MPTL shall meet the Requirements for Category 6A patch cord test head as qualified per TIA 568.2-D Annex C or D.

G. The detailed test results are to be provided to owner and submitted electronically to Manufacturer for warranty acceptance for each tested link.

3.09 BACKBONE FIBER CABLES (INSIDE PLANT)

A. Cables shall be dressed and terminated in accordance with the recommendations made in most current ANSI/TIA-568 Series, ISO/IEC 14763-3, BICSI TDMM, Manufacturer's recommendations, and best industry practices.

B. Minimum bend radius and maximum pulling tension for all cables shall be maintained during and after installation.

C. All cable and associated hardware shall be placed to make efficient use of available space in coordination with other uses. All cable and associated hardware shall be

placed so as to not impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing).

D. Backbone cables shall be installed separately from horizontal distribution cables.

E. A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-installed with all cable installed in any conduit.

F. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits.

G. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

H. Leave 10' (3m) of slack on each end of Fiber backbone cable.

I. Vertical runs of cables shall be supported to messenger strand, cable ladder, mesh grips or other method to provide proper support for the weight of the cable.

J. Each optical Fiber cable shall be individually attached to the respective enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

K. Each optical Fiber cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.

L. When splicing each Fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

M. All spare Fiber strands shall be installed into spare splice trays.

N. Fiber slack shall be neatly coiled within the Fiber splice tray or enclosure. No slack loops shall be allowed external to the Fiber panel.

3.10 OPTICAL FIBER PANELS/ENCLOSURES

A. Cables shall be dressed and terminated in accordance with manufacturer's recommendations and best industry practices.

B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached to the cable strain relief bracket in the enclosure.

C. Bend radius of the optic Fiber cable in the panel/enclosure shall not exceed 10 times the outside diameter of the cable.

D. Each Fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

E. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

F. A maximum of 12 strands of Fiber shall be spliced in each tray.

G. All spare strands shall be installed into spare splice trays.

H. Fiber slack shall be neatly coiled within the Fiber splice tray or enclosure. No slack loops shall be allowed external to the Fiber panel.

I. Installer will visually clean and inspect fiber connector endface prior to insertion into coupler plate.

J. Installer will attach dust caps immediately after endface inspection and after testing.

K. All patch panels shall be bonded to grounding system according to local code Requirements.

3.11 OPTICAL FIBER CONNECTORS AND PIGTAILS

A. All optical fiber shards shall be properly disposed in an approved container to prevent injury. The use of tape is not an approved method for disposal.

B. Application of direct connect fiber connectors (crimp, adhesive or anaerobic) shall be

C. done in accordance with manufacturer’s instructions and industry best practice.

D. Pigtails shall be installed with appropriate fusion splicing equipment that has been

E. calibrated per manufacturer’s recommendations.

F. After polishing/splicing is completed, optical fiber connectors shall be visually checked with an inspection scope (min x200) for damage and debris.

G. If the optical fiber core is fractured, chipped, or scratched it must be re-terminated.

H. Dust caps to be installed immediately after inspection and insertion into coupler plates.

3.12 OPTICAL FIBER PATCH CORDS

A. Fiber patch cords/workstation cords shall be installed as per the Requirements specified by the manufacturer's installation guidelines.

B. Installer will visually inspect and clean fiber connectors at every stage of handling BEFORE mating them.

C. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords is required.

D. Cleaning both connectors each time you disconnect and reconnect is required.

E. Inspection and cleaning of simplex fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3-35.

F. Objective inspection tools shall be used to perform endface inspection.

G. Submit software copy of test results, in original tester software format, to the Owner and to Leviton.

3.13 FACTORY PRETERMINATED FIBER OPTIC TRUNK AND CASSETTE SYSTEM

A. The System shall be installed by factory trained personnel.

B. Polarity of fiber trunks and Cassettes must be coordinated with factory.

C. Rear cable managers and cable clamps shall be provided in all cases and installed per Manufacturers' recommendations.

D. System components shall be installed in accordance with the recommendations made in ANSI/TIA standards as well as manufacturer's recommendations and best industry practices.

E. Each cable shall be individually attached to the respective enclosure/panel by mechanical means.

F. Bend radius of the optic fiber cable in the enclosure/panel shall not exceed 10 times the outside diameter of the cable.

G. Each cable shall be clearly labeled at the entrance to the patch panel. Cables labeled within the bundle shall not be acceptable.

H. Fiber slack shall be neatly coiled stored inside enclosure or at an appropriate external location.

I. Proper handling, inspection, and cleaning of all MTP and duplex connector interfaces prior to final connections is required to achieve factory performance results as detailed below.

1. Installer shall visually inspect fiber connectors at every stage of handling BEFORE mating them.
2. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords and/or MPO/MTP trunks is required.
3. Cleaning both connectors each time you disconnect and reconnect is required.
4. Inspection and cleaning of simplex and MPO/MTP fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3-35.
5. Objective inspection tools shall be used to perform endface inspection.

3.14 NETWORK CHANNEL EXTENDER SYSTEM

A. All Network Channel Extension System designs must be reviewed, confirmed, and approved by the manufacturer of the system.

1. All end devices, end device locations, and End Device Requirements must be determined before designing a Network Channel Extension System, including but not limited to distance, power needs, data needs, and environment.

a. Determine remote device(s) compliance to IEEE 802.3 PoE standards; Type 1-4, PoE 15 W, PoE+ 30 W, PoE++ 60 W, or PoE++ 100 W.
b. Determine the maximum distance between the remote device and the telecommunication closet or location where the source or chassis will be installed, for each device.
c. Identify if any component of the system (source/ chassis, cable, remote module, device) will be installed in a location where they may

be exposed to voltage spikes or currents generated by electrical surges or lightning strikes and design the system accordingly.

d. Confirm the environmental conditions (temperature, humidity, etc.) of which the components are expected to withstand and accommodate in the design.

B. Follow the Manufacturer's instruction manual, i.e., Leviton OneReach™ System Installation Manual https://www.leviton.com/en/docs/Leviton_IST_OneReach_System.pdf. Review and understand all instructions from the manual completely before designing and installing the Network Channel Extension System.

C. Safety

1. Never install communications components in wet locations, unless the components are specifically designed for use in wet locations.
2. Never touch uninsulated wires or terminals unless the wiring has been disconnected from the network interface.
3. Never install wiring or components during a lightning storm.
4. Use caution when modifying or installing communications wiring or components.
5. Be sure the chassis has all power supplies shut off before hooking up a cable and that the wire colors match the terminal block identification.

D. Bulk Cable and Assembly Installation

1. Ensure sufficient pathway/conduit size is available to accommodate the new cabling. Consider all parts of the cable, including the pulling eye assembly, when sizing pathways.
2. Always pull in cable assemblies by attaching the pull rope to the pulling eye assembly, per the Manufacturer's instructions.
3. Cables shall be dressed and terminated in accordance with the recommendations made in the latest ANSI/TIA-568 standards, manufacturer's recommendations, and best industry practices.
4. Minimum bend radius and maximum pulling tension for all cables shall be maintained during and after installation.
5. All cable and associated hardware shall be placed to make efficient use of available space in coordination with other uses. All cable and associated hardware shall be placed to not impair the use or capacity of other building systems, equipment, or hardware placed by others (or existing).
6. A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb.) shall be co-installed with all cables installed in any conduit.
7. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
8. Cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and be supported by messenger strand, cable ladder, or other method to provide proper support for the weight of the cable on alternating floors or as required by local codes.
9. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.
10. The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to Manufacturer's Requirements.
11. Each cable shall be clearly labeled at the entrance to the enclosure. Cables labeled within the bundle shall not be acceptable.

12. When splicing each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.
13. All spare fiber strands shall be installed into spare splice trays.
14. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No fiber strand slack loops shall be allowed external to the fiber panel or enclosure.

E. Remotes shall be placed in enclosures/boxes suitable for the environment such as NEMA Type 1 (indoors, typical) or NEMA Type 4 or greater (outdoors, typical). If any part of the system is outdoors, it is highly recommended that additional surge suppression be installed on both sides of the copper conductors connecting TR equipment to remote equipment. Warranty does not cover damage caused by surges induced on any part of the system.

F. Grounding and Surge Protection

1. If any part of the system is outdoors, it is highly recommended that additional surge suppression be installed on both sides of the copper conductors connecting TR equipment to remote equipment.
2. The Manufacturer's instructions and Requirements as well as the BICSI TDMM Chapter 9 (Bonding and Grounding) shall be utilized as general reference for grounding and bonding, to include the ER and TR Telecommunications Grounding Busbar (TGB) and sizing of grounding conductors. Grounding conductors shall be a minimum of #6 AWG insulated green stranded copper if length is less than 100ft. Consult NEC if length is more than 100ft.

    a. For outdoors installations and other environments with potential surge events, 48 VDC surge protectors, specifically rated for lightning strike protection, are required to be included in the Network Channel Extension system. Additionally, in locations with potential surge events, a surge protector should be added to the network cables running to the powered device.
    b. Proper grounding is required for surge protectors to operate correctly.
    c. Regardless of these details, installations must be compliant with the Requirements of the local authority having jurisdiction.

3. The composite cable surge protector has two sides:

    a. Telecommunications Room / Head-End:

        1) Unprotected input of the surge protector connects to the composite cable.
        2) Protected input of the surge protector connects to the source.

    b. Remote End:

        1) Unprotected input of the surge protector connects to the composite cable.
        2) Protected input of the surge protector connects to the remote module.

3.15 FIELD QUALITY CONTROL

A. Optical Fiber Testing and Quality Assurance- Field Terminated Cabling

1. Testing procedures shall be in accordance with the following:

    a. ANSI/TIA-568.3-D.
    b. ANSI/TIA-526-7, Method B.
    c. ISO/IEC 14763-3

2. Testing:

    a. Test optical fibers at both 850 nm and 1300 nm wavelengths for multimode, 1310 nm and 1550 nm wavelengths for single-mode, end-to- end insertion loss,
    b. Maximum channel insertion loss for fiber optic cables without consolidation point: 2.0 db.

3. All OLTS units shall be of current calibration, submit calibration certificate with test results to Manufacturer.
4. Submit software copy of test results, in original tester software format, to the Owner and to Leviton.
5. One jumper reference method is required for fiber links.
6. Negative fiber attenuation results will not be accepted.

B. Optical Fiber Testing and Quality Assurance-Factory Pre-Terminated Cabling

1. Pre-terminated fiber optic trunk cables shall be installed as per the Requirements specified by the manufacturer's installation guidelines.
2. Components shall be installed by factory-trained personnel.
3. Proper handling, inspection, and cleaning of all MTP™ and duplex connector interfaces prior to final connections is required to achieve factory performance results.

    a. Installer shall visually inspect fiber connectors at every stage of handling BEFORE mating them.
    b. Inspection of both endfaces (Cord end and internal Bulkhead) before mating patch cords and/or MPO/MTP™ trunks is required.
    c. Cleaning both connectors each time you disconnect and reconnect is required.
    d. Inspection and cleaning of simplex and MPO/MTP™ fiber interfaces will adhere to the procedures detailed in International Standard IEC 61300-3- 35.
    e. Objective inspection tools shall be used to perform endface inspection.

4. Installation Contractor shall perform optical test on all fiber channels upon completed installation to include continuity, attenuation, and length. Test results shall be provided to Leviton upon completion for full Product Warranty Requirements.
5. All channel testing shall comply with ANSI/TIA-568.3-D as applicable.
6. Field test equipment must be Encircled Flux compliant to ANSI/TIA-526-14-C.

C. Horizontal

1. Test 100% of all cable runs for defects in installation and verify cabling system performance under installed conditions in accordance with most current ANSI/TIA-568.0-E Series, ISO/IEC 11801-1, BICSI TDMM, manufacturer's recommendations, and best industry practices.
2. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100% useable conductors in all cables installed.
3. Performance Certification Testing of Twisted-Pair Cables: (NOTE: Permanent Link Test results are recommended and are the expected norm).

    a. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens, and performance as specified.
    b. Test horizontal cabling using approved certification tester for Class EA performance compliance in accordance with ANSI/TIA-568.0-E.
    c. Basic Tests Required:

        1) Wire map.
        2) Length (feet).
        3) Insertion loss (dB), formerly attenuation.
        4) NEXT (Near end crosstalk) (dB).
        5) Return loss (dB).
        6) ELFEXT (dB).
        7) Propagation delay (ns).
        8) Delay skew (ns).
        9) PSNEXT (Power sum near-end crosstalk loss) (dB).
        10) PSELFEXT (Power sum equal level far-end crosstalk loss) (dB).

    d. Provide test results in approved certification testers original software format on CD, with the following minimum information per cable:

        1) Circuit ID.
        2) Information from specified basic tests required.
        3) Test Result: “Pass” or “Fail”.
        4) Date and time of test.
        5) Project name.
        6) NVP.
        7) Software version.

    e. Submit fully functional version of tester software for use by the Owner in reviewing test results.
    f. Report in writing to the Owner immediately, along with copy of test results, failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs).

3.16 LABELING

A. General Labeling

1. All labeling is to be in accordance with ANSI/TIA-606-D, ISO 11801-1, adopted labelling schema, and manufacturer’s instructions.

2. Label horizontal cables using machine-printed label at each end of cable at approximately 12 inches from termination point and again at approximately 48 inches from termination point.
3. Handwritten Labels: Not acceptable.
4. Label patch panel ports and TO ports with cable identifier.
5. City of Ontario Label scheme example:

    a. Wall Plate: [(IDF/MDF) Room Number] [Port Number]
    b. Patch Panel: [Port Number]

3.17 QUALITY INSPECTION REPORT

The City of Ontario Information Technology (IT) Agency shall use a Quality Inspection Checklist Report for all projects to verify proper installation of the products in this document.

END OF SECTION 16750

Add header

CITY OF ONTARIO	QUALITY INSPECTION REPORT			
Document #:	Process Owner:	Revision:	Date:	Page:
11-CC-F001	Contractor Program Administration	1.0		1 of 3

1. Project Information

Customer: _____ Contractor: _____

Location _____ Inspector: _____

_____ Date: _____

2. Telecommunications Room/Enclosure (TR/TE)

Ladder Rack/Cable Tray

	Yes	No	N/A
Mounted level			
Installed per manf. spec/NEC			
Bonded to ground			
Bend radii protected			
Rough edges removed			
Anchored properly			
Cable secured			
Filled less than 25%			

Fire stopping

	Yes	No	N/A
Fill ratio verified			
Labeled			
Unused assemblies caped			
Rough edges removed			
Installed per manf. specs			
Pillows secured with wire mesh			
Assembly matches wall rating			
UL assembly #			

Relay Rack(s)

	Yes	No	N/A
Anchored properly			
Installed level & square			
Multiple racks bolted togth.			
Bonded to ground			
Bend radii protected			
Rack/panels labeled (perm)			
Copper panels correct rating			
(i.e. 5e,6,6A)			

	Yes	No	N/A
Panels secure & level			
Fiber panels mounted above eye			
Horizontal wire mgt installed			
Vertical wire mgt installed			
Cables dressed correctly			
Cables labeled within 6 inches			
Cables supported behind panels			
Cables twist maintained			

Cables

	Yes	No	N/A
Correct rating (CMP/CMR)			
Minimum separation (EMI)			
Bundles secured loosely			
Correct rating (5e,6, 6a)			
6A cables secured w/Velcro			
Slack dressed correctly			

Grounding/Bonding

	Yes	No	N/A
TBB, TEBC, GE appropriate size			
TMGB/TGB anchored correctly			
2 hole long barrel con. on busbar			
Busbar(s) & conductors labeled			
Bend radii maintained (8X)			
All connections tight & painted			
surfaces removed			

Notes

Add header

ONTARIO	QUALITY INSPECTION REPORT			
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4. Work Area (inspect min 5%)

Work Area Outlet	Yes	No	N/A
Mounted level			
Permanently labeled			
Cable labeled <6 in.			
Twist maintained			
Connector matches cable & patch panels (i.e. 5e,6, 6a)			

MUTOA	Yes	No	N/A
Mounted level			
Attached to perm. build. struct.			
Permanently labeled			
Conn. matches cable/panels			
Twist maintained			
Cable labeled <6 in.			
Label on MUTOA for max patch cord length			

Notes

5. Backbone (copper/fiber)

Copper	Yes	No	N/A
Bend radii maintained			
Supported correctly			
Tapped correctly			
Binder markers maintained			
Cable securely anchored			

Fiber	Yes	No	N/A
Cable/innerduct securely anchored			
All fiber connectors have caps			
Cable secured to enclosure			
Blank adapter panels installed			
Bend radii maintained in enclosure			

Notes

Recommendations

Signatures

INSPECTOR _____ DATE _____

CONTRACTOR _____ DATE _____

CUSTOMER DATE

SECTION 16754

PATHWAYS FOR AV SYSTEMS

PART 1- GENERAL

1.01 SECTION INCLUDES

A. Conduits

B. Pull Boxes

C. Conduit Fittings

D. Floor Boxes

E. Cable Tray

1.02 RELATED SECTIONS

A. Section 11135 Audio Visual Equipment.

1.03 DESCRIPTION OF WORK

A. Furnish and install all items listed in 1.01 required to support the AV systems cabling as indicated on the AV drawings, specified, or as otherwise required.

PART 2- PRODUCTS

A. Refer to AV Drawings for pathway type required for each cable run. Substitution of pathway type requires Consultant's approval. Pathways shown without cable fill are for temporary or future cable use.

2.01 CONDUITS

A. General

1. Provide Pull String in all conduits for AV system. Pull string shall include numbered foot markings to provide for measurement of cable runs.
2. The sizes of conduits shall be as shown on the drawings, minimum size is 0.75". All conduits shall be reamed and furnished with insulation and/or grounded bushings as required.

B. Flexible Steel Conduit

1. Flexible steel conduits are not acceptable for AV systems installations.

C. Electrical Metallic Tubing (EMT)

1. EMT shall be zinc galvanized both inside and out with a minimum thickness of .0008". It shall be round with uniform wall thickness and continuously welded seams. EMT shall be furnished in ten-foot standard lengths.

D. PVC Conduit

1. PVC conduit shall be rigid non-metallic Schedule 40 heavy wall.
2. Use of PVC shall be limited to underground conduits only.

E. Conduits carrying fiber cables shall have large labels indicating "Fiber Optic Cable." These labels should be placed every 10 feet where exposed.

F. Buried conduits must have yellow "Caution Fiber Optic" tape laid 12 inches above duct bank.

2.02 PULL BOXES

A. Pull boxes shall be constructed of code gauge steel, etched, primed and shall have rust resistant ANSI 61 gray finish and be NEMA 1 construction with screw covers unless noted otherwise. For conduits 1-1/4" and larger terminating in a pull box, the minimum length of pull box shall be 8 times the diameter of the largest conduit terminating in the pull box. Splice boxes shall be sized as per EIA/TIA-569A Table 5.2-3.

B. Location and sizes of pull boxes and splice boxes shall meet the approval of the Architect and Consultant. Condulete type fittings (e.g. LB's, etc.) shall not be used in lieu of pull boxes or bends.

C. Exposed pull boxes in public areas shall be provided with tamperproof screws.

D. Boxes shall be free from unused openings, including knockouts.

E. Pull boxes larger than 12" x 12" for which a custom panel has not been specified, shall have hinged covers.

F. Gang, 4" square and 4-11/16" square boxes must be installed using open center brackets

G. Pull boxes for indoor wet or damp locations shall be NEMA 3R Rated with stainless steel screws.

H. Pull boxes for outdoor locations shall be NEMA 4X Rated stainless steel continuous hinges, door clamps and a hasp.

I. Provide junction box, pull box, and hand-hole assemblies sized as required by the NEC. Pull boxes/hand-holes shall be located using the following table:

1. Runs with total of all bends <90 degrees – 600ft.
2. Runs with total of all bends >=90 degrees and <180 degrees – 400ft.
3. Runs with total of all bends >= 180 degrees and <270 degrees – 200ft.
4. Runs with total of all bends >= 270 degrees are not allowed.

2.03 CONDUIT FITTINGS

A. All rigid, IMC and EMT fittings shall be galvanized malleable iron or steel. Connectors and couplings shall be threaded, setscrew, compression type, and concrete-tight.

B. Conduit bodies shall be malleable iron, threaded type. Provide neoprene cover gaskets for conduit body covers exposed to the weather.

C. Expansion fittings shall be O-Z/Gedney Type "AX" for rigid metal conduit and Type "TX" for electrical metallic tubing. For intermediate metal conduit applications, a 15-inch minimum length of rigid metal conduit shall be used with a Type "AX" expansion fitting. Provide O-Z/Gedney Type "BJ" bonding jumpers at all expansion fittings.

D. Rigid and IMC conduit bushings shall be of the insulated type with phenolic thermosetting insulation molded to a hot dipped galvanized malleable iron body of the threaded type.

E. EMT fittings shall be of the insulated throat type. Fittings larger than 2-1/2 inches shall have threaded bushings installed.

F. PVC conduit fittings shall be slip joint type.

G. All conduit sleeves will be fitted with “spillways” to maintain the bend radius of cables passing through the sleeve.

2.04 FLOOR BOXES

A. Refer to AV drawings for manufacturer, model, quantity, and location information as well as scope of work.

B. Contractor to provide all parts and accessories required for a working floor box system including those required based on specific installation conditions unless otherwise noted.

C. Boxes to have a voltage divider to allow for power receptacles and low-voltage AV connections to reside within the same box. Conduits for high and low voltages must enter box on appropriate side of voltage divider to maintain separation. High and low-voltage wires may not cross within the box.

D. On-grade boxes to be cast-iron, and above grade, in-slab boxes to be steel.

E. Boxes to be fully adjustable, before and after the concrete pour.

F. Boxes shall have applicable approvals from a Nationally Recognized Testing Laboratory and meet all applicable local codes.

G. Floor Boxes on elevated floors must maintain proper fire rating of slab.

H. Provide equipment ground conductor as required by local code.

2.05 CABLE TRAY

A. Cable trays shall be installed as indicated on the AV drawings. Cable tray will only be acceptable in the specific area called out on the AV drawings.

B. Unless otherwise noted on the Drawings, cable tray shall be 12 inches wide and have a usable minimum loading depth of 4 inches deep.

C. Industrial type, single-piece, formed aluminum trough cable tray for heavy cable loads and large cables shall be Chalfant Ladder Tray or Type 156 by B-Line, 4” usable depth and 9” rungs as indicated on the drawings. The tray shall be either trapeze or wall mounted.

D. Industrial type, single-piece, 16-ga fully welded tubular steel with 2-layer black powder coat finish with 9” rungs as indicated on the drawings.

E. Cable tray used in open ceilings in finished areas and storage rooms shall be solid bottom.

F. Straight sections shall be a maximum nominal 10-foot length.

G. Straight sections and fittings shall be assembled with nut and bolted splice plates. Hardware shall be zinc plated. Spring loaded and "snap" type fittings are not acceptable.

H. Factory end plates and fittings shall match the tray width, depth and metal type.

I. The cable tray system shall be U.L. Listed and classified with applicable U.L. labels applied. Cable tray installation shall meet all applicable UL standard requirements for use as an equipment ground conductor.

PART 3- EXECUTION

3.01 INSTALLATION

A. General

1. Whenever possible, cable and raceway routing paths shall follow the logical structure of the building (e.g. follow hallways, aisles and corridors). Route all AV cables and raceways parallel to or

perpendicular to the building structure. No diagonal runs will be permitted unless noted otherwise or pre-approved by the Architect and Consultant. Corridor crossovers shall be kept to a minimum.

2. Coordinate layout of conduits including specific routing and mounting elevations with building structure and work of other trades.
3. Provide a pull string in all raceways, cable trays and conduits.
4. Transitions between cable trays and conduit, etc. shall not exceed 10” horizontally, 24” vertically. Provide “drop-out” supports spillways, and radius controls for changes in elevation as required.
5. All power devices and power sources emit a given amount of radio frequency interference (RFI) and/or electro-magnetic interference (EMI). To reduce or eliminate the field effects of RFI/EMI on the signals residing on a given cable, runs shall be kept at the maximum possible distance from such sources. Running cables through the center of the building can reduce the external interference effects of RFI/EMI in the cable tray. Open wiring and non-metallic raceway shall be routed a minimum of twelve (12") inches away from fluorescent fixtures. Special attention shall be given to the routing of such pathways away from lighting ballasts and high intensity discharge devices. Reference AV0.00 for the required separation distances of signals of different types.

B. Conduits

1. Provide continuous conduits across open or inaccessible ceiling areas.
2. Provide conduits from cable trays to accessible ceilings as required.
3. Conduits attached to cable trays shall be secured with approved conduit clamps.
4. Conduit buried in concrete slab pours shall be full weight rigid galvanized steel or Schedule 40 PVC. All elbows, stub ups and conduit above ground shall be rigid galvanized steel. All joints and terminations for PVC shall be made according to manufacturer's recommendations to ensure all joints are watertight.
5. Conduit buried in or beneath building slabs or exterior below grade shall be full weight rigid galvanized steel or Schedule 40 PVC. The conduit shall be encased in 3" concrete envelope or as called for on the Plan Drawings. All elbows and stub ups shall be rigid galvanized steel. All joints and terminations for PVC shall be made according to manufacturer's recommendations to ensure all joints are watertight.
6. Conduits and cables entering from outside the building shall be sealed water and moisture tight. Seal between conduit and sleeves, conduits and core drilled holes and around conductors inside conduits. Provide cast iron pipe or Schedule 40 galvanized steel conduit sleeves in exterior walls below grade, with intermediate wall stop and anchor collar set in place before concrete pouring. Sleeve shall be a part of the sealing assembly. When the wall opening is core drilled, the wall sleeve may be

omitted. A mechanically compressed rubber sealing assembly shall be placed in the annular space between conduit and the sleeve or the core drilling.

7. Conduits stubbed out into accessible ceiling to be located no more than 2'-6" above finished ceiling.
8. All conduit stub-outs and junction boxes in accessible ceilings to remain accessible by ladders from the finished floor below.
9. Layout the conduit system to avoid crossing building expansion joints. Where crossings are necessary, use expansion joints.

C. Boxes

1. Wall or ceiling boxes must be mounted flush with finished surface.
2. Final mounting height of all boxes on finished surfaces to be coordinated with Architect for alignment with adjacent boxes.
3. In stud walls, boxes on opposite sides of the wall must be separated by a minimum of 1 stud cavity.
4. In CMU or concrete walls, boxes on opposite sides of the wall must be separated by a minimum of 16".
5. Pull boxes shall be placed in straight sections of conduit runs and may not be used in lieu of a bend without approval of the Consultant. Pull boxes and/or splice boxes shall be installed in readily accessible locations. Where boxes are installed above suspended ceilings, they shall be located immediately above the suspended ceiling or the ceiling shall have a suitably marked and hinged panel to facilitate direct access to the pull box.
6. Boxes in accessible ceiling to be located no more than 2'-6" above finished ceiling.
7. All boxes mounted in accessible drop tile ceilings to remain accessible by ladders from the finished floor below.

D. Cable Tray

1. Cable trays shall be trapeze hung and sway braced.
2. Cable trays will not be permitted in mechanical rooms, electrical rooms or any wet or damp rooms. In these area conduits are required.
3. All changes in elevation of the cable tray or where cable leaves the cable tray factory produced radius drop offs, waterfalls and other devices shall be used to ensure the proper cable bend radius is maintained.
4. When rated walls must be breached, cables shall pass through pre-established fire block systems by EZ-Path or similar. Multiple systems shall be used to equal the full capacity of the cable tray. Cables shall enter and/or exit areas at right angles to the structure.

E. Fire Stopping

1. Where pathways pierce walls, floors and/or ceilings, restore fire rating and smoke stoppage integrity as required by code.

F. Excavation:

1. It is the responsibility of the Contractor to obtain all permits and utility marking. Bids shall include landscaping restoration costs.

END OF SECTION