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BARENG MORRELLI SCOTT

MANGINI ASSOCIATES INC.
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DATE:	August 24, 2022
MAI NO.:	1751a
OPSC APPL. NO.:	
DSA APPL. NO.:	02-120394
DSA FILE NO.:	16-H1
PTN:	63891-35

PROJECT MANUAL FOR:

MODERNIZATION AT CORCORAN HIGH SCHOOL – SCIENCE BUILDING

CORCORAN UNIFIED SCHOOL DISTRICT
CORCORAN, KINGS COUNTY, CALIFORNIA

LICENSED ARCHITECT
GILBERT M. BARENG
No. C-33544
REN. 07-31-23
STATE OF CALIFORNIA

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STRUCTURAL ENGINEER
LANE ENGINEERS INC.
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IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-120394 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 05/01/2023

SET NUMBER

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Not Used

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SECTION 01 1100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY:

A. Related Sections: Close coordination between this Section, the General and Supplementary Conditions, and Divisions 1 through 33 is required.

B. Project Location: **Corcoran High School, 1100 Letts Avenue, Corcoran CA, 93212**

C. Project: The Project consists of the total construction of which the Work performed under the Contract Documents is a part and which may include construction by the Owner or by separate contractors, for:

MODERNIZATION AT CORCORAN HIGH SCHOOL – SCIENCE BUILDING

D. Work: The Work of the Project consists of all labor, material, equipment, and services to perform all selective demolition and construction required by the Contract Documents, including but not limited to alterations to (1) existing science classroom building.

E. Applicable Codes: All work shall be performed in accordance with the plans, specifications and the following regulations:
1. 2019 Building Standards Administrative Code, Part 1, Title 24 CCR.
2. 2019 California Building Code (CBC), Part 2, Title 24 CCR.
3. 2019 California Electrical Code (CEC), Part 3, Title 24 CCR.
4. 2019 California Mechanical Code (CMC) Part 4, Title 24 CCR.
5. 2019 California Plumbing Code (CPC), Part 5, Title 24 CCR.
6. 2019 California Energy Code (CEC), Part 6, Title 24 CCR.
7. 2019 California Fire Code, Part 9, Title 24 CCR.
8. 2019 California Green Building Standards Code (CALGreen), Part 11, Title 24 CCR.
9. 2019 California Referenced Standards, Part 12, Title 24 CCR.
10. Title 19 CCR, Public Safety, State Fire Marshal Regulations.
11. 2016 NFPA 72 National Fire Alarm Code, as amended.
12. 2016 NFPA 80 Fire Door and Other Opening Protectives.
13. 2016 NFPA 13 Automatic Sprinkler Systems, as amended.

F. Conflicts in the Drawings and Specifications:
1. When conflicts are noticed prior to bidding, the bidder shall notify the architect immediately in order that an addendum can be issued to all bidders prior to bidding. When the discrepancy is noticed after the bid, the architect shall be notified and will review the discrepancy and interpret the intent. For the purpose of bidding and interpreting, **the most restrictive and potentially most expensive condition may prevail.**
2. In the case of ambiguity, conflict, or lack of information, the Architect shall respond with reasonable promptness and provide additional instructions, by means of drawings and/or written instructions, as may be otherwise necessary for proper execution of the work. All such drawings and instructions shall be consistent with the contract documents, true developments thereof, and reasonably inferable therefrom.

1.2 DIVISION OF THE STATE ARCHITECT REQUIREMENTS

A. Addenda: Changes or alterations of approved plans or specifications that affect structural, fire/life safety, or accessibility portions of the Project prior to letting a construction contract shall be made by means of addenda submitted to and approved by DSA in accordance with Section 4-338, California Administrative Code, Title 24, Part 1, California Code of Regulations.

B. Changes: Changes or alterations of approved plans or specifications that affect structural, fire/life safety, or accessibility portions of the Project after a contract for the work has been let shall be made by means of Construction Change Documents submitted to and approved by DSA in accordance with Section 4-338, California Administrative Code, Title 24, Part 1, California Code of Regulations.
   1. Refer to Section 01 2600 for modification procedures.

C. Intent of the Contract Documents:
   1. The intent of the Drawings and Specifications is that the Work of alteration, rehabilitation, or reconstruction shall be in accordance with Title 24, California Code of Regulations.
   2. Should any existing conditions such as deterioration or non-complying conditions be discovered which is not covered by the Contract Documents, wherein the finished work will not comply with Title 24, California Code of Regulations, a Construction Change Document or separate set of Drawings and Specifications, detailing and specifying the work shall be submitted to and approved by DSA prior to proceeding with the Work.
      a. Refer to Section 01 2600 for modification procedures.

1.3 CONTRACTS

A. All work of this project will be let as a single lump sum General Contract.

1.4 FEES AND PERMITS

A. The Owner will be responsible to obtain and pay for the following:
   1. DSA approval and field inspection fee.

B. The Contractor shall be responsible to obtain and pay for the following:
   1. Permits and licenses required for work performed in the public right-of-way.
   2. Permits, licenses, and inspection fees required for execution and completion of the Work which are not the responsibility of the Owner.

C. The Contractor shall be responsible for requesting all inspections required by the governing jurisdictions.

1.5 FUTURE WORK

A. Route all underground utilities a minimum of 10'-0" away from all building footprints identified as future construction.

B. Construct building pads for future buildings as indicated, grading top of pad to provide for drainage.

1.6 WORK SEQUENCE

A. Refer to Section 00 3100 for preliminary schedule requirements.
B. Construct the Work within the following constraints:
   1. Fire Department Requirements: Maintain access to existing hydrants and maintain existing fire lanes free of obstruction.
   2. Finish Flooring Installation: Complete enclosure of interior spaces, make HVAC system operational, and bring interior spaces to design temperature and humidity 48 hours prior to vapor emission control treatment pre-testing as specified in Section 09 6110.
   3. Building Flush Out: Provide flush out of building with 100% outside air for 14 calendar days as required by Section 23 0001.

1.7 CONTRACTOR'S USE OF PREMISES

A. Limit use of the site to construction activities in the areas indicated.

B. Confine operations to areas within the Contract Limits indicated. Portions of the site beyond areas in which construction operations are indicated shall not be disturbed.

C. Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

D. Keep driveways and entrances serving the premises clear and available at to the Owner, the Owner's employees, and the public at all times.

E. Keep bus lanes and drop-off zones clear and available to the Owner at all times.

F. Use of existing toilets within the existing buildings, by the Contractor, shall not be permitted.

G. Store and stockpile materials on the property, excluding public rights-of-way.

1.8 OWNER OCCUPANCY

A. Owner intends to occupy the Project by the date stated in the Agreement as the Contract Completion Date.

B. Owner intends to continue to occupy adjacent portions of the existing site and/or buildings during the entire construction period. Do not interfere with the Owner's and public's use of the site and existing buildings outside of the Contract Limits indicated. Schedule the Work to accommodate Owner occupancy during construction. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Limit conduct of especially noisy exterior work to the hours of [8:00 a.m. – 3:00 p.m.].

D. Limit conduct of especially noisy interior work to the hours of [8:00 a.m. – 3:00 p.m.].

E. Where the Work requires the HVAC system to be nonoperational in areas occupied by the Owner, provide temporary heating or cooling as needed for occupant comfort.

1.10 WORK BY OWNER

A. Items noted as NIC (Not In Contract) will be furnished and installed by the Owner.

B. The Owner will furnish and install the following work:
   1. Classroom and miscellaneous equipment and furnishings indicated as NIC.
   2. Grading and re-seeding of existing lawn areas damaged by construction operations.
   3. Repair and reconfiguration of existing landscape irrigation systems made necessary by the Work.

1.11 OWNER FURNISHED PRODUCTS

A. Owner will furnish certain products for installation by the Contractor as indicated on the Drawings.

END OF SECTION 01 1110

SECTION 01 2100 - CASH ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. To provide adequate budget and bonding to cover items not precisely determined by the Owner prior to bidding, allow within the proposed Contract Sum the amounts described in this Section.

B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Other provisions concerning Cash Allowances are stated in Paragraph 3.8 of the General Conditions.
3. Other provisions concerning Cash Allowances also may be stated in other Sections of these Specifications.

1.2 CASH ALLOWANCE PROVISIONS

A. Costs Included in Cash Allowances: As defined in the General and Supplementary Conditions.

B. Architect Responsibilities: Architect shall meet with the Owner, Contractor and product manufacturer to determine the products for use.

C. Contractor Responsibilities: Cooperate with Owner's testing laboratory to obtain timely information relative to substrate conditions and actual cost of products selected.

D. Differences between the allowance amount and the actual cost of the Work will be adjusted by Change Order.

1.3 ALLOWANCES SCHEDULE

A. Moisture Control Treatment for Flooring: Include the sum of **$30,000.00** for moisture control treatment for flooring in areas indicated in the Contract Documents.
1. Allowance includes use of an alternate flooring adhesive recommended by the floor covering manufacturer as suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present
2. Allowance includes use of a coating intended by its manufacturer to resist water vapor transmission or internal relative humidity to the degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment or with only the addition of a skim coat of patching compound or adhesive.
a. Moisture control treatment for flooring is specified in Section 09 6110.
3. Testing for moisture conditions in concrete floor slabs is specified in Section 09 0560.

END OF SECTION 01 2100

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes procedures for securing approval of proposed substitutions.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Make submittals in accordance with pertinent provisions of Section 01 3300.

1.2 SUBSTITUTIONS

A. Substitutions: Contractors, subcontractors and/or material suppliers shall comply with the requirements set forth in this Section. All requests for material substitutions shall be submitted with all required substantiating data, comparisons to the material specified, including samples and colors as needed to determine their acceptance. Failure to provide the required documentation is justification for rejection.
1. Prior to Bid: Substitution Requests shall be submitted a minimum of 10 days prior to the bid (if material is to be included on the final addendum). Substitutions may be submitted by general contractor or subcontractor bidders directly to the Architect.
2. After Award of Contract. Substitution Requests may be submitted not more than 35 days after the award of the contract. Substitution requests shall only be submitted by the General Contractor.
3. Substitution Requests received greater than 35 days after the award shall be rejected.

B. Required Substitution Submittal Requirements:
1. Submit required substitution information with a completed “Substitution Request Form” found at the end of this Section.
2. Manufacturer's descriptive literature and product specifications for each product, with the proposed products clearly identified.
3. Comparative specification data between the specified item and the proposed substitution, showing compliance with the specified requirements.
4. Test reports indicating compliance with ASTM standards and ICC ES approvals where compliance with such standards is required by the Contract Documents or where compliance is claimed by the Contractor requesting substitution.
5. Samples of actual material and color, where applicable.
6. **Submittal without this information will automatically be rejected.**

C. Approval of Substitutions:
1. Where the phrase "or equal," or "or equal as approved by the Architect," occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved for this Work by the Architect.
2. The burden of proof as to the equivalency of any material, process, or product shall rest with the Contractor. Any or all of the following will be used by the Architect to determine if a proposed substitution is equivalent to the specified products or materials:
a. Code and legislative compliance.
b. Functional performance and characteristics.
c. Industry standard compliance.
d. Composition of materials.
e. Cost.
f. Aesthetic characteristics.

g. Environmental characteristics.
h. Manufacturer characteristics.
i. Installation characteristics.
j. Maintenance requirements.
k. Warranty characteristics.

3. **Approvals shall be at the sole discretion of the Architect and the decision of the Architect shall be final and binding.**
4. The provisions allowing submission of substitutions shall not in any way authorize an extension of time for performance of the Work.

D. Substitution of any material, system, or product that would normally be reviewed by DSA (Structural Safety, Fire/Life Safety, Access Compliance, or Energy) shall be submitted to and approved by DSA prior to fabrication or use. Such substitutions shall be considered Construction Change Document in accordance with Section 01 2600.

1.3 DELAYS

A. Delays in construction arising by virtue of the non-availability of a specified material due to late approval and/or ordering of materials will not be considered as justifying an extension of the agreed Time of Completion, or reason for change.

B. All additional time required by the Architect or his consultants in dealing with such delay will be charged to the Contractor at the rates listed above.

C. Equal or better material replacements caused by delay in approvals and/or ordering may cost more than the original material specified. Increased costs shall be absorbed by the Contractor and not the Owner.

END OF SECTION 01 2500

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SUBSTITUTION REQUEST FORM

PROJECT: _____

SPECFICIATION SECTION: _____ **ARTICLE/PARAGRAPH:** _____

SPECIFIED SECTION: _____

PROPOSE SUBSTITUTION: _____

Attach complete technical data including laboratory tests and code approvals, detailed drawings, and other data indicating compliance with the requirements of the Contract Documents. Clearly identify products being proposed for substitution. Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

FILL IN BLANKS BELOW:

A. Does the substitution affect dimensions on Drawings? ☐Yes ☐No

B. Will the undersigned pay for changes to the building design, including building design, engineering and detailing costs caused by the requested substitution? **(Negative response may be cause for rejection)**
☐Yes ☐No Explain: _____

C. What affect does substitution have on other trades? _____

D. Differences between proposed substitution and specified item? _____

E. Manufacturer's guarantee of the proposed and specified items are: ☐Same ☐Different
Explain: _____

F. Manufacturer will provide colors that match color selection in finish schedule: ☐Yes ☐No

The Undersigned hereby certifies that the function, appearance, and quality are equivalent to or superior to the specified item. The undersigned agrees to waive all claims for additional costs related to accepted substitution, including costs associated with changes to building design, engineering, or details, which may subsequently become apparent.

Submitted by: _____

Signature: _____ Date: _____

Firm: _____

Phone: _____ Address: _____

Fax: _____

ARCHITECT'S REVIEW AND ACTION

☐Accepted – Make submittals in accordance with Section 01 2500.
☐Accepted as noted – Make submittals in accordance with Section 01 2500.
☐Rejected – Use specified materials.
☐Received too late – Use specified materials.

By: _____ **Date:** _____

MANGINI ASSOCIATES INC.

Remarks: _____

SECTION 01 2600 - CONTRACT MODIFICATION PROCEDURES AND FORMS (DSA)

PART 1 - GENERAL

1.1 SUMMARY:

A. This section includes procedural requirements for consideration and execution of modifications to and interpretations of the Contract Documents. This section is intended to supplement requirements set forth in the Agreement and the General and Supplementary Conditions.

B. Section includes:
1. Documentation of changes in Contract Sum and Contract Time.
2. Interpretation and clarification procedures.
3. Change procedures.
4. Correlation of Contractor submittals based on changes.

C. Related Sections:
1. Close coordination between this Section, the General and Supplementary Conditions, and Divisions 1 through 33 is required.
2. Section 00 5210: Agreement, Contract Sum, retainage, payment period, values of unit prices.
3. Section 00 7210: Requirements for progress payments, final payment, changes in the Work.
4. Section 00 7310: Percentage allowances for Contractor's overhead and profit.
5. Section 01 2100: Payment procedures relating to allowances.

1.2 DIVISION OF THE STATE ARCHITECT REQUIREMENTS

A. In addition to the modification requirements of this section, the Agreement, and the General and Supplementary Conditions, the Division of the State Architect (DSA) requires that all changes to the approved construction documents that affect structural, accessibility, or fire/life safety portions of the Project be submitted to and approved by DSA in accordance with the procedure set forth in the current edition of DSA Interpretive Regulation IR A-6.

B. Definitions:
1. **Approved Construction Documents:** The approved construction documents are the drawings, specifications, addenda, deferred approvals, changes and bulletins approved by the governing code jurisdiction.
2. **Change:** A change is a revision, modification, deletion, addition, or substitution to the approved Construction Documents.
3. **Change Order:** A document defining and memorializing construction changes that result in changes to the Construction Contract, usually changing Contract Sum or Contract Time.
4. **Clarification:** A clarification is a statement that clarifies (but does not change) the requirements of the approved Construction Documents.
5. **Contract:** A written agreement for construction, alteration, reconstruction, repair, or other construction activities.
6. **Construction Change Documents (CCD):** The documentation of construction changes for DSA purposes, using DSA Form-140, prepared and submitted by the Architect.
7. **DSA:** The Division of the State Architect (DSA) is the Authority Having Jurisdiction over Project for code compliance.
8. **Interpretation:** An interpretation is a statement that interprets (but does not change) the requirements of the approved Construction Documents.

C. **DSA Changes:** In accordance with the current edition of DSA Interpretation of Regulation IR A-6, changes to the approved construction documents that affect structural, accessibility, or fire/life safety portions of the Project made after a contract for the Work has been let shall be made by means of a Construction Change Document submitted and approved by DSA prior to commencement of the Work shown thereon.

D. **Non-DSA Changes:** In accordance with the current edition of DSA Interpretation of Regulation IR A-6, changes to the approved construction documents that do not affect structural, accessibility, or fire/life safety portions of the Project are not required to be submitted to or approved by DSA.

E. **Change Orders:** DSA does not review change orders.

1.3 MODIFICATION PROCEDURES

A. Definitions:
   1. **Bulletin:** A bulletin is a document produced by the Architect to memorialize all changes, clarifications and interpretations to the approved Construction Documents. A bulletin may or may not change the Contract Sum or the Contract Time.
      a. For the purpose of changes requiring DSA approval, the Architect's Bulletin number will be the same as the DSA CCD number.
   2. **Bulletin Log:** The Bulletin Log is an organized method of numbering, logging, cost accounting, and tracking the status of each bulletin issued.

B. For minor changes not involving an adjustment to the Contract Sum or Contract, the Architect will issue a Bulletin which provides supplementary instructions and information, including a detailed description of the change with supplementary or revised drawings and specifications.
   1. Proceeding with the changes described in the Bulletin indicates the Contractor's acknowledgment that there will be no change in Contract Sum or Contract Time.
   2. In the event the Contractor believes that such Bulletin constitutes a change to the adjustment to the Contract Sum or Contract Time, the Contractor shall immediately give written notice to the Architect within 10 calendar days of receipt of the Bulletin stating that the Contractor considers the Bulletin to be a Change Order. Failure to give such written notice shall waive the Contractor’s right to seek additional time or cost.

C. For changes involving adjustment to the Contract Sum or Contract Time, Architect will issue a Bulletin which provides a detailed description of the proposed change with supplementary or revised drawings and specifications.
   1. Contractor shall prepare and submit a fixed price quotation in the form of a Change Order Request (COR) within 14 calendar days.
   2. The Owner shall provide written acceptance of the Contractor's COR prior to the Contractor commencing work described in the COR.

D. The Contractor may propose a change by submitting a Change Order Request (COR) to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6200.

E. Execution of Change Orders: Architect will issue Change Orders on the form attached at the end of this Section for signatures of parties as provided in the Conditions of the Contract.

F. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

G. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

H. Promptly enter changes in Project Record Documents.

1.4 CONTRACT INTERPRETATION AND CLARIFICATION PROCEDURES

A. **Request for Information (RFI):** A written request from the Contractor to the Architect, seeking an interpretation or a clarification of some requirement of the Contract Documents. The Contractor shall clearly and concisely set forth the issue for which it seeks clarification or interpretation and why a response is needed from the Architect. The Contractor shall, in the written request, set forth its interpretation or understanding of the contract's requirements along with reasons why it has reached such an understanding.
   1. The Architect will review all RFI to determine whether they are RFI within the meaning of this term. Project communications; substitution submittals; product data, shop drawings, or samples submittals, or construction schedule submittals shall not transmitted by RFI. Project communications shall not be considered RFI.
   2. Responses to RFI shall be issued within 10 calendar days of receipt of the request from the Contractor unless the Architect determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Architect, the Architect will, within 10 calendar days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a Request for Information on an activity with 10 calendar days or less of float on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Architect to respond to the request provided that the Architect responds within the 10 calendar days set forth above.
   3. In the event the Contractor believes that a response to a Request for Information will cause a change to the requirements of the Contract Documents, the Contractor shall immediately give written notice to the Architect within 10 calendar days of receipt of the request the Architect stating that the Contractor considers the response to be a Change Order. Failure to give such written notice shall waive the Contractor's right to seek additional time or cost under the Changes article of the General Conditions.
   4. Failure on the part of the Contractor to provide timely Requests for Information does not constitute a crisis solution from the Architect.
   5. Requests for Information that affect structural, accessibility, or fire/life safety portions of the Project made after a contract for the Work has been let shall be submitted to and approved by DSA as a Construction Change Document prior to commencement of the Work shown thereon.

END OF SECTION 01 2600

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REQUEST FOR INFORMATION RFI NO.

TO: **Mangini Associates Inc.** **DATE:**
Attn: **ARCHITECT'S RFI NO.:**
PROJECT NO.:
PROJECT: **DSA APPL. NO.:**

Subject:
Plan/Spec. Ref:
Question:

Suggestion:

Attachments:

Contractor's Contract Status:

- ☐ No change in contract time of sum required
- ☐ Change in contract time may be required
- ☐ Change in contract sum may be required

The undersigned certifies that the Contractor has thoroughly reviewed all Contract Documents and determines that the information requested is not contained in the Contract Documents.

By: **Company:** **Title:**
Phone: **Fax:** **Email:**

Response:

By: **Date:**
MANGINI ASSOCIATES INC.

CC:

MANGINI | ARCHITECTURE INGENUITY
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BULLETIN NO. 01

TO:	Contractor Name Contractor Address Contractor Address	**DATE:**	January 25, 2017
		BULLETIN NO.:	One
		PROJECT NO.:	XXXX
		DSA FILE NO.:	02-123456
PROJECT:	Project Name Owner Name	**DSA APPL. NO.:**	54-12

☐ **Supplemental Instructions:** The Work shall be carried out in accordance with the following supplementary instructions, clarifications, or interpretations issued in accordance with the Contract Documents without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in Contract Sum or Contract Time.

☐ **Proposal Request:** Submit an itemized proposal for changes in Contract Sum and/or Time for to the proposed modifications to the Contract Documents described herein. **This is not a Change Order, a Construction Change Directive, or a direction to proceed with the changes to the Work described herein.**

BULLETIN DESCRTIPTION:

Item BX.01: Description

Item BX.02: Description

ATTACHMENTS:

Drawing B1.1 dated November 29, 2017

END BULLETIN NO. XX

MANGINI | ARCHITECTURE INGENUITY
McLAIN BARENG MORRELLI

MANGINI ASSOCIATES INC.
4320 West Mineral King Avenue
Visalia, California 93291

www.mangini.us
(559) 627-0530 *Office*
(559) 627-1926 *Fax*

CHANGE ORDER NO. 01

TO: Contractor Name
Contractor Address
Contractor Address

DATE: February 8, 2017
CO NO.: One
PROJECT NO.: XXXX

PROJECT: Project Name
Owner Name

THE CONTRACT IS CHANGED AS FOLLOWS:

See attached Exhibit "A" for Description of Work

TOTAL THIS CHANGE ORDER: **DEDUCT** **$0.00**

Attachments: None

The Contractor agrees that this resolution constitutes a final accord and satisfaction of the Contractor's rights with respect to this change order.

The original Contract Sum was	$	-
Net change by previous Change Orders	$	-
The Contract Sum prior to this Change Order was	$	-
The Contract Sum will be changed by this Change Order	$	-
The new Contract Sum including this Change Order will be	$	-

The Contract Time will be **unchanged** **ZERO** (0) days.
The Date of Completion as of the date of this Change Order therefore is **Month, Day, Year**

Contractor: _____ Date: _____
Name, President
Company

Architect: _____ Date: _____
Architect
Mangini Associates Inc.

Owner: _____ Date: _____
Name, Superintendent
Owner Name

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CHANGE ORDER NO. 1
PROJECT NAME

EXHIBIT "A"

Description of Work

Item No. 1:	**BL #0:** Description of Work **Reason:**	ADD	$0.00
Item No. 2:	**BL #0:** Description of Work **Reason:**	DEDUCT	$0.00

TOTAL THIS CHANGE ORDER **$0.00**

SECTION 01 2910 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. Related Sections:
1. Section 00 7210: General Conditions related to payment procedures.
2. Section 01 3210: Construction schedules and schedule updates.

1.2 SCHEDULE OF VALUES

A. One week prior to first application for payment, submit proposed Schedule of Values to Architect.
1. Meet with the Architect and determine additional data, if any, required to be submitted.
2. Secure Architect's approval of Schedule of Values prior to submitting first application for payment.
3. Without documentation, the Architect will value the work and spread the costs throughout the project.

B. Construction Schedule Correlation: Schedule of Values line items shall be identical to construction schedule activity items.

C. Activity Dollar Value: Assign a dollar value to each activity which includes overhead and profit.

D. Construction Activity Breakdown:
1. Limit activities to a single floor level.
2. Separate vertical activities from horizontal activities.
3. Separate site work into quadrants.
4. Separate on-site work from off-site work.
5. For plumbing, mechanical, and electrical work, separate activities into underground, rough-in, and finish activities.
6. Separate costs (cabling, devices, installation, programming, testing) for each of the following systems from the other power and lighting electrical costs:
    a. Fire alarm.
    b. Data
    c. Telephone.
    d. Intercom / clock.
    e. Intrusion alarm.
7. For concrete work, separate activities into footings, exterior walks, interior slabs, curbs/mowstrips.

E. Stored Materials: When the Contractor desires to request payment for stored materials (on-site or off-site), such materials shall be identified in the schedule as a material line item. Materials not identified as material line item will not be considered for payment as stored materials and will only be considered for payment when incorporated into the Work.

F. Division 1 Activities: At a minimum, break down Division 1 costs into the following categories:
1. Mobilization.
2. Surveying.
3. Supervision/administration.
4. Bonds and insurance.
5. Temporary facilities and controls.

6. Demobilization.

G. Cost Correlation: Progress in terms of Contractor's applications for payment shall be measured as a percentage and shall be based on an estimate of actual dollar value of work completed and materials stored, versus total dollar value for each activity included in Schedule of Values, less applicable retainage.

1.3 QUALITY ASSURANCE

A. Assure arithmetical accuracy of the sums described.

B. When so requested by the Architect, provide copies of the subcontracts or other data acceptable to the Architect, substantiating the sums described.

1.4 PAYMENT FOR STORED MATERIALS

A. The Contractor is encouraged to order materials early in order to prevent delays. **Delays arising from non-availability of a specified material due to late approval and/or ordering of materials will not be considered as justifying an extension of time or reason for change. Refer to Section 01 6200.**

B. The Architect and Owner will consider payment for materials stored properly in accordance with the General Conditions. Payment for materials stored off-site will require, at a minimum:
1. Storage at a bonded or insured yard or warehouse with the stored materials properly tagged and identifiable for the project;
2. Insurance certificate acceptable to the Owner naming the Owner as additional insured, with the stored items specifically described on the certificate;
3. Verification by the Inspector of Record;
4. Manufacturer's invoices for materials and freight.

1.5 APPLICATIONS FOR PAYMENT

A. **General:** Use AIA Document G702, "Application for Payment" as summary and certification page.

B . **Initial Application for Payment:** Submittal of the following items is a condition precedent to certification and payment of the first application for payment. The Architect may refuse to certify payment, and the Owner shall have the right to refuse to pay any certified amount, if the Contractor has not completed or submitted any or all of the following:
1. Listing of subcontractors and principal suppliers and fabricators.
2. Schedule of Values approved by the Architect.
3. Construction Schedule reviewed by the Architect.
4. Listing of Contractor's staff assignments and principal consultants.
5. Inspector of Record signature on the AIA G702 document.

C. **Progress Payments:** Submittal of the following items is a condition precedent to certification and payment of each progress application for payment. **The Architect may refuse to certify payment, and the Owner shall have the right to refuse to pay any certified amount, if the Contractor has not completed and submitted any or all of the following:**
1. Updated construction schedule as specified in Section 01 3210.
2. Recovery schedule specified in Section 01 3210 when required.
3. Inspector of Record signature on the AIA G702 document.

D. **Final Application for Payment:** Submittal of the following items is a condition precedent to certification and payment of the final application for payment. **The Architect may refuse to certify payment, and the Owner shall have the right to refuse to pay any certified amount, if the Contractor has not completed and submitted**

any or all of the following:

1. Administrative actions and submittals specified in Section 01 7700 as preliminary procedures for Final Acceptance.
2. Inspector of Record signature on the AIA G702 document.

END OF SECTION 01 2910

SECTION 01 3110 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Architect will conduct project meetings throughout the construction period. The Contractor's relations with his subcontractors and materials suppliers and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

B. Related Sections: 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.

1.2 SUBMITTALS

A. Agenda Items: To the maximum extent practicable, advise the Architect at least 48 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes: The Architect will compile minutes of each project meeting, and will furnish one copy to the Contractor and to the Owner. Recipients of copies may make and distribute such other copies as they wish.

1.3 QUALITY ASSURANCE

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.4 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held weekly.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

1.5 MEETING LOCATION

A. The Architect will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

1.6 PRECONSTRUCTION MEETING

A. Preconstruction Meeting will be scheduled to be held within 15 working days after the Owner has issued the Notice to Proceed.
   1. Mandatory attendance by authorized representatives of the Contractor and major subcontractors, including but not limited to:
      a. Earthwork.
      b. Concrete.
      c. Rough carpentry.
      d. Roofing.
      e. Plumbing/mechanical.
      f. Electrical.
      g. Data
   2. The Architect will advise other interested parties, including the Owner, and request their attendance.

B. Minimum Agenda: Data will be distributed and discussed on at least the following items:
   1. Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers, and Architect.
   2. Channels and procedures for communications.
   3. Construction schedule, including sequence of critical work.
   4. Contract Documents, including distribution of required copies of original Documents and revisions.
   5. Processing of Shop Drawings and other data submitted to the Architect for review.
   6. Processing of Requests for Information, Proposal Requests, Change Orders and Payment Requests.
   7. Rules and regulations governing performance of the Work; and
   8. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.

1.7 PROJECT MEETINGS

A. Attendance:
   1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
   2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum Agenda:
   1. Review, revise as necessary, and approve minutes of previous meetings.
   2. Review progress of the Work since last meeting, including status of submittals for approval.
   3. Identify problems which impede planned progress.
   4. Develop corrective measures and procedures to regain planned schedule.
   5. Complete other current business.
   6. Verify that Record Drawings are current and accurate.

C. Revisions to Minutes:
   1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
   2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
   3. Challenge to minutes shall be settled as priority portions of "old business" at the next regularly scheduled meeting.

END OF SECTION 01 3110

SECTION 01 3210 - CONSTRUCTION PROGRESS SCHEDULES (Bar Chart)

PART 1 - GENERAL

1.1 SUMMARY

A. Prepare and maintain construction schedules as specified in this Section.

B. 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. Section 00 3110: Preliminary Schedules.
2. Section 01 1110: Work sequences and constraints, Owner occupancy, and Owner furnished items.
3. Section 01 2910: Schedule of values and payments.
4. Section 01 3300: Requirements for shop drawings, product data, and samples.
5. Section 01 7700: Project completion and closeout requirements.

1.2 SUBMITTALS

A. Schedule Development Submittals: Submit 3 color copies of schedule diagram with each submittal.

B. Schedule Updates: Submit 3 color copies of schedule diagram with each with each application for payment.

1.3 SCHEDULE DEVELOPMENT AND UPDATES:

A. Schedule: Submit schedule within 30 calendar days after date of Owner's Notice of Award and prior to first application for payment. Architect may refuse to certify application for payment if a construction schedule has not been submitted.

B. Schedule Updates:
1. Update schedule monthly as part of the application for payment specified in Section 01 2910.
   a. Record actual start and finish dates.
   b. Graphically indicate progress of each active activity and remaining duration.
2. In addition to updates required for applications for payment, provide a complete schedule submittal whenever the Contractor's planned sequence of construction is changed, when approved change orders impact critical path activities, or when time extension is approved by change order.

1.4 RESPONSIBILITY FOR THE SCHEDULE

A. Responsibility for construction planning and the effective and efficient implementation of such to meet the Contract Completion Date and any required milestones are the sole responsibility of the Contractor.

B. Review of the schedule and subsequent revisions by the Owner or the Architect shall be limited to review for compliance with the requirements of the Contract Documents; review shall not imply agreement of the Owner or Architect to the Contractor's planned procedures, coordination, scheduling, etc., as being appropriate or reasonable. Comments offered by the Owner or Architect relating to schedule logic or sequence which are the Contractor's responsibility are offered as a courtesy and are not conditions of acceptance.

C. Non-Waiver:
1. If the accepted schedule and subsequent revisions do not include contractually required constraints, review and/or acceptance of the schedule and subsequent revisions by the Owner or the Architect shall not waive such requirements.

2. Review of the schedule and subsequent revisions by the Owner or the Architect shall not constitute a waiver of any contract requirement.
3. Contract requirements shall take precedence in the event of conflicts between the accepted schedule and contract requirements.

1.5 CONTRACT MODIFICATIONS

A. When a contract modification is required, submit proposed schedule revisions reflecting the proposed change impact.

B. Time Impact Analysis: Time impact analysis shall be provided as support of a time extension request, claim or request for equitable adjustment by the Contractor.
1. Submit a time impact analysis illustrating the influence of each change or delay on the Contract Completion Date or milestones. The current monthly updated schedule accepted by the Architect shall be used to display the impacts of the change. No other non-approved modifications shall be incorporated into the schedule being used to justify the change impact.
2. Each time impact analysis shall include a fragmentary network demonstrating how the Contractor proposes to incorporate the impact into the schedule. The fragmentary network shall identify the predecessors to the new activities and demonstrate the impact to successor activities.
3. Include a narrative report describing the effects of new activities and relationships to interim and Contract Completion Dates.
4. Include written certification signed by the major subcontractors that they have reviewed and accepted proposed schedule revisions.

C. Determination of contract time extension shall be based on the schedule updates in effect for the time period in question, and other factual information. Actual delays found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be cause for time extension to the Contract Completion Date.

1.6 TIME EXTENSIONS

A. Extension of time for performance will be granted only to the extent that a delay occurs which impacts activities currently on the critical path, consumes all available float, and extends completion of the Work beyond the current Contract Completion Date.

B. The Contractor acknowledges and agrees that delays in activities which, according to the schedule, does not in fact actually affect any milestone completion or the Contract Completion Date shown on the schedule at the time of delay, will not be a basis for a time extension.

1.7 SCHEDULE RECOVERY

A. The Contractor shall take action to put the Project back on schedule, at no additional cost to the Owner, when it becomes apparent from the current schedule that, through no fault of the Owner:
1. The critical path becomes more than 5% behind the time remaining for completion of the Work.
2. Any milestone required by the Contract Documents may not be met.
3. Any schedule update reveals that the Work will complete later than the Contract Completion Date.

B. Action by the Contractor to put the Work back on schedule may include any or all of the following:
1. Increase construction manpower;
2. Increase the number of working hours per shift, shifts per working day, working days per week, or the amount of construction equipment, or any combination of the foregoing;
3. Reschedule activities to achieve maximum practical concurrency of activities;
4. Expedite delivery of materials.

C. Notify the Architect of the specific measures taken or planned to increase the rate of progress together with an estimate of when scheduled progress will be regained and submit planned revisions to construction schedule prior to implementation of such measures and schedule revisions.

1.8 VOLUNTARY ACCELERATION

A. Early completion or voluntary acceleration of the schedule by the Contractor is acceptable provided that:
   1. The Owner is agreeable to such acceleration and so notifies the Contractor in writing;
   2. At the time of submission of the Preliminary Construction Schedule, such acceleration is clearly indicated and the Owner is notified of actions on the Owner's part necessary to accommodate the change or acceleration;
   3. The Owner is compensated for any inconvenience or expense associated with such acceleration;
   4. The time between early completion date and the Contract Completion date is identified as a schedule activity as “Project Float Time.” Such “Project Float Time” within the construction schedule is not for the exclusive use or benefit of either the Owner or the Contractor but is a jointly owned, expiring project resource available to both parties as needed to meet contract milestones and the Contract Completion Date.

B. The Owner may require various changes in the Work. Pursuant to the voluntary acceleration and float sharing provisions of this Section, no time extensions will be granted nor delay damages paid until a delay occurs that impacts activities currently on the critical path, consumes all available float, and extends completion of the Work beyond the current Contract Completion Date.

1.9 PROJECT SCHEDULE

A. Contract Time: As established by the Agreement Between the Owner and Contractor and amended by change order.

B. Progress of the Work:
   1. Time is of the essence in the performance of this Contract.
   2. Schedule the Work in such a manner as to provide for timely completion.
   3. Begin schedule with the Notice to Proceed and conclude with the late-finish date of the critical path on the Contract Completion Date which shall be the date of Notice of Completion.

C. Plan of the Work: The schedule shall reflect Contractor’s actual plan for prosecution of the Work.

D. DSA Oversight Process: In connection with the DSA Construction Oversight Process, which includes the use of inspection cards and review of changes to the DSA-approved construction documents, the Contractor must (a) include specific tasks in its baseline schedule to take into account these procedures since they are critical path issues; and (b) include a reasonable amount of float in the baseline schedule to accommodate the additional time required by these DSA procedures.

E. Detail: Time scale network diagram in calendar days and prepare at level of detail and logic which will schedule as separate activities all salient features of the Work. At a minimum, include:
   1. Project mobilization.
   2. Schedule preparation and updates.
   3. Submittal and shop drawing preparation.
   4. Review and DSA approval of deferred approvals.
   5. Review of submittals and shop drawings for critical materials and equipment.
   6. Procurement, fabrication, delivery, and installation of major equipment and critical materials.
   7. Testing and inspection.

8. Significant activities of the work of each trade.
    a. Separate plumbing, mechanical, and electrical into underground, rough-in, and finish activities.
    b. Separate concrete work activities into footings, exterior walks, interior slabs, curbs/mowstrips.
9. Separate the following systems from other power and lighting electrical activities:
    a. Fire alarm system.
    b. Data, telephone, intercom / clock, intrusion alarm, audio visual systems.
10 Power shut-downs.
11. All milestone dates.
12. Testing of concrete floor slabs for moisture and pH.
13. Remediation of concrete floor slabs due to unsatisfactory moisture or pH conditions.
14. Final clean-up.
15. Start-up and testing.
16. Commissioning.
17. Correction list work.
18. Building flush out (100% outside air for 14 days).
19. Demobilization.
20. Closeout documentation.

F. Provide for schedule, logic, and operating constraints of the Work as specified in Section 01 1100.

1.10 BAR CHART SCHEDULE

A. Prepare a bar chart graphically showing the order of all activities necessary to complete the Work, and the sequence in which each activity is to be accomplished, as planned by the Contractor. Indicate a separate time bar for each activity.

B. Format:
1. Sequence of Listings: The Table of Contents of this Project Manual.
2. Coordination of Listings: Correspond each schedule activity to a line item listed in the Schedule of Values. Refer to Section 01 2910.
3. Time Scale: Provide a continuous line to identify the first working day of each week.

C. Identify work of each separate stage and other logically grouped activities. In the case of multiple buildings on 1 site, separate the significant elements of the work of each trade for each building as a sub-schedule. Graphically group activities of separate stages and buildings, **do not use a random (or scattered) format.**

1.11 SCHEDULE ACTIVITIES

A. **Schedule Activities:**
1. 30 day maximum duration.
2. Limit activities to a single floor level.
3. Separate vertical activities from horizontal activities.
4. Separate site work into quadrants.
5. Separate on-site work from off-site work.

B. **Activity Information:** Indicate the following information for each activity on network diagram:
1. Activity description.
2. Activity number corresponding to the CSI section numbers listed in the Table of Contents.
3. Duration.
4. Start and completion dates.
5. Status indicator (started or complete).

C. Milestone Activities: Indicate date on the diagram for each of the following milestone activities:
   1. Start project: Start schedule no earlier than the contract award date and the project duration shall start on the Notice to Proceed date.
   2. Early completion: If the Contractor's schedule shows completion of the project prior to the Contract Completion Date, the Contractor shall include an activity named "contractor early completion".
   3. End project: Include as the last activity an activity named "end project" finish date equal to the Contract Completion Date.

END SECTION 01 3210

SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Make submittals required by the Contract Documents, and revise and resubmit as necessary to establish compliance with the specified requirements, all as described in this Section.
   1. The section includes requirements for building systems described as Deferred Approval Items on the drawings or in the specifications.

B. Related Sections:
   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.
   2. Other requirements for submittals may be described in pertinent Sections of these Specifications.
   3. Section 01 3560: High Performance Criteria Summary.

C. Work not Included:
   1. Submittals not required by the Contract Documents will not be reviewed by the Architect.
   2. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Architect unless specifically called for within the Contract Documents.

1.2 SUBMITTALS

A. Make submittals of Shop Drawings, Samples, substitution requests, and other items in accordance with the provisions of this Section.

B. Substitutions shall comply with the procedures for substitutions specified in Section 01 2500.

C. High Performance Criteria: Submit in accordance with Section 01 3560 - High Performance Criteria Summary under Submittals.

1.3 QUALITY ASSURANCE

A. Coordination of Submittals:
   1. Prior to each submittal to the Architect, the **General Contractor shall** carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
   3. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.

B. Accuracy of Submittals:
   1. By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements, and field construction criteria relate thereto, or will so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

   2. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract

Documents by the Architect's review or approval of Shop Drawings, Product Data, Samples, or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal requesting a substitution and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Architect's review thereof.

1.4 USE OF ARCHITECT'S CAD DRAWINGS

A. General:
1. Electronic CAD files of the Contract Drawings may be provided for Contractor's convenience and use in preparing submittals, subject to the requirements of this Section.
2. All requests by subcontractors for CAD drawings shall be transmitted through the Contractor and CAD files released by the Architect shall only be released to the Contractor.

B. Requirements for Release of Architect's Electronic CAD Files:
1. Release of CAD files is subject to Contractor's acceptance of Architect's "Waiver of Liability for Electronic CAD Files", a copy of which is attached at the end of this section.
2. Receipt of executed liability waiver agreement is a condition precedent to releasing architectural CAD files.

C. Requirements for Release of Civil Engineer's Electronic CAD Files:
1. Cost of Civil Engineer's preparation of civil CAD files shall be borne by the Contractor and is in addition to the Contract Sum.
2. Release of civil CAD files is subject to Contractor's acceptance of Civil Engineer's "Waiver of Liability for Electronic CAD Files". Contact the Civil Engineer to obtain the waiver form.
3. Receipt of executed liability waiver agreement is a condition precedent to releasing civil CAD files.

D. The Contractor assumes all liability and risk for use of electronic CAD files. Architectural / engineering drawings are essentially diagrammatic in terms of graphics and are not intended to provide scalable dimensional accuracy. Electronic CAD files are an incomplete representation of the Contract Documents which may not include addendum information or hand drawn additions or modifications. In the event of a conflict between the signed and approved Construction Documents and the electronic CAD files, the signed and approved Construction Documents shall govern.

E. The transfer of CAD files to the Contractor is for the Contractor's convenience only, and does not in any way release the Contractor from the requirement to produce its own shop drawings by the normal method of preparing plans and details by drafting. Delays in the release of CAD files shall not relieve the Contractor of preparing submittals in a timely fashion and such delays shall not provide a basis for claims of delay and damages.

PART 2 - PRODUCTS

2.1 TYPES OF SUBMITTALS

A. Shop Drawings:
1. Scale and Measurements: Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.
2. Types of Prints Required: Submit Shop Drawings in the form of blackline prints of each sheet.
3. Review comments of the Architect will be shown on the sepia transparency when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purposes.

B. Manufacturer's Literature:
1. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal,

clearly show and highlight the portion of the contents being submitted for review.
2. Submit seven copies of each item.

C. Samples:
1. Provide Sample or Samples identical to the precise article proposed to be provided. Identify as described under "Identification of Submittals" below.
2. Provide three samples; one to be retained by the Architect, one to be returned to the Contractor, and one to be retained by the Inspector of Record.

D. Colors and Patterns: Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.

2.2 ELECTRONIC SUBMITTALS

A. Electronic submittal are acceptable in lieu of hard copies providing the following requirements are met:
1. Submittal shall be in PDF format, with book marks for table of contents and each tab, and sub-bookmarks for each item.
2. All text shall be searchable, except text that is part of a graphic.
3. Submittal shall include all items required by the Contract Documents, except a binder is not required.
4. Electronic submittals shall be processed through normal channels. Do not submit directly to the Architect's consultants.
5. Contractor shall provide Owner and Inspector with hard copies of the final Submittal. Coordinate exact number required with the Architect.
6. One hard copy of any submittal may be required upon the Architect’s request for use during review.

B. Electronic submittals which do not comply with the above requirements will be rejected.

PART 3 - EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

A. Consecutively number all submittals.
1. When material is submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
2. On resubmittals, cite the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

3.2 GROUPING OF SUBMITTALS

A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
1. Partial submittals may be rejected as not complying with the provisions of the Contract.
2. The Contractor may be held liable for delays so occasioned.

3.3 TIMING AND REVIEW OF SUBMITTALS

A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

B. In scheduling, allow at least 30 calendar days for review by the Architect following the Architect's receipt of the submittal, unless mutually agreed otherwise in writing by the Architect and the Contractor.

C. Resubmittal Costs: The Architect and the Architect's consultants will review the original submittal only as part of their services to the Owner. If the time expended in resubmittal reviews exceeds normal resubmittal review time, the costs of resubmittal reviews by the Architect or the Architect's consultants will be paid to the Architect by the Owner as additional services on an hourly basis.
   1. The Architect will bill the Owner for the additional services required by the Architect and/or the Architect's consultants for such resubmittal reviews, time expended, and reimbursable expenses incurred, and the Owner shall be reimbursed by deducting the same amount from the Contractor's subsequent Application for Payment.

3.4 REQUIRED SUBMITTALS

A. Provide Submittals as required by each Specification Section.

END OF SECTION 01 3300

WAIVER OF LIABILITY FOR ELECTRONIC CAD FILES

Electronic CAD files for [Project Name and Location], have been requested by CONTRACTOR. These files are being provided, subject to the following terms and conditions, pursuant to the acceptance and execution of this agreement. For the purposes of this agreement the term ARCHITECT shall mean the Architect and all of its Consultants.

Electronic files provided are compatible with AutoCAD. ARCHITECT makes no representation as to the compatibility of these files with CONTRACTOR'S hardware or software. Due to the potential that the information presented on the electronic files can be modified, unintentionally or otherwise, ARCHITECT has the right to remove all indicia of ownership and or all involvement from electronic display.

Data contained on these electronic files are part of ARCHITECT'S instruments of service which are copyrighted and proprietary in nature and shall not be used by CONTRACTOR or any other entity receiving this data through or from CONTRACTOR for any purpose other than as a convenience in the preparation of shop drawings and field engineering for the referenced project. The CONTRACTOR agrees that the use of digital information provided by the ARCHITECT for any purpose or activity that constitutes the practice of Land Surveying and/or Civil Engineering, as defined by the California Business and Professions Code, will be by or under the direct supervision of a Land Surveyor or Civil Engineer licensed to practice in the State of California. Such practices include, but are not limited to creating a GPS model for earthwork. Any use or reuse by CONTRACTOR or by others will be at CONTRACTOR'S sole risk and without liability or legal exposure to ARCHITECT.

The transfer of electronic files to CONTRACTOR is for the CONTRACTOR'S convenience only, and does not in any way relieve CONTRACTOR from the requirement to produce shop drawings by the normal method of preparing plans and details by drafting. Delays in release of CAD files shall not relieve CONTRACTOR of responsibility for preparing shop drawings or providing field engineering in a timely fashion and such delays shall not provide a basis for claims of delay and damages.

The CONTRACTOR agrees to reciprocate with the ARCHITECT, upon request, relative to drawing files produced by it or its subcontractors for the subject project, under the same conditions as we have received digital files from the ARCHITECT.

The CONTRACTOR assumes all liability and risk for use of architectural / engineering electronic CAD files and agrees these electronic files are not construction documents and that differences may exist between these electronic files and corresponding hard copy construction documents. Electronic CAD files are an incomplete representation of the Contract Documents which may not include addendum information or hand drawn additions or modifications. In the event a conflict arises, signed and sealed hard copy construction documents will govern. By using these electronic files the CONTRACTOR is in no way relieved of its duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate work with that of other CONTRACTORS on the project.

CONTRACTOR recognizes the instability of electronic storage media and that the transfer of electronic data may not be total or accurate, because of equipment and/or software incompatibility, or changes that may be made by CONTRACTOR and/or other entities receiving this data through or from CONTRACTOR during the editing of the information provided.

CONTRACTOR agrees to make no claim, and hereby waives, to the fullest extent permitted by law, any claim or cause of action against ARCHITECT, ARCHITECT'S officers, directors, employees, agents, or consultants that may arise out of or in connection with CONTRACTOR'S use of the electronic files. CONTRACTOR agrees to the fullest extent permitted by law, to indemnify and hold ARCHITECT and OWNER harmless from any damage, liability, or cost, including reasonable attorneys' fees and costs of defense, arising from any reuse or modification of the plans and specifications by CONTRACTOR or any person or entity which acquires or obtains the plans and specifications. In no event shall ARCHITECT or OWNER be liable for any loss of profit or any damages. It is understood that CONTRACTOR shall be solely responsible for verification of conditions and coordination of their work into the work product.

Under no circumstances shall delivery of the electronic files to CONTRACTOR be deemed a sale by ARCHITECT, and ARCHITECT makes no warranties, either express or implied, of merchantability and fitness for any particular purpose.

_____	_____
CONTRACTOR Name	Printed Name and Title
_____	_____
CONTRACTOR Address	Authorized Signature
_____	_____
	Date

List drawing sheets requested below or attach separate list:

_____

_____

SECTION 01 4320 - DSA CONSTRUCTION OVERSIGHT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes the oversight provided by the Division of the State Owner (DSA) for projects under its jurisdiction.

B. Related Sections: 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. Section 01 2600: Contract modification procedures and forms.
2. Section 01 4520: Testing and inspection services.

1.2 DEFINITIONS

A. The following definitions apply to terms used in this Section:
1. DSA Approved Construction Documents: Portions of plans, specifications, addenda, deferred submittals, revisions, and construction change documents (CCDs) duly approved by DSA that contain information related to, and affecting Structural Safety, Fire/Life Safety, and Accessibility. While all portions of the construction documents may contain a DSA identification stamp, this stamp is not the approval. The DSA approval is indicated by a letter to the District. This letter clarifies that the approval is limited to Structural Safety, Fire/Life Safety and Accessibility.

1.3 DSA PROCEDURES, INTERPRETATION OF REGULATIONS, AND FORMS

A. The requirements of the following DSA procedural documents shall apply to this Section:
1. DSA Procedure PR 13-01: Construction Oversight Process.

B. The requirements of the following DSA Interpretation of Regulations documents shall apply to this Section:
1. DSA IR A-8: Project Inspector and Assistant Inspector Duties and Performance.
2. DSA IR A-13: Stop Work and Order to Comply.

C. The Project Inspector, assistant inspectors, Laboratory of Record, Architect, other design professionals, and the Owner shall communicate project information and make certain reports pertaining to the status of construction compliance using the following DSA forms:
1. DSA 1 Application for Approval of Plans and Specifications
2. DSA 5 Project/Special Inspector Qualification Record
3. DSA 6-AE Architect/Engineer Verified Report
4. DSA 6-C Contractor Verified Report
5. DSA 6-PI Project Inspector Verified Report
6. DSA 102-IC Construction Start Notice/Inspection Card Request
7. DSA 103 Statement of Structural Tests and Special Inspections
8. DSA 130 Certificate of Compliance - Approved Bleacher/Grandstand Fabricator
9. DSA 140 Application for Approval of Construction Change Document.
10. DSA 151 Project Inspector Notifications
11. DSA 152 Project Inspector Card
12. DSA 154 Notice of Deviations/Resolution of Deviations
13. DSA 155 Project Inspector Semi-Monthly Report
14. DSA 156 Commencement/Completion of Work Notification
15. DSA 291 Laboratory of Record Verified Report

16. DSA 292 Special Inspectors Employed Directly by the District Verified Report
17. DSA 293 Geotechnical Verified Report

1.4 QUALITY ASSURANCE

A. Project Inspector: The Owner shall employ a DSA approved Project Inspector in accordance with the requirements of the California Code of Regulations, Title 24. The Inspector's duties are specifically defined in Title 24, Part 1, Section 4-342.
   1. The work of construction in all stages of progress shall be subject to the personal continuous inspection of the Inspector.
   2. The Inspector shall have free access to any or all parts of the work at any time.
   3. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep the Inspector fully informed respecting the progress and manner of the work and character of the materials.
   4. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

B. DSA Construction Oversight: California Code of Regulations (CCR), Title 24, Part 1, Chapter 4, Article 1 (Sections 4-201 through 4-222) and Group 1, Articles 5 and 6 (Sections 4-330 through 4-344) provide regulations governing the construction process for projects under the jurisdiction of DSA.
   1. Observation of Construction by DSA: The DSA District Engineer conducts occasional site walks to make observations as necessary to ascertain that inspections have been completed diligently. During the site visit, the DSA District Engineer may provide guidance to the Project Inspector, as needed, to ensure enforcement of construction documents.
   2. DSA Field Trip Notes: At the conclusion of the site visit, the DSA Field Engineer issues a Field Trip Note (form DSA 135 or comparable) to the Project Inspector, who shall distribute the field trip note to the school Owner and the responsible design professional.
      a. The field trip note indicates any findings by the Field Engineer that require action by the Project Inspector and/or the Architect and other responsible design professionals to ensure project compliance with Field Act requirements.
      b. The field trip note may include informational comments, including construction status and guidance given to the Project Inspector.
      c. The field trip note becomes a part of the DSA project records.

C. Testing and Special Inspection: Testing required for the project is specified in Section 01 4520 - Testing and Special Inspection Services.
   1. Form DSA-103 is attached to Section 01 4520.
   2. Testing may be required by other Sections that is not specifically noted on Form DSA -103.

1.5 PROJECT INSPECTOR

A. General: The Project Inspector shall perform specific duties in accordance with Title 24, Part 1 (Sections 4-333 and 4-342).
   1. The Project Inspector acts under the direction of the Architect and is subject to supervision by DSA.
   2. The Project Inspector does not have the authority, under Title 24, to direct the Contractor in the execution of the work, nor to stop the work of construction.

B. Code Prescribed Duties:
   1. Maintain Job File: The Inspector shall maintain Project records.
   2. Comprehend of the Construction Documents: The Project Inspector shall study and fully comprehend the requirements of the construction documents in order to provide competent inspection of the work. The Inspector shall:
      a. Consult Architect and other responsible design professionals to resolve uncertainties in the Inspector's comprehension of the plans and specifications prior to construction of that portion of

the work.
   b. Review requirements for each phase of the construction with the Contractor prior to commencing that phase of the work.
   c. Readily identify non-compliant work as the construction progresses to facilitate prompt corrective action.
   d. Verify code-compliant implementation of the materials testing and special inspection program.
   e. Be involved in the Contractor's interpretation of the construction documents in accordance with Title 24, Part 1, Section 4-343.
3. Continuous Inspection of the Work:
   a. Provide complete and timely inspection of every part of the work.
   b. Provide prompt verbal notification to the Contractor of any deviation so that the deviation can be immediately corrected.
   c. The Project Inspector shall have personal knowledge of the construction, obtained through the Project Inspector's own physical inspection of the work in all stages of its progress.
4. Maintain Records of Inspections: The Inspector shall maintain detailed records of all inspections.
5. Communications Required of the Inspector: The Inspector shall during the course of construction, provide specific code-prescribed notices and reports to the Architect, other responsible design professionals, DSA, the Owner, and the Contractor.
6. Inspector's Monitoring of the Materials Testing and Special Inspection Program: The Inspector is responsible, under the direction of the Architect, for monitoring the work of the laboratory of record (LOR) any Special Inspectors hired directly by the Owner to ensure that all materials testing and special inspections required for the project are satisfactorily completed in accordance with the DSA approved documents. The Project Inspector shall monitor the following aspects of the structural testing and special inspection program:
   a. When DSA approval for special inspectors is required for Owner-employed special inspectors, the Project Inspector shall identify and report any special inspectors on the job site that are not DSA approved.
   b. The Project Inspector shall verify that the Laboratory of Record (LOR) is included on the List of DSA Accepted Testing Laboratories on the DSA website.
   c. The Project Inspector shall verify that the LOR and special inspectors have received sufficient advance notification to perform the required material sampling or special inspection.
   d. The Project Inspector is responsible for verifying that all required material sampling and special inspections have been performed. The Project Inspector is also responsible to observe any special Inspector's on-site presence, performance of duties, the special inspector's documentation of complying and non-complying work, and issuance of deviation notices.
   e. The Project Inspector shall report on DSA 155 the status and resolution of deviations reported by any LOR or special inspector.
7. Monitoring of Assistant Inspectors: The Project Inspector shall provide technical guidance to assistant Inspectors and shall verify the assistant inspectors' comprehension of the construction documents.
   a. The Project Inspector shall also monitor the assistant Inspectors' performance, verifying that the assistant inspectors are properly checking the construction, recording inspections, and performing other assigned duties.
   b. The Project Inspector shall ensure that any assistant inspector is performing the duties indicated on the assistant Inspector's approved form DSA 5-AI.
   c. The Project Inspector shall provide continuous on-site supervision of all assistant Inspectors.

C. Prohibited Duties: The Project Inspector is prohibited from performing functions associated with actual construction work such as:
1. Performing construction work.
2. Ordering or purchasing materials.
3. Directing the work of the Contractor, Sub-Contractors, volunteer labor, or any entity performing construction work.
4. Coordinating or scheduling the construction work.

5. Performing "quality control" of construction.
    a. Quality control is the responsibility of the Contractor.
    b. Quality assurance is the responsibility of the Project Inspector.

D. Ancillary Duties: The Project Inspector may perform duties for the Owner that are not code-prescribed as long as such duties do not interfere with inspection duties.
1. It is the Inspector's responsibility to report all ancillary duties to DSA, the Architect, and the structural engineer.
2. The Inspector shall also report unforeseen time demands that are impacting, or will impact, his or her ability to perform code-prescribed duties.
3. DSA may approve a Project Inspector when (in the opinion of DSA) these ancillary duties would not create a conflict of interest. DSA may withhold approval of a Project Inspector or withdraw approval at any time if the appearance of a conflict of interest arises.

1.6 DSA CONSTRUCTION OVERSIGHT PROCESS

A. Project Inspection Card (Form DSA 152): DSA will issue Project Inspection Cards for each project.
1. The number of inspection cards issued varies by project types. In general, one inspection card is required for each separate building and one for the site work, which includes non-building site structures.
2. The project inspection cards are issued electronically by upload to DSA Box.

B. Use of Project Inspection Card:
1. The Project Inspection Card is considered to be an interim verified report by the project inspector.
2. The Project Inspector signs off the applicable blocks and sections on the form as the work progresses. When signing off the blocks and sections of the form, the Project Inspector is verifying that:
    a. Identified areas are determined to be in compliance with the DSA approved construction documents,
    b. Required testing and inspections are complete, and
    c. Required documentation has been received by the Project Inspector.

C. Project Posting of Forms DSA 152: The Project Inspector shall post the forms in his Job File and shall electronically upload the forms to DSA Box.
1. The information in the forms shall always be current. Each time the form is updated, a new electronic posting is required such that the electronically posted form is always kept current.
2. The Project Inspector shall:
    a. Immediately, upon request, make the form available for review by any parties involved in the construction.
    b. Include a current copy of the forms any time a Verified Report (form DSA 6-PI) is submitted.
    c. Upon request, provide a current copy of the forms to DSA, the Owner, or the Architect.

D. Duties of the Inspector of Record: The Inspector shall provide notifications to DSA, Inspector's Semi-monthly Reports, deviation notices, record of communications to the Architect and other responsible design professionals, report the following communications during the course of a construction project which include:
a. Notifications to DSA: Start of work, minimum 48 hours prior to completion of foundation trenches, minimum 48 hours prior to first concrete placement, and when work is suspended for more than one month.
b. Semi-monthly Reports: Make semi-monthly reports (on the 1st and 16th of every month) on the progress of construction, on the form DSA 155 and submitted to the Architect and structural engineer, with a copy sent to DSA and the Owner.
c. Deviation Notices: When the Inspector identifies deviations from the DSA approved plans and specifications, the Inspector shall verbally notify the Contractor. If the deviation is not immediately corrected, the Inspector shall promptly issue a written notice of deviation on form DSA 154 to the Contractor, with a copy sent to the Architect and DSA. The status and resolution of all deviations shall be

documented on semi-monthly reports.

d. Record of Communications to the Architect and other Responsible Design Professionals: All uncertainties in the Inspector's or Contractor's comprehension of the documents shall be reported in writing to the Architect and other responsible design professionals.
e. Reporting for Projects with Work Stoppage: This may be required in cases where DSA issues a Stop Work Order, Order to Comply or a request for Owner to stop work.
f. Verified Reports: Submit verified reports on form DSA 6-PI directly to DSA, with copies to the Architect, other responsible design professionals, and the Owner upon any of the following:
    1) Work on the project is suspended for a period of more than one-month.
    2) The services of the Inspector are terminated for any reason prior to completion of the project and such termination is not a result of work stoppage.
    3) DSA requests a verified report.
    4) At the time of occupancy of any building involved in a project prior to completion of the entire DSA approved scope of work.
    5) The entire project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the Owner can occupy or utilize the project for its intended use, as determined by the Owner and the Architect.

D. Duties of the Laboratory of Record:
1. Meet with the project inspector, design professionals, and the Contractor as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
2. Obtain a copy of the DSA approved construction documents from the Architect prior to the commencement of construction.
3. Obtain a copy of the DSA approved Statement of Structural Tests and Special Inspections (form DSA 103) from the Architect prior to the commencement of construction.
4. Report all project related activities to the project inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and Special Inspectors to ensure the testing and special inspection program is satisfactorily completed.
5. Provide material testing as identified in the DSA approved construction documents.
6. Submit test reports to the project inspector on the day the tests were performed for any tests performed on-site.
7. Submit material test reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the material tests were performed to DSA, the Architect, structural engineer, project inspector and the Owner.
8. Immediately submit reports of material tests not conforming to the requirements of the DSA approved construction documents to DSA, the Architect, structural engineer, project inspector and the Owner.
9. The Engineering Manager shall submit an interim Laboratory of Record Verified Report (form DSA 291) and the Geotechnical Engineer shall submit an interim Geotechnical Verified Report (form DSA 293) to DSA, the project inspector, Owner and the Architect upon any of the following events occurring:
    a. Within 14 days of the completion of the material testing/special inspection program.
    b. Work on the project is suspended for a period of more than one month.
    c. The services of the Laboratory of Record are terminated for any reason prior to completion of the project.
    d. DSA requests a verified report.
    e. The Engineering Manager shall submit an interim verified report (form DSA 291) and the Geotechnical Engineer shall submit form DSA 293 to DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152, prior to the Project Inspector signing off that section of the project inspection card, if that section required material testing.

E. Duties of Special Inspectors Employed by the Laboratory of Record:
   1. Meet with the Project Inspector, Architect, and the Contractor as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
   2. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
   3. Perform work under the supervision of the Engineering Manager for the Laboratory of Record.
   4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
   5. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
   6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents to DSA, the Architect, structural engineer, Project Inspector and the Owner.
   7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed to DSA, the Architect, structural engineer, Project Inspector and the Owner.
   8. The Engineering Manager for the Laboratory of Record shall submit verified report form DSA 291 to DSA, the Project Inspector, the Owner and the Architect.
   9. The reports are required to be submitted upon any of the following events occurring:
      a. Within 14 days of the completion of the special inspection work.
      b. Work on the project is suspended for a period of more than one month.
      c. The services of the special inspector are terminated for any reason prior to completion of the project.
      d. DSA requests a verified report.
      e. The Engineering Manager for the Laboratory of Record shall submit an interim verified report to DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152, prior to the signing off that section of the project inspection card, if that section required special inspections.

F. Duties of Special Inspectors Not Employed by the Laboratory of Record:
   1. Meet with the Project Inspector, Laboratory of Record, the design professionals, and the Contractors as needed to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
   2. Report all project related activities to the Project Inspector. The Project Inspector is responsible for monitoring the work of the Laboratory of Record and special inspectors to ensure the testing and special inspection program is satisfactorily completed.
   3. Perform work under the direction of the Architect, as defined in Section 4-335(f)1.B of the 2019 California Administrative Code (Title 24, Part 1).
   4. Perform inspections in conformance with the DSA approved construction documents, applicable codes and code reference standards.
   5. Prepare detailed daily inspection reports outlining the work inspected and provide the Project Inspector a copy of the reports on the same day the inspections were performed.
   6. Immediately submit reports of materials or work not conforming to the requirements of the DSA approved construction documents to DSA, the Architect, structural engineer, Project Inspector and the Owner.
   7. Submit daily special inspection reports in a timely manner such that construction is not delayed and not to exceed 14 days from the date the special inspections were performed to submitted to DSA, the Architect, structural engineer, Project Inspector and the Owner.
   8. Submit Special Inspection Verified Report forms DSA 292 to DSA, the project inspector, the Owner and the Architect upon any of the following events occurring:
      a. Within 14 days of the completion of the special inspection work.

b. Work on the project is suspended for a period of more than one month.
c. The services of the special inspector are terminated for any reason prior to completion of the project.
d. DSA requests a verified report.
e. Submit an interim Special Inspection Verified Report (form DSA 292) to DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152, prior to the Project Inspector signing off that section of the project inspection card, if that section required special inspections.

G. Duties of the Architect:
1. Responsible to the Owner and to DSA to see that the completed work conforms in every material respect to the DSA approved construction documents.
2. Ensure the Project Inspector is approved by DSA for the project by submitting form DSA 5 PI to and obtaining approval from DSA prior to the start of construction, and prior to requesting issuance of form DSA 152.
3. Provide a copy of the DSA approved construction documents to the project inspector and Laboratory of Record prior to the commencement of construction.
4. Provide a copy of the DSA approved Statement of Structural Tests and Special Inspections (form DSA 103) to the Project Inspector and Laboratory of Record prior to the commencement of construction.
5. Provide general direction of the work of the Project Inspector.
6. Issue specific instructions to the testing facility and the special inspectors prior to start of construction.
7. Direct and monitor the work of special inspectors who are not provided by the Laboratory of Record, as defined in Section 4-335(f)1B of the 2019 California Administrative Code (Title 24, Part 1).
8. Notify DSA as to the disposition of materials noted on laboratory testing, and/or special inspection reports as not conforming to the DSA approved construction documents.
9. Respond to DSA Field Trip Notes (form DSA 135 or comparable) as necessary.
10. Provide observation of the construction and maintain such personal contact with the project as is necessary to assure themselves of compliance, in every material respect, with the DSA approved construction documents.
11. Submit Architect Verified Reports (form DSA 6-AE) to DSA and to the Project Inspector upon any of the following events occurring:
    a. The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the Owner can occupy or utilize the project.
    b. Work on the project is suspended for a period of more than one month.
    c. The services of the Architect or engineer are terminated for any reason prior to completion of the project.
    d. DSA requests a verified report.
    e. The Architect or engineer shall submit an interim Architect Verified Report (form DSA 6-AE) to DSA and a copy to the Project Inspector for each of the applicable sections of the form DSA 152 prior to the Project Inspector signing off that section of the project inspection card.

H. Duties of the Other Responsible Design Professionals:
1. Responsible to the school board and to DSA to see that the completed work for which they are delegated responsibility conforms in every material respect to the DSA approved construction documents.
2. Provide observation of the construction and maintain such personal contact with the project as is necessary to assure themselves of compliance, in every material respect, with the DSA approved construction documents.
3. Submit an Architect/Engineer Verified Report (form DSA 6-AE) to the Architect, who in turn will submit to DSA and the project inspector, upon any of the following events occurring:
    a. The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the Owner can occupy or utilize the project.

b. Work on the project is suspended for a period of more than one month.
c. The services of the Architect or engineer are terminated for any reason prior to completion of the project.
d. DSA requests a verified report.
e. The Architect shall submit to DSA and the Project Inspector an Interim Architect/Engineer Verified Report (form DSA 6-AE), signed by all Architects and engineers having delegated responsibility for each of the sections of the form DSA 152 applicable to the areas of delegated responsibility, prior to the Project Inspector signing that section off on the project inspection card.

I. Duties of Contractor:
1. The Contractor shall carefully study the DSA approved documents and shall plan a schedule of operations well ahead of time.
2. If at any time it is discovered that work is being done which is not in accordance with the DSA approved construction documents, the Contractor shall correct the work immediately.
3. Verify that DSA 152 forms were issued for the project prior to the commencement of construction.
4. Meet with the Architect, the Laboratory of Record and the Project Inspector to mutually communicate and understand the testing and inspection program, and the methods of communication appropriate for the project.
5. Notify the Project Inspector, in writing, of the commencement of construction of each and every aspect of the work at least 48 hours in advance by submitting form DSA 156, or other agreed upon written documents, to the Project Inspector.
6. Notify the Project Inspector of the completion of construction of each and every aspect of the work by submitting form DSA 156 (or other agreed upon written documents) to the Project Inspector.
7. Consider the relationship of the signed off blocks and sections of the form DSA 152 and the commencement of subsequent work.
   a. Until the Project Inspector has signed off applicable blocks and sections of the form DSA 152, the Contractor may be prohibited from proceeding with subsequent construction activities that cover up the unapproved work.
   b. Any subsequent construction activities, that cover up the unapproved work, will be subject to a "Stop Work Order" from DSA or the Owner, and are subject to removal and remediation if found to be in non-compliance with the DSA approved construction documents.
8. Submit the final Contractor Verified Reports (form DSA 6-C) to DSA and the Project Inspector upon any of the following events occurring:
   a. The project is substantially complete. DSA considers the project to be complete when the construction is sufficiently complete in accordance with the DSA approved construction documents so that the Owner can occupy or utilize the project.
   b. Work on the project is suspended for a period of more than one month.
   c. The services of the Contractor are terminated for any reason prior to the completion of the project.
   d. DSA requests a verified report.

J. Duties of the Owner:
1. Provide for competent, adequate and continuous construction inspections and material testing for the project by employing an appropriate DSA certified approved Project Inspector and Laboratory of Record.
2. Contractually provide for and ensure that the design team is fulfilling their code required duty to observe the construction by making periodic visits of reasonable frequency.
3. Ensure that the Project Inspector is approved by DSA for the project by submitting form DSA 5 to and obtaining approval from DSA prior to the start of construction and prior to requesting issuance of project inspection cards (DSA 152 forms).
4. Ensure the Laboratory of Record is LEA approved and employed prior to the start of construction and prior to requesting issuance of project inspection cards (DSA 152 forms).
5. Ensure that the project inspection cards (DSA 152 forms) are issued prior to commencement of construction.
6. Submit Statement of Final Actual Project Cost (form DSA 168) to DSA when the project is substantially

complete.

1.7 CONTRACTOR COOPERATION WITH PROJECT INSPECTOR AND DSA

A. The Inspector and DSA shall have access to the Work at all times and at all locations where the Work or parts of the Work is in progress. The Contractor shall provide facilities for such access to enable the Inspector and DSA to perform their functions properly and safely.

END OF SECTION 01 4320

SECTION 01 4520 - TESTING AND SPECIAL INSPECTION SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes testing and inspection to be provided by the Owner and cooperation required from the Contractor with the Owner's selected testing agency and others responsible for testing and inspecting the Work. For detailed testing requirements, refer to the quality control requirements of the following sections:
   1. Section 01 4320: DSA Construction Oversight.
   2. Section 03 1510: Concrete expansion anchor testing.
   3. Section 03 3000: Concrete testing and inspection.
   4. Section 05 1200: Structural steel testing and inspection.
   5. Section 05 5000: Metal fabrications testing and inspection.
   6. Section 09 0560: Testing of concrete floor slabs for moisture and pH.

B. Testing may be required per the Specification Sections noted above that is not specifically noted on Form DSA-103, Statement of Structural Tests and Special Inspections.

C. Related Sections: 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. Section 01 4320: DSA construction oversight.

D. Work Not Included:
   1. Selection of testing laboratory: The Owner will select a prequalified independent testing laboratory.
   2. Payment for initial testing: The Owner will pay all services of the DSA approved testing laboratory as further described in Part 2 of this Section.

1.2 SUBMITTALS

A. Test Reports:
   1. The testing laboratory will provide test and inspection reports for all testing and inspection required by this Section and the Division of the State Architect in accordance with DSA Procedure 13-1.
   2. One copy of all test and inspection reports shall be forwarded by the testing laboratory to DSA, the Owner, the Architect, the Engineer, the Inspector, and the Contractor.
   3. Reports shall include all tests made regardless of whether such tests indicate that the material is satisfactory or unsatisfactory.
   4. Samples taken but not tested shall also be reported.
   5. Reports shall indicate that the material or materials were sampled and tested in accordance with the requirements of Title 24, California Code of Regulations, and the Contract Documents.
   6. Reports shall indicate the specified design strength and state definitely whether or not the material or materials tested comply with the requirements.

B. Contractor's Statement of Responsibility: In accordance with CBC Section 1704A.4, Contractor shall submit a statement of responsibility to the Architect, the Owner, and DSA prior to the commencement of work of the main wind or seismic force resisting systems or component. Statement of responsibility shall contain acknowledgment of awareness of the special inspection requirements contained in the statement of special inspections.

C. Verified Reports: The testing laboratory will provide interim and final verified reports in accordance with Section 01 4320 and DSA Procedure PR 13-1.

1.3 QUALITY ASSURANCE

A. The Owner will select an independent testing laboratory to conduct tests. Testing laboratory shall be approved by the Architect, Structural Engineer, and the Division of the State Architect.

B. Selection of material required for testing shall be by the laboratory or the Owner's representative and not by the Contractor.

C. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials.

D. Division of the State Architect Testing & Inspection: At a minimum, the testing required for the project is indicated in the Form DSA-103, Statement of Structural Tests and Special Inspections attached at the end of this Section.
   1. Where no testing requirements are described, but the Owner or DSA decides that testing is required, the Owner or DSA may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.
   2. Testing may be required by other Specification Sections that is not specifically noted on Form DSA-103, Statement of Structural Tests and Special Inspections.

1.4 MATERIALS, TESTING, AND INSPECTION STANDARDS

A. Comply with the California Building Code, 2019 Edition.

B. Concrete - Section 03 3000:
   1. Material Standards:
      a. Portland cement: CBC Section 1903A.1, ACI 318, Table 26.4.1.1.1(a).
      b. Fly ash: ACI 318, Table 26.4.1.1.1(a).
      c. Concrete aggregates: CBC Section 1903A.5; ACI 318, Section 26.4.1.2.1(a)(1).
   2. Material Tests:
      a. Reinforcing bar test: CBC Section 1910A.2.
      b. Waiver of reinforcing bar testing: CBC Section 1910A.2.
      c. Concrete strength: ACI 318, Section 26.12.
      d. Drilled expansion / epoxy bolt: CBC Section 1910A.5.
      e. Composite construction cores: CBC Section 1910A.4.
   3. Special Inspections:
      a. Job site inspection: CBC Section 1704A.3, Table 1705A.3.
      b. Batch plant inspection: CBC Section 1705A.3.3.
      c. Waiver of batch plant inspection: CBC Section 1705A.3.3.1.
      d. Post-installed anchors: CBC Table 1705A.3, Type 4, Section 1910A.5.

C. Structural Steel - Section 05 1200:
   1. Material Standards:
      a. Structural steel: CBC Sections 2203A.1.
      b. Material identification: CBC Section 2203A.1 and AISC 360-16 Section A3.1.
   2. Material Tests:
      a. Structural steel: CBC Section 2203A.1.
      b. High strength bolts, nuts, washers: CBC Section 2213A.1.
      c. End welded studs: CBC Section 2213A.2.
   3. Special Inspection: CBC Table 1705A.2.1.
      a. Shop fabrication: CBC Section 1705A.2.1.
      b. Welding: CBC Section 1705A.2.5, Table 1705A.2.1.
      c. Steel frame special inspection: CBC Table 1705A.2.1.

d. End welded stud welding: CBC Table 1705A.2.1.
e. High strength bolts: CBC Table 1705A.2.1.

D. Wood - Section 06 1100:
1. Material Standards:
a. Sawn Lumber Material Standards: CBC Section 2303.1.1.
b. Plywood Material Standards: CBC Section 2303.1.5.
c. Structural Composite Lumber Material Standards: CBC Sections 2303.1.4 and 2303.1.3.1.

E. Moisture Control Treatment Testing:
1. Testing and Inspection: Refer to Section 09 0650.

F. Earth Fill, Foundations, and Excavations - Section 31 2000:
1. Special Inspection:
a. Fill and Compaction: CBC Section 1705A.6 and Table 1705A.6.
b. Pier Foundations: CBC Section 1704A.8.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Promptly process and distribute required copies of test reports and related instructions to assure necessary re-testing and replacement of materials with the least possible delay in progress of the Work.

PART 2 - PRODUCTS

2.1 PAYMENT FOR TESTING

A. Initial Testing: The Owner will pay for services requested by the Owner.

B. Retesting: When initial tests indicate non-compliance with the Contract Documents, subsequent retesting occasioned by the non-compliance shall be performed by the same testing agency and the costs thereof will be paid by the Contractor.

2.2 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

2.3 OWNER’S INSPECTOR

A. The Owner shall employ a DSA approved Inspector in accordance with the requirements of the California Code of Regulations, Title 24. The Inspector’s duties are specifically defined in Title 24, Part 1, Section 4-342.
1. Refer to Section 01 4320 - DSA Construction Oversight.

B. The work of construction in all stages of progress shall be subject to the personal continuous inspection of the Inspector. The Inspector shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep the Inspector fully informed respecting the progress and manner of the work and character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY

A. Representatives of the Owner and the testing laboratory shall have access to the Work at all times and at all locations where the Work or parts of the Work is in progress. The Contractor shall facilities for such access to enable the laboratory to perform its functions properly and safely.

3.2 TAKING SPECIMENS

A. Test specimens and prisms required for concrete, grout and mortar shall be taken by the testing laboratory and delivered directly to the testing laboratory as required by the California Building Code, 2019 Edition.

B. The testing laboratory shall be responsible for testing the samples.

C. Miscellaneous materials to be tested shall be tagged by the Project Inspector and delivered to the testing laboratory for testing. The testing laboratory shall provide specimen containers for the Project Inspector for the required tests.

3.3 SCHEDULES FOR TESTING

A. Establishing Schedule:
   1. The Contractor shall notify the Project Inspector a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents, which must by terms of the Contract be tested, in order that the Inspector may arrange for testing of the material at the source of supply.
   2. The Contractor shall provide time within the construction schedule required for the laboratory to perform its tests and to issue each of its findings.
   3. Contractor shall coordinate times for testing of materials and/or installations with the testing laboratory not less than 48 hours prior to the need for testing.

B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory as required.

C. Adherence to Schedule: When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay may be back charged to the Contractor and shall not be borne by the Owner.

D. Tests and Inspections Required:
   1. Refer to attached Form DSA 103.
   2. Testing may be required by other Specification Sections that is not specifically noted on Form DSA-103, Statement of Structural Tests and Special Inspections.

3.4 UNTESTED MATERIALS

A. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed any required testing and inspection, or prior to receipt of notice from the Architect that testing and inspection will not be required, shall not be incorporated into the Work.

B. If such non-inspected and non-tested material is incorporated into the project, it shall be removed at the Contractor’s expense and no consideration will be given for delays or additional cost caused by this action.

END OF SECTION 01 4520

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS, 2019 CBC

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2019 CBC

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A (2019 CBC).

****NOTE:** Undefined section and table references found in this document are from the CBC, or California Building Code.

KEY TO COLUMNS

1. TYPE	2. PERFORMED BY
Continuous – Indicates that a continuous special inspection is required **Periodic** – Indicates that a periodic special inspection is required **Test** – Indicates that a test is required	**GE** – Indicates that the special inspection shall be performed by a registered geotechnical engineer or his or her authorized representative. **LOR** – Indicates that the test or special inspection shall be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See CAC Section 4-335. **PI –** Indicates that the special inspection may be performed by a project inspector when specifically approved by DSA. **SI** – Indicates that the special inspection shall be performed by an appropriately qualified/approved special inspector.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

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Geotechnical Reports: Project does NOT have and does NOT require a geotechnical report

	S1. GENERAL:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify that: • Site has been prepared properly prior to placement of controlled fill and/or excavations for foundations. • Foundation excavations are extended to proper depth and have reached proper material. • Materials below footings are adequate to achieve the design bearing capacity.	**See Notes**	**PI**	Refer to specific items identified in the Appendix listing exemptions for limitations. Placement of controlled fill exceeding 12" depth under foundations is not permitted without a geotechnical report.

	S2. SOIL COMPACTION AND FILL:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify use of proper materials, densities and inspect lift thicknesses, placement and compaction during placement of fill.	**Continuous**	**LOR***	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.
☑	**b.** Compaction testing.	**Test**	**LOR***	* Under the supervision of a geotechnical engineer or LOR's engineering manager. Refer to specific items identified in the Appendix listing exemptions for limitations.

	S3. DRIVEN DEEP FOUNDATIONS (PILES):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Verify pile materials, sizes and lengths comply with the requirements.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**b.** Determine capacities of test piles and conduct additional load tests as required.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

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	Test or Special Inspection	Type	Performed By	Code References and Notes
☐	**c.** Inspect driving operations and maintain complete and accurate records for each pile.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**d.** Verify locations of piles and their plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and record any pile damage.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**e.** Steel piles.	Provide tests and inspections per STEEL section below.		
☐	**f.** Concrete piles and concrete filled piles.	Provide tests and inspections per CONCRETE section below.		
☐	**g.** For specialty piles, perform additional inspections as determined by the registered design professional in responsible charge.	*	*	* As defined on drawings or specifications.

	S4. CAST-IN-PLACE DEEP FOUNDATIONS (PIERS):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Note**
☐	**a.** Inspect drilling operations and maintain complete and accurate records for each pier.	**Continuous**	**PI**	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
☐	**b.** Verify pier locations, diameters, plumbness and lengths.Record concrete or grout volumes.	**Continuous**	**PI**	Continuous inspection to be provided by project inspector. Refer to specific items identified in the Appendix listing exemptions for limitations.
☐	**c.** Concrete piers.	Provide tests and inspections per CONCRETE section below.		

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (SOILS), 2019 CBC

Table 1705A.6, Table 1705A.7, Table 1705A.8

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	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
	S5. RETAINING WALLS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Placement, compaction and inspection of backfill.	**Continuous**	**GE***	**1705A.6.1.** * By geotechnical engineer or his or her qualified representative. (See S2 above).
☐	**b.** Placement of soil reinforcement and/or drainage devices.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.** Segmental retaining walls; inspect placement of units, dowels, connectors, etc.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative. See DSA IR 16-3.
☐	**d.** Concrete retaining walls.	Provide tests and inspections per CONCRETE section below.		
☐	**e.** Masonry retaining walls.	Provide tests and inspections per MASONRY section below.		

	S6. OTHER SOILS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Soil Improvements	**Test**	**GE***	Submit a comprehensive report documenting final soil improvements constructed, construction observation and the results of the confirmation testing and analysis to CGS for final acceptance. * By geotechnical engineer or his or her qualified representative.
☐	**b.** Inspection of Soil Improvements	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
☐	**c.**			

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

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	C1. CAST-IN-PLACE CONCRETE			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Verify use of required design mix.	**Periodic**	**SI**	**Table 1705A.3 Item 5, 1910A.1.**
☑	**b.** Identifiy, sample, and test reinforcing steel.	**Test**	**LOR**	**1910A.2;** ACI 318-14 Section 26.6.1.2; DSA IR 17-10. (See Appendix for exemptions.)
☑	**c.** During concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	**Test**	**LOR**	**Table 1705A.3 Item 6**; ACI 318-14 Sections 26.5 & 26.12.
☑	**d.** Test concrete (f'_c).	**Test**	**LOR**	**1905A.1.15;** ACI 318-14 Section 26.12.
☑	**e.** Batch plant inspection: **Periodic**	**See Notes**	**SI**	Default of **'Continuous'** per **1705A.3.3**. If approved by DSA, batch plant inspection may be reduced to **'Periodic'** subject to requirements in Section **1705A.3.3.1,** or eliminated per **1705A.3.3.2.** See IR 17-13. (See Appendix for exemptions.)
☐	**f.** Welding of reinforcing steel.	Provide special inspection per STEEL, Category S/A4(d) & (e) and/or S/A5(g) & (h) below.		

	C2. PRESTRESSED / POST-TENSIONED CONCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Sample and test prestressing tendons and anchorages.	**Test**	**LOR**	**1705A.3.4, 1910A.3**
☐	**b.** Inspect placement of prestressing tendons.	**Periodic**	**SI**	**1705A.3.4, Table 1705A.3 Items 1 & 9.**

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

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	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**c.** Verify in-situ concrete strength prior to stressing of post-tensioning tendons.	**Periodic**	**SI**	**Table 1705A.3 Item 11.** Special inspector to verify specified concrete strength test prior to stressing.
☐	**d.** Inspect application of post-tensioning or prestressing forces and grouting of bonded prestressing tendons.	**Continuous**	**SI**	**1705A.3.4, Table 1705A.3 Item 9;** ACI 318-14 Section 26.13

	C3. PRECAST CONCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect fabrication of precast concrete members.	**Continuous**	**SI**	ACI 318-14 Section 26.13.
☐	**b.** Inspect erection of precast concrete members.	**Periodic**	**SI***	**Table 1705A.3 Item 10.** * May be performed by PI when specifically approved by DSA.

	C4. SHOTCRETE (IN ADDITION TO SECTION C1):			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.** Inspect shotcrete placement for proper application techniques.	**Continuous**	**SI**	**1705A.19, Table 1705A.3 Item 7, 1908A.6, 1908A.7, 1908A.8, 1908A.9, 1908A.11, 1908A.12.** See ACI 506.2-13 Section 3.4, ACI 506R-16.
☐	**b.** Sample and test shotcrete (f'_c).	**Test**	**LOR**	**1908A.5, 1908A.10.**

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS (CONCRETE), 2019 CBC

Table 1705A.3; ACI 318-14 Sections 26.12 & 26.13

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	C5. POST-INSTALLED ANCHORS:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☑	**a.** Inspect installation of post-installed anchors	**See Notes**	**SI***	**1617A.1.19, Table 1705A.3 Item 4a (Continuous) & 4b (Periodic), 1705A.3.8** (See Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13. * May be performed by the project inspector when specifically approved by DSA.
☑	**b.** Test post-installed anchors.	**Test**	**LOR**	**1910A.5.** (See Appendix for exemptions.)

	C6. OTHER CONCRETE:			
	Test or Special Inspection	**Type**	**Performed By**	**Code References and Notes**
☐	**a.**			

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

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Exempt items given in DSA IR A-22 or the 2019 CBC (including DSA amendments) and those items identified below with a check mark by the design professional are NOT subject to DSA requirements for the structural tests **/** special inspections noted. **Items marked as exempt shall be identified on the approved construction documents**. The project inspector shall verify all construction complies with the approved construction documents.

	SOILS:
☐	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per CBC Table 1806A.2 and having no geotechnical report for the following cases: A) free standing sign or scoreboard, B) cell or antenna towers and poles less than 35'-0" tall (e.g., lighting poles, flag poles, poles supporting open mesh fences, etc.), C) single-story structure with dead load less than 5 psf (e.g., open fabric shade structure), or D) covered walkway structure with an apex height less than 10'-0" above adjacent grade.
☐	2. Shallow foundations, etc. are exempt from special inspections and testing by a Geotechnical Engineer for the following cases: A) buildings without a geotechnical report and meeting the exception item #1 criteria in CBC Section 1803A.2 supported by native soil (any excavation depth) or fill soil (not exceeding 12" depth per CBC Section 1804A.6), B) soil scarification/recompaction not exceeding 12" depth, C) native or fill soil supporting exterior non-structural flatwork (e.g., sidewalks, site concrete ramps, site stairs, parking lots, driveways, etc.), D) unpaved landscaping and playground areas, or E) utility trench backfill.

	CONCRETE/MASONRY:
☐	1. Post-installed anchors for the following: A) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding" in the Appendix below) given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) or B) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
☐	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
☐	3. Non-bearing non-shear masonry walls may be exempt from certain DSA masonry testing and special inspection items as allowed per DSA IR 21-1.16. Refer to construction documents for specific exemptions accordingly for each applicable wall condition.
☐	4. Epoxy shear dowels in site flatwork and/or other non-structural concrete.

Appendix: Work Exempt from DSA Requirements for Structural Tests / Special Inspections

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	CONCRETE/MASONRY:
☐	5. Testing of reinforcing bars is not required for items given in CBC Section 1910A.2 subject to the requirements and limitations in that section.

	WELDING:
☐	1. Solid-clad and open-mesh fences, gates with maximum leaf span of 10', and gates with a maximum rolling section of 10' all having an apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates/fences are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
☐	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds shall not be ground flush.
☐	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
☐	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
☐	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for Sections S/A3, S/A4 and/or S/A5 of listing above).
☐	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for sections S/A3, S/A4 and/or S/A5 located in the Steel/Aluminum category).
☐	7. Any support for exempt non-structural components given in CBC Section 1617A.1.18 (which replaces ASCE 7-16, Section 13.1.4) meeting the following: A) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) ≤4' above supporting floor/roof, B) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

DSA 103-19: LISTING OF STRUCTURAL TESTS & SPECIAL INSPECTIONS(SIGNATURE), 2019 CBC

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Increment Number:

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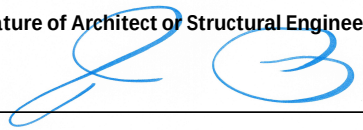
Name of Architect or Engineer in general responsible charge:

Name of Structural Engineer (When structural design has been delegated):

John Atilano

Signature of Architect or Structural Engineer:



Date:

3-31-23

Note: To facilitate DSA electronic mark-ups and identification stamp application, DSA recommends against using secured electronic or digital signatures.

DSA STAMP

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 02-120394 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 05/01/2023

DSA 103-19: LIST OF REQUIRED VERIFIED REPORTS, CBC 2019

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1. Structural Testing and Inspection: Laboratory Verified Report Form DSA 291

2. Concrete Batch Plant Inspection: Laboratory Verified Report Form DSA 291

3. Post-installed Anchors: Laboratory Verified Report Form DSA 291, or, for independently contracting SI, Special Inspection Verified Report Form DSA 292

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide construction facilities and temporary controls needed for the Work including, but not necessarily limited to:
1. Temporary utilities such as heat, water, electricity, and telephone;
2. Field offices;
3. Sanitary facilities;
4. Enclosures such as tarpaulins, barricades, safety devices, and canopies;
5. Temporary fencing of the construction site and/or buildings as required to secure the project;
6. Temporary protect of new and existing work;
7. Temporary protection of existing buildings and site.

B. Related Sections:
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.
2. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work is not part of this Section.
3. Permanent installation and hookup of the various utility lines are described in other Sections.

1.2 QUALITY ASSURANCE

A. Comply with governing regulations and rules/recommendations of utility companies and governmental agencies having jurisdiction.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

PART 2 - PRODUCTS

2.1 TEMPORARY UTILITIES

A. Water:
1. Provide necessary temporary piping and water supply and, upon completion of the Work, remove such temporary facilities.
2. Provide and pay for water used in construction.

B. Electricity:
1. Provide all necessary temporary poles and wiring and, upon completion of the Work, remove such temporary facility.
2. Provide area distribution boxes so located that the individual trades may furnish and use 100 ft maximum length extension cords to obtain power and lighting at points where needed for work, inspection, and safety.
3. Provide lighting as needed to permit safe and reasonable lighted working conditions.
4. Provide and pay for electricity used in construction.

C. Fire Protection: Provide for and maintain fire safety during construction and/or alteration of a building per Chapter 33 of the 2019 California Fire Code.

D. Safeguards During Construction: Provide for and maintain safeguards during construction and/or alteration of a building per Chapter 33 of the 2019 California Building Code.

E. Heating: Provide and maintain heat necessary for proper conduct of operations and temperature conditions needed for the Work.

F. Ventilation: Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and prevent accumulation of dust, fumes, vapors, or gases.

G. Telephone/Fax:
1. Make necessary arrangements and pay costs for installation and operation of telephone, FAX, internet service and copier service in the Contractor's office at the site.
2. Provide telephone and fax lines in the office of the Project Inspector for use in connection with the Work.
3. Costs of telephone and fax calls in the Inspector’s office are not in contract.

2.2 FIELD OFFICES AND SHEDS

A. Office Facilities:
1. Contractor’s Office: Provide a field office (8' by 12' minimum size) and sheds adequate in size and accommodation for Contractor's offices, supply, and storage.
2. Secure portable or mobile buildings when used. Provide steps and landings at each doorway. Meet all applicable codes and regulations.
3. Remove all facilities when they are no longer needed, but only after approval of the Architect.
4. Inspector’s Office: Provide a private space within the field office (8' by 16' minimum size), or a separate job trailer with adequate heating and cooling, power, and telephone outlets for the Project Inspector and for holding project meetings.
    a. Provide 30"x84" table and 8 chairs.
    b. Provide windows (approximately 10% of floor area) oriented to the construction areas.
    c. Provide plan table and stool for inspector.

B. Sanitary Facilities:
1. Provide temporary sanitary facilities in the quantity required for use by all personnel per local and state health and sanitary regulations.
2. Maintain in a sanitary condition at all times and in reasonable proximity of the work.

2.3 TEMPORARY ENCLOSURES

A. Provide and maintain for the duration of construction all scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges, lighting, and other temporary construction necessary for the safe and proper completion of the Work in compliance with pertinent safety and other regulations.

B. Provide and maintain suitable temporary sidewalks, closed passageways, fences, and other structures required by law so as not to obstruct or interfere with traffic in public streets, alley ways, or private right-of-way. Leave an unobstructed way along public and private places for pedestrians and vehicles.

C. Provide temporary partitions and ceilings as needed to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

2.4 TEMPORARY FENCING

A. Provide and maintain temporary fencing for the duration of construction to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Minimum fence height shall be 6'-0" high. Fence panels shall be stretched over 4-sided pipe frames.

2.5 VEHICULAR ACCESS AND PARKING

A. Access the site as indicated on the Drawings, or as directed by the Owner.

B. Do not use existing parking areas for the Contractor's parking or storage of materials.

C. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on the site.

D. Construct and maintain temporary roads accessing public thoroughfares to serve construction area. Extend and relocate as the Work requires.

E. Provide and maintain access to fire hydrants, free of obstructions, with an all-weather hard surface able to support 50,000 pounds minimum fire apparatus. Fire hydrants shall be charged and accessible by local fire authorities prior to loading the site with combustible materials.

F. Employees vehicles not required for the direct construction of the Work shall be parked offsite unless otherwise authorized by the Owner.

2.6 DUST PROTECTION

A. Provide dust suppression measures, including watering of all graded or excavated material at least twice a day, stopping grading and excavation activities when the wind speed exceeds 20 mph for one hour, watering or covering all material transported off-site, and minimizing the area disturbed by grading and excavation activities.

B. Maintain adequate water and trucks to be used throughout the progress of the project to mitigate airborne dust. Maintain the site in a damp condition, not allowing excessive powdering of soil.

2.7 PROTECTION

A. Landscaping: Protect all existing trees, shrubs, lawns, and landscape work from damage, providing guards and coverings. Maintain by irrigation any existing trees, shrubs, lawns, and landscape work though-out the Contract which are within the Contractor's temporary fencing. Damaged landscaping shall be repaired or replaced at the Contractor's expense.

B. Public and Private Streets, Curbs, and Walks:
   1. Protect all existing streets, curbs, walks, and other street improvements and immediately make all necessary repairs for damage occurring thereto during the course of the Work at the Contractor's expense.
   2. Keep all public and private streets and ways clean of debris, spilled materials and products, and wet and dry earth at all times and clean at the end of each working day. Clean wet earth from vehicles prior to their leaving the site.

C. Weather: Provide protection at all times against weather--rain, winds, storms, frost, or heat--so as to maintain all work, materials, apparatus, and fixtures free from injury or damage. At the end of the day's work, cover all work likely to be damaged.
   1. Water Protection: Protect excavations, trenches, and/or building from damage from rain water, spring water, ground water, backing up of drains or sewers, and all other water at all times. Provide pumps and equipment and enclosure necessary to provide this protection.
   2. Drainage: Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations free of water.
   3. Cold Weather: During cold weather, protect all work from damage.
   4. Snow and Ice: Remove all snow and ice as may be required for proper protection and/or prosecution of the Work.

D. Installed Roofing Materials: Provide means for protection of roofing materials during construction activities. Provide a minimum of 3/4" plywood as protection for storage or materials, walking areas, and working areas. Protect from solvents, oils, or other materials harmful to the installed roofing material.

E. Existing Utilities and Services: Maintain in operation through-out the Contract all existing utilities and services serving the existing facilities occupied by the Owner or by others.

F. Existing Structures and Improvements: The Contractor shall be responsible for all existing structures and improvements within the work area, and shall provide adequate protection. Any existing structure or improvement damaged during construction shall be repaired or replaced with materials, fixtures, or equipment of the same kind, quality, and size. Any materials, and/or equipment temporarily removed for protection and not damaged, shall be reinstalled.

G. Adjacent Property: Provide necessary protection for adjacent property and the lateral support therefor in conformance with the 2019 California Building Code.

2.8 SECURITY

A. The Contractor shall be responsible for security and protection of his equipment and the site-stored and installed products whether paid for by the Owner or not, until the Owner accepts the Project.

B. On-site security lighting shall be hooded and adjusted to reduce or eliminate illumination of surrounding properties and roadways.

2.9 DEBRIS CONTROL

A. Keep site clean and orderly in appearance at all times. Do not allow debris to accumulate over the site.

B. Collect debris daily and store in a central location or container. Remove from the site monthly prior to review of payment request.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.

B. Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.

END OF SECTION 01 5000

SECTION 01 5710 - EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. In accordance with pertinent provisions of this Section, install erosion control straw mat, straw wattles, and/or straw bales as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related Sections:
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.
2. Section 01 5725: Storm Water Pollution Prevention Plan.
3. Section 31 1000: Site clearing.
4. Section 33 4000: Storm drainage.

1.2 QUALITY ASSURANCE

A. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

B. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the geotechnical engineer.

C. Install erosion control materials prior to expected rainfall and maintain throughout the construction period.

D. Comply with storm water pollution prevention plan.

1.3 SLOPE PROTECTION

A. Minor Slopes: Provide continuous straw mat protection over all soils disturbed by construction operations. Minor slopes shall be slope with finish grade less than 10 horizontal to 1 vertical, up to 6.5 horizontal to 1 vertical.

B. Major Slopes: Provide continuous straw mat protection plus horizontal trench with continuous straw wattles at 4' on center over all soils disturbed by construction operations. Major slopes shall be slope with finish grade equal to or greater than 6.5 horizontal to 1 vertical.

1.4 EXISTING UTILITIES

A. Field verify the location of all existing underground utilities prior to beginning any earthwork. Work around and protect all existing utilities during the course of the Work.

B. Where existing utilities are indicated on the drawings, extreme care shall be exercised in excavating near these utilities to avoid damage, and the Contractor will be held responsible for any damage caused by construction operations.

PART 2 - PRODUCTS

2.1 EROSION CONTROL MATTING

A. Erosion control matting shall be straw blanket of 100% agricultural straw fiber matrix with a functional longevity of 6 months or greater. Evenly distribute straw fiber over the entire area of the mat. The blanket shall be covered on the top and bottom with a lightweight photodegradable polypropylene net with mesh size of approximately ½" by ½". Sew blanket together on 1.5" centers with degradable thread.

B. Acceptable Products:
1. North American Green, S150 straw erosion control blanket.
2. Cascade Geotechnical Inc., S-31 LD straw erosion control blanket.
3. Erosion Control Systems, ProGuard SS straw erosion control blanket.
4. Other equal product approved by the Architect.

2.2 STRAW WATTLES

A. Straw wattles are intended to capture and keep sediment on the slopes. Wattles shall be manufactured from 100% agricultural rice straw and wrapped in tubular black plastic netting or hemp. They are approximately 8" in diameter or larger by 25'-30' in length.

B. Acceptable Products:
1. California Straw Works,
2. Other equal product approved by the Architect

2.3 STRAW BALES

A. Provide Straw Bales continuously around all drainage inlets and maintain them to prevent silt build-up in storm drainage pipe. Clean storm drain pipes prior to acceptance of the project and verify there are no obstructions.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 EROSION CONTROL MATTING

A. Provide straw bales as required for loose spreading straw over native disturbed soil during grading operations and foundation and stem wall construction. Fine grade soil as soon after floor and wall framing is complete but before anticipated rainfall.

B. Install erosion control matting at the top of the slope by anchoring the mat into an earthen trench and anchor as recommended by the manufacturer.

C. Roll mats downhill and then horizontally with laps and staples as recommended by the manufacturer.

3.3 STRAW WATTLES

A. Prepare slope with Erosion Control Matting prior to laying the wattling material.

B. Dig and smooth trenches across the slope on contour, to place rolls. Provide trench depth as recommended by the manufacturer, but not less than ½ the diameter of the roll.

C. Trenches shall be placed 4' on center and perpendicular to water flow.

D. Anchor wattles in place with stakes driven and spaced as recommended by manufacturer.

3.4 FIELD QUALITY CONTROL

A. Inspect the erosion control blanket and wattles immediately following the first significant storm. Make sure all rolls are in full contact with soils.

B. Repair any gullys or washouts immediately.

C. Provide gravel or river rock in areas of excessive erosion acceptable to the Architect and at no additional cost to the Owner.

END OF SECTION 01 5710

SECTION 01 5725 - STORM WATER POLLUTION PREVENTION PLAN

PART 1 - GENERAL

1.1 SUMMARY

A. The State Water Resources Control Board (SWRCB) regulates storm water discharges associated with construction and land disturbance activities. Certain projects are required to obtain permit coverage under California's Construction General Permit (GCP), Order No. 2009-0009-DWQ. A site-specific Storm Water Pollution Prevention Plan (SWPPP) is required to obtain permit coverage under the CGP.

B. Related Sections
1. Section 01 5710: Erosion Control

C. This project disturbs less than one acre, therefore permit coverage has not been obtained and a SWPPP is **NOT** required, however the Contractor shall comply with the applicable sections of the California Green Building Code.

1.2 REFERENCES

A. Section 5.106 of the California Green Building Code, latest edition

END OF SECTION 01 5725

SECTION 01 6200 - PRODUCT OPTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section describes product options available to bidders and the Contractor.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 01 2500: Substitution procedures.
3. Section 01 3300: Submittal procedures.

1.2 PRODUCT OPTIONS

A. The Contract shall be based on standards of quality established in the Contract Documents.
1. In agreeing to the terms and conditions of the Contract, the Contractor has accepted a responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.
2. Neither the Owner nor the Architect has agreed to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

B. Colors: Provide finish selections indicated in the Finish Schedule.
1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
2. Manufacturer's Standard Colors and Finishes: Where the Finish Schedule specifies a manufacturer's standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as other manufacturer's "standard colors" from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings.
3. Custom Colors: Where the Finish Schedule indicates a specific manufacturer's colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable.

1.3 DELAYS

A. Delays in construction arising by virtue of the non-availability of a specified material due to late approval and/or ordering of materials will not be considered as justifying an extension of the agreed Time of Completion, or reason for change.

B. All additional time required by the Architect or his consultants in dealing with such delay will be charged to the Contractor at the rates listed above.

C. Equal or better material replacements caused by delay in approvals and/or ordering may cost more than the original material specified. Increased costs shall be absorbed by the Contractor and not the Owner.

END OF SECTION 01 6200

SECTION 01 6600 - STORAGE AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related Sections:
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.
2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

B. **Materials not properly stored will not be paid for by the owner. Materials previously paid for but not properly stored at time of payment request will be deducted from the request.**

1.3 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Architect, determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
1. Maintain packaged materials with seals unbroken and labels intact until time of use.
2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Architect may reject as noncomplying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner. Additional time required to secure replacements and to make repairs will not be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION 01 6600

SECTION 01 7120 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide such field engineering, staking services, and required certifications as required for proper completion of the Work including, but not necessarily limited to establishing and maintaining lines and levels.

B. Related Sections:
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.
2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
3. As described in the General Conditions, the Owner will furnish survey describing the physical characteristics, legal limitations, utility locations, and legal description of the site.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01 3300.

B. Submit the following:
1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
2. Documentation verifying accuracy of field engineering work

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 PROCEDURES

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
1. Locate and protect control points before starting work on the site.
2. Preserve permanent reference points during progress of the Work.
3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
4. Promptly advise the Architect when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
    a. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
    b. Locate such replacements according to the original survey control.

END OF SECTION 01 7120

SECTION 01 7300 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section establishes administrative and supervisory requirements pertaining to project coordination and general installation provisions.

B. Related Sections: 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.

1.2 COORDINATION

A. Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
   1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
   2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

G. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement. Comply with manufacturer’s installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

F. Provide attachment and connection devices and methods necessary for securing Work. Allow for expansion and building movement.

G. Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

H. Recheck measurements and dimensions prior to starting installation.

I. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

J. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

K. Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.4 SITE CONDITIONS

A. Where existing utilities are indicated on the drawings, extreme care shall be exercised in excavating near these utilities to avoid damage, and the Contractor will be held responsible for any damage caused by construction operations.

B. Should utilities not indicated on the drawings be found during construction, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage arising from construction operations after discovery of these utilities.

3.5 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration until Notice of Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION 01 7300

SECTION 02 2620 – HAZARDOUS MATERIAL ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. In accordance with pertinent provisions of this Section, carefully abate and remove from the site those items scheduled to be so demolished and removed. Section includes:
   1. Abatement of asbestos containing materials.
   2. Abatement of lead containing materials.

B. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Section 00 3100: Existing building survey; information about known hazardous materials.
   3. Section 01 5000: Temporary enclosures, dust control barricades, security at occupied areas, waste removal and cleanup during construction.
   4. Section 01 6600: Handling and storage of items removed for salvage and relocation.
   5. Section 01 7330: Cutting and patching.
   6. Section 01 7420: Construction Waste Management and Control.
   7. Section 02 4210: General demolition.

PART 3 - EXECUTION

3.1 SCOPE

A. See attached for Hazardous Material Abatement Scope & Procedures by Leon Environmental Services.

END OF SECTION 02 2620

Leon Environmental Services

Richard "Danny" Leon CAC Certification No. 04-3708
Tommy Leon CAC Certification No. 05-3882

SPECIFICATIONS FOR ASBESTOS ABATEMENT

Corcoran High School
Asbestos Abatement Project
Science Building
1100 Letts Ave
Corcoran, CA

Prepared for:

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DESCRIPTION OF WORK

The work covered by this project specification includes the abatement, handling and disposal of all asbestos containing materials identified in the Leon Environmental Services report **C47-24** dated March 25, 2024, for **Corcoran High School Science Building, 1100 Letts Ave, Corcoran, CA.**
It will describe some of the procedures and equipment required to protect workers, the environment, and building occupants from contact with asbestos fibers.
All asbestos activities will be in compliance with AHERA (40 CFR 763 Subpart E) the asbestos in schools' regulations. The work also includes the disposal of any asbestos contaminated materials generated by the work.
Quantities listed below are estimates, for sampling purposes only, and should be verified prior to asbestos abatement. See full report for more detailed ACM locations. The abatement contractor is responsible for his own measurements and material quantification to determine quantities for bid purposes.

ACM LOCATION & APPROXIMATE QUANTITIES

Sample	Location	Material	% Of ACM	Friable	Sq. Ft.
Science Building					
01, 02, 03, 04	Science Bldg Rm 901 - 908	Beige 12x12 Floor Tile	2%	No	6,097'
		Black Mastic	5%	No	
27, 28	Science Bldg Rm 903 & 908	Black Lab Counters	2%	No	TBD

SCOPE OF WORK

1. Removal and disposal of all ACM Floor Tile and Floor Tile Mastic from the Science Building.
   Please note: All non-asbestos containing flooring associated with the ACM black mastic must be considered contaminated and handled as non-friable asbestos

OWNERS REPRESENTATIVE

The owners' representative for all asbestos related issues will be Leon Environmental Services. Leon Environmental Services personnel will be onsite as needed during

asbestos abatement activities. Leon Environmental Services personnel will perform the following activities:

- Pre-abatement inspection to assure proper set up of containment under negative pressure.
- Monitor abatement contractor to assure compliance with AHERA (40 CFR 763 Subpart E) regulations and project specifications.
- Post abatement visual clearance.

SCHEDULE AND SCOPE

1. All abatement activities will be completed in the time frame set by General Contractor. Work hours will be set by the General Contractor.
2. Allow 2 working days for air clearance by Leon Environmental Services.
3. Water and power will be supplied by General contractor and or VUSD.
4. All asbestos abatement activities will be in compliance with AHERA Regulations (40 CFR 763 Subpart E), the asbestos in schools regulations.
5. Prior to the start of any asbestos abatement activities, the abatement contractor will submit a written work plan to the consultant for approval.

ABATEMENT CONTRACTOR QUALIFICATIONS

1. The Asbestos Abatement Contractor must be licensed, certified, and registered with DOSH for working with asbestos containing materials in accordance with California Administrative Code, Title 8, article 2.5.
2. The Asbestos Abatement Contractor must meet all insurance and bonding requirements set by Corcoran Unified School District**.**
3. All abatement personnel assigned to project must be AHERA certified workers.
4. The contractor, must at all times, have current medical exam, fit test and worker training certificate documentation for all personnel readily available at the job site.

REGULATORY REQUIREMENTS

The asbestos abatement contractor shall comply with the following regulatory agencies:
1. California Occupational Safety & Health Administration (Cal-OSHA)
2. Local Air Quality Management District (SJVPCD)
3. Division of Health Services (DOSH)
4. Environmental Protection Agency (EPA) 40 CFR 763 Subpart E (AHERA)
5. Department of Transportation (DOT)
6. California State Contractors License Board

Should at any time there exist a conflict between these specifications and other applicable regulations, the most stringent shall apply.

PERSONAL PROTECTIVE EQUIPMENT

1. The contractor shall be required to utilize a minimum of half-face air purifying respirators and full body disposable coveralls at all times during removal activities.
2. A shower, with hot and cold running water, and decontamination facility is required to be installed adjacent and contiguous to the work area for all removal of Class I friable ACM. The shower facility is required to be used upon each exit from the work area. Shower water shall be filtered to appropriate levels prior to disposal into a sanitary sewer.
3. An appropriate decontamination facility is required for all abatement of non-friable non-hazardous ACM.

GENERAL REMOVAL REQUIREMENTS

1. Asbestos abatement containments shall be constructed to minimize clearance sampling cost to the district. Classroom containments shall be conjoined wherever feasible and is cost effective.
2. All non-friable ACM abated by manual labor only, may be disposed of as non-friable non-hazardous ACM.
3. All penetrations into the work area(s) shall be sealed with 6 mil poly critical barriers including vents and HVAC units on roofs.
4. No visible emissions are permitted at any time during the course of this project, regardless of the results of any air monitoring. Should visible emissions occur, removal efforts will be immediately ceased, and the situation corrected.
5. The contractor is required to maintain a competent person on-site at all times.
6. Clearance shall be issued upon passing a visual inspection. The visual clearance will be conducted by Leon Environmental Services.
7. Liquidated damages in the amount set by the contract will be accessed for each and every day the work is not completed in the allotted time.

REMOVAL OF NON-FRIABLE ASBESTOS

8. Work area must be cleared of all Personnel.
9. Demarcate work area.
10. Set up Critical Barriers
11. Set up negative air machines.
12. All negative air machines will be DOP Tested on site.
13. A minimum of 6ft splash guards.

14. Remove and dispose of Floor Tile and Mastic from the Science Building. The breaking of all Floor Tile must be kept to a minimum.
15. If the Black Floor Tile Mastic is removed by mechanical means the material will be considered a Friable Hazardous Material and CLASS I work.
16. Visual Clearance by Owner's Representative.

REMOVAL OF FRIABLE ASBESTOS

17. A full 3-stage decontamination facility to include an operational shower with hot and cold running water is required for all CLASS I work.
18. All penetrations into the work area(s) shall be sealed with critical barriers consisting of two (2) layers of 6-mil poly and duct tape for all CLASS I work.
19. Containment shall consist of one (2) layers of 6-mil polyethylene sheeting and duct tape for all CLASS I work.
20. The removal areas shall be kept wet before and during removal activities.
21. The containment shall be kept under negative air pressures at all times.
22. No visible emissions are permitted at any time during the course of this project, regardless of the results of any air monitoring. Should visible emissions occur, removal efforts will be immediately ceased and the situation corrected to the satisfaction of the Consultant. Work will not start again until approved by the Consultant.
23. Removal shall be accomplished with minimal cutting, tearing, or breaking of the materials.
24. The use of compressed air, dry sweeping is prohibited.
25. The work area shall be HEPA vacuumed and misted with water prior to the end of each days shift.
26. The contractor is required to maintain a competent person on-site at all times.
27. Final Air Clearance shall be performed upon passing visual inspection conducted by Consultant.
28. All personal air monitoring results shall be submitted to the Consultant within 48 hours of collection

DISPOSAL REQUIREMENTS

1. Friable ACM must be properly disposed of and manifested as hazardous waste in accordance with all federal, state and local regulations.
2. Disposal of non-friable ACM shall be documented with a non-friable waste shipment manifest. The manifest must clearly state that the landfill is aware that they are accepting non-friable asbestos containing materials.
3. Transportation of ACM waste must comply with DOSH and DOT regulations.
4. The cost for all disposal and transportation of removed materials is to be included in the contractor's bid.

INSURANCE/ BONDING

The contractor shall not commence work under this contract until all required insurance and bonding has been obtained and approved by the Corcoran Unified School District. Certificates of Insurance shall contain the following:

1. The Corcoran Unified School District and Leon Environmental Services must be named as “Additional Insured”, but only with respect to the work or activities of this project and under this contract.
2. Standard insurance coverage for general liability, automotive liability, workers compensation, etc., is also required.

PROJECT CLOSE OUT DOCUMENTATION

1. All personal air monitoring results for this project and laboratory accreditation.
2. Competent person and worker training certs, medical exam and fit test documentation for all personnel assigned to this project.
3. Contractor Daily logs and employee daily roster.
4. Entry/exit logs for all contained areas.
5. Safety meeting documentation and safety meeting attendance roster.
6. Copy of all non-hazardous waste manifest and or Hazardous waste manifest.
7. Contractor licensing information.
8. Copies of notifications to regulatory agencies

OWNER RESPONSIBILITIES

Owner will supply all water and power.

QUESTIONS AND CLARIFICATIONS

1. All questions regarding the project site, the site conditions, and the contract documents shall be submitted to the General Contractor.
2. All questions and clarifications shall be submitted to:

Vincente Rojas
Corcoran Unified School District
1520 Patterson Ave,
Corcoran, CA 93212
Email: vincenterojas@cocoranunified.com

SECTION 02 3100 - SUBSURFACE UTILITY INVESTIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes investigation and identification of location of overhead, surface, and underground utilities by the Contractor using firm specializing in underground utility verification.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Divisions 1 through 16 of these Specifications.
2. Section 02 4100: Demolition.
3. Section 31 2000: Earthwork.

PART 2 - PRODUCTS

2.1 UTILITY VERIFICATION COMPANIES

A. Use utility verification firm specializing in underground utility location.
1. Off-site utility verification: Underground Service Alert (USA), 800/642-2444.
2. On-site utility verification:
a. MDR Utility, (559) 827-3713.
3. Verify and stake all on-site utilities with Owner and on-site investigation prior to excavation.

PART 3 - EXECUTION

3.1 INVESTIGATION

A. Prior to demolition, trenching, and earthwork operations, identify location, routing, and elevation of underground utilities in the construction area and along utility trench routings with the Owner.

B. Verify existing utilities with the service providers (i.e., power, telephone, water, sewer, cable TV, etc.) to the point of connection on site (meter, transformer, etc.)

C. Locate underground utilities using electronic detection when available, utility map analysis, and on-site survey.

D. Underground utilities include but are not limited to gas, water, sewer, storm drain, electrical power and signals (fire alarm, telephone, computer, intercom, data), and sprinkler irrigation and controls.

E. Where non-metallic utilities such as storm drain lines are in the work site, snake metallic trace lines through the line prior to electronic detection.

3.2 IDENTIFICATION

A. Identify underground utilities by stakes, flags, and painted lines.

B. Document the invert elevation of all cleanouts, manholes, and drainage structures.

C. Maintain staking and marking of such utilities throughout the duration of the Work.

3.3 COORDINATION

A. Coordinate the proposed routing and elevation of pipes, conduits, and trenches that are part of the Work with existing utilities.

B. Coordinate the routing and elevation of new underground utilities with existing underground utilities. Notify the Architect immediately of any conflicts, prior to proceeding with demolition, trenching, or earthwork operations.

3.4 SITE CONDITIONS

A. Where existing utilities are indicated on the drawings, extreme care shall be exercised in excavating near these utilities to avoid damage, and the Contractor will be held responsible for any damage caused by construction operations.

B. Should utilities not indicated on the drawings be found during construction, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage arising from construction operations after discovery of these utilities.

3.5 UNFORSEEN CONDITIONS

A. Utilities and obstructions not traceable or noted on the Drawings will be considered unforeseen. Should such lines be encountered and damaged, the Contractor shall repair such condition immediately. The cost of repairs will be compensated to the Contractor on a time-and-materials basis by change order.

END OF SECTION 02 3100

SECTION 02 4210 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. In accordance with pertinent provisions of this Section, carefully demolish and remove from the site those items scheduled to be so demolished and removed. Section includes:
   1. Selective demolition of built site elements.
   2. Selective demolition of building elements for alterations purposes.
   3. Abandonment and removal of existing utilities and utility structures.
   4. Removal and/or relocation of designated building equipment and fixtures.
   5. Removal of designated construction.
   6. Disposal of materials.
   7. Storage of removed materials where indicated.

B. Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   1. Section 00 3100: Information about known hazardous materials.
   2. Section 01 1100: Work sequence, continued occupancy of the building, limitations on Contractor's use of site and premises, description of items to be removed by Owner, description of items to be salvaged or removed for re-use by Contractor.
   3. Section 01 5000: Temporary enclosures, dust control barricades, security at occupied areas, waste removal, and cleanup during construction.
   4. Section 01 5720: Temporary erosion and sedimentation control.
   5. Section 01 6600: Handling and storage of items removed for salvage and relocation.
   6. Section 01 7300: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
   7. Section 01 7330: Cutting and patching.
   8. Section 02 0160: Relocation of existing trees, shrubs, and other plants, pruning of existing trees to remain.
   9. Section 03 3540: Demolition of existing flooring to be polished and dyed.
   10. Section 07 0150: Removal of existing roofing, roof insulation, flashing, trim, and accessories.
   11. Section 31 1000: Vegetation and existing debris removal.
   12. Section 31 2000: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.2 REFERENCES

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.

1.3 QUALITY ASSURANCE

A. Applicable Codes: Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection. Perform demolition work in accordance with Chapter 33, 2019 California Fire Code.

B. Obtain required permits from authorities and comply with the requirements of the governing jurisdictions.

C. Do not close or obstruct egress from any building exit or site exit.

D. Do not disable or disrupt building fire or life safety systems without 3 days' prior written notice to Owner.

E. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.

1.4 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent and occupied properties in the general area of the project site.

B. Cease operations immediately if operations appear to be causing any detrimental effect to adjacent properties and notify Architect. Do not resume operations until directed.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide, erect, and maintain temporary barriers as required for the work.

B. Protect any existing improvements noted to remain or not noted for demolition.

C. Mark location and termination of utilities.

3.2 EXAMINATION

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only. By careful study of the Contract Documents, determine the location and extent of selective demolition to be performed. Visit the site and verify the extent and location of selective demolition required.
   1. Verify that construction and utility arrangements are as shown.
   2. Carefully identify limits of selective demolition.
   3. Mark interface surfaces as required to enable workmen also to identify items to be removed and items to be left in place intact.
   4. Report discrepancies to Architect before disturbing existing installation.
   5. Beginning of alterations work constitutes acceptance of existing conditions.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.

8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Demolished material shall be considered property of the Contractor and shall be completely removed from the job site except where specifically noted otherwise. Do not burn or bury materials on site.

C. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

D. Do not begin removal until receipt of notification to proceed from Owner.

E. Do not begin removal until built elements to be salvaged or relocated have been removed.

F. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

G. Remove materials as demolition progresses. Upon completion of demolition, leave areas in clean condition.

H. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

I. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

D. Remove existing work as indicated and as required to accomplish new work.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

F. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Intrusion Alarm): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 1110 for other limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

3.6 REPLACEMENTS

A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Architect and at no additional cost to the Owner.

END OF SECTION 02 4210

SECTION 03 1510 - POST-INSTALLED ANCHORS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide post-installed anchors where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
   1. Definition: Post-installed anchors are concrete anchors installed in drilled holes after concrete has hardened and includes expansion anchors, screw anchors, and epoxy-type (adhesive) anchors.

B. Related Sections:
   1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 1 Specification Sections, apply to work of this section.
   2. Section 03 3000: Cast-in-place concrete.
   3. Section 05 5000: Metal fabrications.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.

B. Product Data:
   1. Submit manufacturer's descriptive literature and product specifications for each product.
   2. Include data to indicate compliance with the specified requirements.
   3. Submit manufacturer's recommended installation procedures.
   4. Submit current ICC research or evaluation reports evidencing maximum allowable shear and withdrawal load data.

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: To ensure consistent quality of anchorage, obtain concrete expansion anchors from a single manufacturer.

B. Manufacturer Qualifications: Provide concrete expansion anchors with current International Code Council Evaluation Service Reports acceptable to the Division of the State Architect, and in conformance with the 2019 California Building Code.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
   1. Hilti KB-TZ2 (ESR 4266).
   2. Simpson Strong-Bolt (ESR-1771).
   3. Hilti HUS-EZ (ESR-3027).
   4. SimpsonTiten HD (ESR-2713).
   5. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Finish: Type 316 stainless steel at exterior applications; zinc-plated at interior applications; mechanically galvanized or type 316 stainless steel when in contact with preservative treated lumber.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate and furnish anchorages and directions for installation from manufacturer for items to be embedded in concrete construction.

3.2 INSTALLATION

A. Fastening to In-Place Construction (New or Existing Concrete): Provide anchorage devices where necessary for securing designated items indicated on the drawings, or as necessary for a complete and proper job to in-place construction.

B. Install post-installed anchors in strict accordance with the manufacturer's written instructions.

C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for designated items of construction. Set work accurately in location, alignment and elevation, level true and free of rack, measured from established lines and levels.

D. Concrete shall attain the specified design strength per the contract documents (2,500 psi minimum) prior to installation of post-installed anchors. Adhesive anchors shall be installed into concrete having a minimum age of 21 days at the time of installation. No anchors shall be installed into concrete that is less than 7 days old.

3.3 TESTING AND INSPECTION REQUIREMENTS

A. General Testing Requirements:
   1. For verifying satisfactory installation workmanship, an independent testing laboratory shall proof load tests for concrete expansion anchors acting in tension in the presence of the project inspector.
   2. If any anchor fails testing, test all anchors of the same type, not previously tested until 20 consecutive anchors pass, then resume the initial test frequency.
      a. If anchors are used for the support and bracing of non-structural components such as pipe, duct or conduit, the 20 consecutive anchors shall be only those anchors installed by the same trade.
   3. Continuous Inspection: Continuous inspection shall be provided during installation by project inspector.

B. Testing Frequency:
   1. Sill Plate Bolting: Test 10% of anchors.
   2. Other Structural Applications: Test all anchors.
   3. Non-structural Applications and Equipment Anchorage: Test 50% or alternate bolts in a group, including at least 1/2 of the anchors in each group.
   4. Exceptions:
      a. Undercut anchors that allow visual confirmation of full set shall not require testing.
      b. Where the factored design tension on anchors is less than 100 pounds and the anchor is clearly noted on the approved construction documents, only 10% of those anchors shall be tested.
      c. Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all of the following conditions are met:
         1) The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.
         2) The number of dowels in any one member equal or exceeds 12.
         3) The dowels are uniformly distributed across a seismic force resisting members (such as shear walls, collectors, and diaphragms).

4) Anchors to be tested shall be selected at random by the special inspector.

d. Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting systems shall not be required.

e. Testing is not required for power actuated fasteners used to attach metal tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.

C. Test Loads: Test loads shall be listed in the contract drawings and shall be determined by one of the following methods:

1. Twice the maximum allowable tension load or 1-1/4 times the maximum design strength of anchors as provided in an approved test report using criteria adopted in CBC 1909.2.7.5 or determined in accordance with chapter 17 of ACI 318.
   a. Tension test load need not exceed 80% of nominal yield strength of anchor element ($0.8A_bF_y$).
2. Tension or torque test values from the table within the contract drawings.

D. Test Acceptance Criteria: Use the ICC-ESR for the anchor installed or the manufacturer's written instructions, acceptable to DSA. Field tests shall satisfy the following minimum requirements:

1. Hydraulic Ram Method: Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernible movement during the tension test, e.g. as evidence of loosening of the washer under the nut. For adhesive anchors, where other than bond is being tested, the testing devices shall not restrict the concrete shear cone type failure mechanism from occurring.
2. Torque Wrenched Method: Anchors tested with a calibrated torque wrench must attain the specified torque within 1/2 turn of the nut.
   a. Exceptions:
      1). Wedge or Sleeve type: 1/4 turn of the nut for a 3/8" sleeve anchor only.
      2). Screw Type: 1/4 turn of screw after initial seating of the screw head.

E. Testing Procedure:

1. Testing procedure shall be as required by the manufacturer’s ICC-ESR.
2. Manufacturer’s recommendation for testing may be approved by the enforcing agency, when ICC-ESR does not provide testing procedure.

END OF SECTION 03 1510

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide cast-in-place concrete, including form work and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
   1. The work of this Section includes special precautions to reduce cracking in concrete slabs.

B. Related Sections:
   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.
   2. Section 03 1510: Post-installed Anchors.
   3. Section 07 9210: Joint Sealants.
   4. Section 31 2000: Earthwork.

C. Special Coordination Requirements: Coordinate with the work of the following sections to identify the finish flooring manufacturer's concrete slab requirements. Such requirements may be over and above the requirements of the Contract Documents and may require additional materials, means, or methods, which shall be included as part of the Work.
   1. Section 09 6500: Resilient flooring.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Mix Designs: Secure concrete mix designs from the concrete supplier or the testing laboratory in accordance with provisions of Section 01 4520, and submit to the Architect for review and approval. Distribute approved mix designs to testing laboratory, batch plant, job site, and governmental agencies having jurisdiction.
      a. Include a statement clearly indicating the concrete supplier's proposed basis of concrete mix proportions based on ACI 301-16, Section 4.2.3.
      b. When ACI 301-16, Section 4.2.3 is used, strength records used for establishing and documenting concrete mixture proportions shall not be more than 24 months old.
   2. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements for the following:
      a. Vapor barrier.
      b. Curing materials.
      c. Slip dowel system.
   3. Shop Drawings: Submit shop drawings for the reinforcing steel.
   4. Submit cementitious materials certification to DSA complying with CBC Section 1910A.1.
   5. Submit batch tickets of each load to the Inspector of Record.

1.3 QUALITY ASSURANCE

A. Codes and Standards: Comply with 2019 California Building Code except where more stringent requirements are shown or specified.

B. In accordance with CBC Section 1705A.3.5, do not place concrete until forms and reinforcement have been inspected, all preparations for placement have been completed, and preparations have been checked by the Inspector of Record, all subject to observation of the Architect, Structural Engineer and DSA.

C. Placing Record: In accordance with CBC Section 1705A.3.6, keep a concrete placing record on site recording the

time and date of placing the concrete in each portion of the structure. Keep placing record until completion of the structure and make available to the inspection of the Owner, Architect, Structural Engineer, Inspector of Record, and DSA.

D. Field Mock-up: Before performing work of this Section, provide following field mock-up to verify selections made under submittals and to demonstrate aesthetic finish and texture of site concrete, parking lot concrete and fire lane concrete. Approval does not constitute approval of deviations from Contract Documents, unless Architect specifically approves deviations in writing.
   1. Form, reinforce, and cast concrete slab for 3 foot square field mock-up. One mock-up for each finish and texture specified.
   2. Concrete shall be same mix design as scheduled for Project.
   3. Perform placement and finishing work using same personnel as will place and finish concrete for Project.
   4. Mock-up shall be representative of work to be expected.
   5. Approval is for following aesthetic qualities:
      a. Compliance with approved submittals.
      b. Compliance with specified finish and texture.
      d. Compliance with specified color.
   6. Obtain mock-up approval by the Owner, Architect and Project Inspector before starting work on Project.
   7. Unacceptable mock-ups shall be removed from the site and reinstalled until the mock-up is deemed to be in compliance with the project requirements and is acceptable by the Owner, Architect and Project Inspector.
   8. Protect and maintain approved field mock-ups during construction in an undisturbed condition as a standard for judging completed work. Remove mock-up and dispose of materials when no longer required and when directed by the Architect at the end of the project.

1.4 NOTICE CONCERNING SLAB CURLING AND SHRINKAGE CRACKING

A. The Contractor is hereby notified that concrete construction practices and concrete materials can significantly increase the potential for cracking and slab curling, which include the following:
   1. Placement of slabs over high-moisture content subgrade.
   2. Increased mix temperature.
   3. Excessive haul in transit mixture, too long a waiting period at the project site, or too many revolutions at mixing speed.
   4. Use of smaller size aggregate under conditions where larger could have been used.
   5. Use of mixture having high shrinkage characteristics.
   6. Excessive coatings on aggregate due to insufficient washing or contamination during handling.
   7. Use of aggregates of poor inherent quality with respect to shrinkage.
   8. Exceeding the maximum water/cement ratio.

B. The Contractor is responsible for choosing concrete materials and for implementing concrete construction practices which minimize slab curling and shrinkage cracking.

1.5 SPECIAL WARRANTY

A. Manufacturer's Warranty: In addition to the warranty requirements of the Contract Documents, submit 2 copies of a warranty from the interior slab curing product manufacturer with an extended correction period of **15-years** covering labor and materials to replace or repair floor covering that fails due to moisture migration or moisture-born alkalinity contaminates originating from the concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 FORMS

A. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.

B. Except for metal forms, use new materials. Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.
   1. Form Facing for Exposed to View Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
   2. Chamfer or radius outside corners of beams, joists, columns, and walls.

C. Slip Dowel System: Speed Dowel by Westec Barrier Technologies; #4 rebar dowels x 24" long at 18" on center, minimum of 12" sleeve.

D. Snap Ties: Snap Ties by Dayton/Richmond Concrete Accessories (Constar Supply 559-564-5012), with A-8 Waterseal Washer.

E. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

2.3 REINFORCEMENT

A. Comply with the following as minimums:
   1. Bars: ASTM A615, Grade 40 for #3 bars and smaller, Grade 60 for #4 bars and larger, using deformed bars for #3 and larger.
   2. Bending: ACI 318-14, Section 26.6.3.
      a Bars shall be limited to one shop or field bend at any location on the bar.
      b. Partially embedded bars shall not be field bent, except as indicated on the Drawings or permitted by the Architect.
      c. A bar bent in the incorrect location shall not be straightened; such bars shall be discarded.

B. Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in ACI 318-14.

C. Do not use reinforcement having any of the following defects:
   1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
   2. Bends or kinks not indicated on the Drawings or required for this Work;
   3. Bars with cross-section reduced due to excessive rust or other causes.

D. Shop fusion welded stirrup/tie cages shall be permitted provided they are in conformance with CBC 1903A.8.

2.4 CONCRETE

A. Portland Cement: ASTM C150, Type II.

B. Fly Ash: May be used as a partial substitute for Portland cement as follows:
   1. Fly ash: ASTM C618, Class F (Class C is not permitted).
   2. Fly ash used may be included in the water/cement ratio calculation.
   3. Not more than 20% by weight of fly ash shall be substituted for Portland cement.
   4. For concrete with surfaces to be polished, no fly ash in the mixture is allowed.

C. Normal Weight Aggregate: ACI 318 Section 26.4.1.2.1(a).(1) and ASTM C 33, except as modified in CBC Section 1903A.5. Provide aggregates from a single source for exposed concrete.

D. Water: ACI 318-14, Section 26.4.1.3.

E. Admixtures:
   1. Do not use calcium chloride admixtures.
   2. Admixtures are not permitted without approval from Architect and DSA.

2.5 NORMAL WEIGHT CONCRETE DESIGN MIX

A. Proportions: Concrete mix shall be proportioned based on field experience or trial mixtures in accordance with ACI 318-14, Section 26.4.3, and ACI 301-16, Section 4.2.3.
   1. Mix design submittals shall include a statement clearly indicating the concrete supplier's proposed basis of concrete mix proportions through the use of one of the following:
      a. Field experience under ACI 301-16 paragraph 4.2.3.4a, or
      b. Trial mixtures under ACI 301-16 paragraph 4.2.3.4b.
   2. When ACI 301-16, Section 4.2.3 is used as the concrete supplier's proposed basis of concrete mix proportions, strength records used for establishing and documenting concrete mixture proportions shall not be more than 24 months old.

B. Design Professional: A registered civil or structural engineer, licensed in California, with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use.
   1. Mix design submittals shall include the engineer’s stamp and signature.

C. Cement Content: Minimum of 5.5 sacks of cement per cubic yard.
   1. Minimum of 5.0 sacks of cement per cubic yard for site concrete (flat work and rat slabs). Off-site concrete shall conform to governing agency standards.

D. Type A Water Reducer (interior slab on grade only): 28.20 oz/cy, plus or minus 20%.

E. Water/Cementitious Material Ratio:
   1. Footings: Maximum of 0.56.
   2. Site Concrete: Maximum of 0.67.
   3. Interior Slabs/Parking Lots/Fire Lanes: Maximum of 0.50.

F. Minimum Compressive Strength:
   1. Footings, interior slabs, parking lots, fire lanes and retaining walls: 3,000 psi at 28 days.
   2. Site Concrete and rat slabs: 2,500 psi at 28 days.
   3. Polished concrete: 3,500 to 4,000 psi at 28 days.

G. Aggregate Gradation Optimization:
   1. Workability Factor: 32-42%; **target 35%.**
   2. Coarseness Factor: 52-72%; **target 60%.**
   3. Fineness Modulus: 2.80 to 3.10.
   4. Paste Fraction: 27% plus or minus.

5. Mortar Fraction: Passing the No. 8 sieve.
   a. ¾" to 1" aggregate: 55-57%.
   b. 1-1/2" aggregate: 53-54%.

H. Aggregate Gradation Limits of Combined Mixture:

Sieve Size	% Passing	
	Interior Slabs Parking Lots Fire Lanes 1-1/2"	**Footings Site Concrete Rat Slab Retaining Walls 1"**
2"	100	--
1-1/2"	95-100	100
1"	80-96	94-100
3/4"	65-80	87-99
1/2"	55-65	65-78
3/8"	45-60	55-64
#4	35-50	40-55
#8	25-38	33-43
#16	20-30	19-32
#30	10-20	9-24
#50	2-12	4-12
#100	1-6	1-8
#200	0-4	0-4

I. Slump Limits: Proportion and design mixes for slump at point of placement of 4" plus or minus 1".

J. Concrete Temperature: 90 deg F maximum at time of placement.

K. Ready-Mix Concrete: Comply with ASTM C94, and as herein specified.

2.6 LIGHTWEIGHT CONCRETE DESIGN MIX

A. Proportions: Concrete mix shall be proportioned based on field experience or trial mixtures in accordance with ACI 318-14, Section 26.4.3, and ACI 301-16, Section 4.2.3.
   1. Mix design submittals shall include a statement clearly indicating the concrete supplier's proposed basis of concrete mix proportions through the use of one of the following:
      a. Field experience under ACI 301-16 paragraph 4.2.3.4a, or
      b. Trial mixtures under ACI 301-16 paragraph 4.2.3.4b.
   2. When ACI 301-16, Section 4.2.3 is used as the concrete supplier's proposed basis of concrete mix proportions, strength records used for establishing and documenting concrete mixture proportions shall not be more than 24 months old.

B. Aggregate: Expanded shale, vacuum saturated or thermal quenched; ASTM C330.
   1. Maximum Lightweight Aggregate Size: 3/4".

C. Shrinkage Control: Aggregate shall be prepared within 72 hours of being used or be re-wetted for 1/2 hour, twice a day if longer storage is required at the plant.

D. Compressive Strength: 3,000 psi at 28 days. Polished concrete: 3,500 to 4,000 psi at 28 days.

E. Slump Limits: 3" plus or minus 1", measured at the end of the discharge line.

F. Cement Content: Minimum 6.0 sacks of cement per cubic yard.

G. Water/Cement Ratio: 0.50 maximum, measured on free water only.

H. Maximum Lightweight Aggregate Size: 3/4".

I. Entrained Air: 4% to 7%.

J. Weight: 110 pounds per cubic foot, plus or minus 3 pounds.

2.7 CURING MATERIALS

A. Interior Slabs with floor covering (resilient flooring and carpet): Concrete surface treatment applied the day of the concrete placement; volatile organic compound (VOC) content rating as required to suit regulatory requirements.
   1. Acceptable Products:
      a. PMC3300 by Curranseal, www.curranseal.com.
      b. VC-5 by Sinak Corporation, www.sinak.com.

B. Interior Slabs with tile, polished concrete, sealed concrete or bare concrete: Curing blanket, 4 mil white opaque polyethylene laminated over 10 oz. burlap; ASTM C171.

C. Exterior Flatwork on Grade: Clear, Curing compound, colorless, non-yellowing material containing 30% solids content minimum; ASTM C309.
   1. Shall not discolor concrete or other materials, shall not leave an oily residue upon evaporation of solvent.
   2. Shall afford moisture loss not greater than 0.055 grams/cm^2 at minimum average of 300 square feet.
   3. Meet State of California Air Regulation Board Solvent Emission Standards.
   4. Curing compounds may not be used on areas to receive traffic coatings unless specifically accepted by the traffic coating manufacturer.
   5. Solvent borne acrylic cure and seal products are not acceptable; ASTM C1315.

2.8 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Expansion Joint Filler: Comply with ASTM D1751 or provide resin-impregnated fiberboard conforming to ASTM D1752.

C. Non-shrink Grout:
   1. Factory premixed grout; ASTM C1107.
   2. Compressive strength: 7,000 psi at 28 days.

D. Dry Pack Grout: One part Portland Cement to two parts fine sand.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

B. Coordinate with Section 31 2000 – Earthwork prior to placing any concrete.

3.2 FORMWORK INSTALLATION

A. Construct forms to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
   1. **Non-Exposed Surfaces:** Where concrete surfaces are not exposed to view, construct formwork conforming to a Class B Surface, Paragraph 4.8.3 of ACI PRC-117.1-14.
   2. **Exposed Surfaces:** Where concrete surfaces are exposed to view, construct forms so that concrete surfaces will have a tolerance of 1/2 of the tolerance limits of a Class A Surface, Paragraph 4.8.3 of ACI PRC-117.1-14.

B. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape. Forms and their supports shall be designed so as not to damage previously placed structure.
   1. Slab Forming Techniques: Do not puncture the vapor barrier.

3.3 SOIL TREATMENT OF SIDEWALK AND PAVEMENT AREAS WITH HERBICIDES

A. Just prior to placing concrete for pavements and sidewalks, apply herbicide soil treatment at recommended rates for application. Protect desirable vegetation from herbicide treatment.

B. Herbicide shall bear evidence of registration under Federal Insecticide, Fungicide, and Rodenticide Act for weed control application.

3.4 REINFORCING

A. Comply with the following, as well as the specified standards, for details and methods of reinforcing placement and supports.
   1. Clean reinforcement and remove loose dust and mill scale, earth, oil, and other materials which reduce bond or destroy bond with concrete.
   2. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations. Provide metal chairs, dobies, or other aids manufactured for this purpose.
   3. Place reinforcement to obtain the required coverages for concrete protection.
   4. Reinforcement of site concrete and fire lane paving shall be placed at 2” below the concrete surface unless otherwise shown.
   5. Unless otherwise shown or noted on the Drawings, lap bars as noted on Lap Schedule in structural drawings.
   6. Partially embedded reinforcing shall not be bent without the approval of the DSA.

3.5 EMBEDDED ITEMS

A. Do not embed piping, other than electrical conduit, in structural concrete. See structural drawings for provisions for pipes, sleeves, conduits or other penetrations into or through the footings.

B. Set bolts, inserts, and other required items in the concrete, accurately secured so they will not be displaced, and in the precise locations needed. **IN NO CASE SHALL ANY BOLT OR ANCHOR BE STABBED IN PLACE WHILE OR AFTER THE CONCRETE IS POURED.** Evidence of stabbing will necessitate testing at the expense of the contractor.

C. **Slip Dowel System:** Install in accordance with manufacturer's written recommendations.

3.6 MIXING CONCRETE

A. Transit mix the concrete in accordance with provisions of ASTM C94.
   1. Water shall only be added at the beginning of discharge and shall be a one-time addition of water. At a minimum, the drum shall be turned an additional 30 revolutions after addition of water. After discharge has begun the addition of water is prohibited.
   2. Discharge of the concrete shall be completed within 90 minutes, or before the drum has revolved 300 times after the cement has been exposed to the mixing water or aggregates.

B. Cold Weather Requirements:
   1. Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather. All concrete materials and all reinforcement, forms, fillers, and ground with which concrete is to come in contact shall be free from frost. Frozen materials or materials containing ice shall not be used.
   2. When mixing concrete during freezing or near-freezing weather, the mix shall have a temperature of at least 55 deg F., but not more than 90 deg F. When necessary, concrete materials shall be heated before mixing. Special precautions shall be taken for the protection of transit-mixed concrete.
   3. The concrete shall be maintained at a temperature of at least 55 deg F. for not less than 72 hours after placing. After the initial curing period allow the concrete surface to dry prior to exposure. Do not permit the concrete to cool faster than the rate of 5 deg F per hour or more for the first 24 hours.

C. Hot Weather Requirements:
   1. During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection and curing to prevent excessive concrete temperatures or water evaporation that may impair required strength or serviceability of the member or structure.
   2. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

3.7 PLACING CONCRETE

A. Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the Inspector of Record, all subject to the observation of the structural engineer or Architect.

B. Preparation:
   1. Remove foreign matter accumulated in the forms.
   2. Rigidly close openings left in the formwork.
   3. Wet wood forms sufficiently to tighten up cracks; wet other material sufficiently to maintain workability of the concrete.
   4. Use only clean forms and tools.

C. Conveying: ACI 318-14, Section 26.5.2.1.
   1. Concrete shall be conveyed from mixer to place of final deposit by methods that will prevent separation or loss of materials.
   2. Conveying equipment shall be capable of providing a supply of concrete at site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.
   3. Remove rejected concrete from the job site.

D. Placing Concrete in Forms: ACI 318-14, Section 26.5.2.1.
   1. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concreting shall be carried on at such a rate that concrete is at all times plastic and flows readily into spaces between reinforcement.
   2. Where concrete is placed in lifts, each lift shall be thoroughly consolidated before the next layer is placed. The rate of placement shall be rapid enough so that previously placed concrete has not yet set when the next lift of concrete is placed upon it. Do not allow flow lines, seams, and planes of weakness (cold joints) to form as a result of placement means and methods.

E. Placing Concrete Slabs:
   1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
   2. Bring slab surfaces to the correct level with a straightedge, and then strike off.
   3. Use wood bullfloats or darbies to smooth the surface, leaving the surface free from bumps and hollows.
   4. Do not sprinkle water on the plastic surface. Do not disturb the slab surface prior to start of finishing operations.

3.8 CONSOLIDATION

A. All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
   1. Where conditions make consolidation difficult, or where reinforcement is congested, batches of concrete adjusted to use smaller size aggregates shall be used as approved by the structural engineer and the enforcement agency.
   2. Do not vibrate forms or reinforcement.
   3. Do not use vibrators to transport concrete inside the forms.
   4. Perform consolidation by experienced personnel.

3.9 JOINTS

A. Construction Joints (CJ):
   1. Do not use horizontal construction joints except as may be shown on the Drawings.
   2. If additional construction joints are found to be required, secure the Architect's approval of joint design and location prior to start of concrete placement.
   3. Joints shall be constructed in accordance with ACI 318-14, Section 26.5.6.

B. Isolation Joints (IJ):
   1. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except dowels in floors bonded on only one side of the joints) to extend continuously through any isolation joint, unless specifically noted.
   2. Fill isolation joints full depth with joint material approved by the Architect.
   3. Provide isolation joints as shown on plans.

C. Crack Control Joint (CCJ):
   1. Provide template or guide as required for straight sawcut.
   2. Joints shall be spaced as indicated on the Drawings, but not more than 10'-0" on center.

a. Joints shall be placed to produce panels that are as square as possible and never exceed a length to width ratio of 1 ½ to 1 – in which case additional joints shall be installed.
3. Saw cut joints before concrete begins to cool, within 2 to 12 hours after placing.
4. Use 1/8" thick blade and cut at least 1" deep but not less than one third (1/3) the depth of the slab.

3.10 CONCRETE SLAB FINISHING

A. Finish work shall be performed in accordance with ACI 302.1R-15, Chapter 10.

B. Finished Slab Surfaces: Except as may be shown otherwise on the Drawings, provide the following finishes at the indicated locations:
1. Scratch Finish: Apply to monolithic slab surfaces that are to receive concrete floor topping or mortar setting bed.
2. Float Finish: Apply to monolithic slab surfaces that are to receive trowel finish and other finishes specified hereinafter, and to slab surfaces which are to be covered with tile on a setting bed.
3. Trowel Finish: Apply to interior monolithic slab surfaces that are to be exposed to view, unless otherwise shown, and to slab surfaces that are to be covered with resilient flooring, carpeting, thin-set tile, paint, or other thin-film finish coating system.
4. Non-slip Broom Finish: Apply to exterior walks, stairs, drives, ramps, and similar pedestrian and vehicular areas. Coordinate required final finish with Architect before application.
a. Medium broom finish for slopes < 5%.
b. Heavy broom finish for slopes ≥5%.

C. Finish Concrete Slab Tolerances:
1. Slabs shall be level unless slope is otherwise specified.
2. Tolerances of finished slab surfaces shall comply with ACI 117.1R-14 "Class A Surface Finish Tolerance". Depressions in floor between high spots shall not be greater than 1/8" between a 10' long straight edge.
3. Depressed surfaces shall be leveled with an approved filler and sanded smooth.
4. High spots shall be ground down until level. Remove dislodged aggregate and patch floor.
5. Grind or fill surface defects which would telegraph through applied floor covering systems.
6. Owner reserves the right to test floors and concrete members for conformance to ACI 117.1R-14 Tolerance Specifications by Use of the "Dipstick Floor Profiler". Should tolerances not be within the limits specified, the Contractor shall be required to pay for all testing costs and repairs required to bring materials into compliance.

D. Exterior Flatwork Edge and Joint Finishing:
1. Finish slab edges, including those at formed joints, with an edger having a radius of 1/8".
2. Edge transverse joints prior to brooming. Brooming shall eliminate the flat surface left by the surface face of the edger.
3. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with the properly proportioned mortar mixture and then finished.

E. Required Grinding of Interior Slab:
1. The Contractor shall anticipate that grinding will be required as a result of curling or other slab defects. Grinding required to bring the slab surface into acceptable tolerances for finished flooring installation shall be included as part of the Work.
2. Provide a slip resistant surface after grinding and filling with a 0.6 coefficient of friction at exposed slabs and exterior flatwork.

3.11 CURING

A. ACI 318, Section 26.5.3: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Curing Methods with Surface Applied Curing Products: Apply curing products immediately after concrete finishing in strict accordance with the manufacturer's written installation instructions.

3.12 REMOVAL OF FORMS

A. ACI 318, Section 6.2.
   1. Forms shall be removed in such manner as not to impair safety and serviceability of the structure. All concrete to be exposed by form removal shall have sufficient strength not to be damaged thereby.

B. No portion of the forming and shoring system may be removed less than 12 hours after placing concrete. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.
   1. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
   2. Do not strip vertical concrete in less than 7 days.

C. Finished Surfaces:
   1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged.
   2. Release sleeve nuts or clamps, and pull the form ties neatly.
   3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.

D. Repair of Surface Defects: Repair or replace deficient work at no additional cost to the Owner.
   1. Repair tie holes and other surface defects immediately after formwork removal.
   2. Where the concrete surface will be textured by sandblasting or bush-hammering, repair surface defects before texturing.
   3. Repair tie holes and surface defects to match surrounding concrete color and surface texture.
   4. Repair tie holes and surface defects in conformance with ACI 301-16, Paragraph 5.3.7.

3.13 SURFACE FINISH OF VERTICAL CONCRETE SURFACES

A. Unexposed Form Finish: Rub down or chip off fins or other raised areas.

B. Exposed (to view) Form Finish: Rub down or chip off and smooth fins or other raised areas.
   1. As-Cast Finish: Provide surface finish 3.0 in accordance with ACI 301-16, Paragraph 5.3.3.3.
   2. Rubbed Finish:
      a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
      b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
      c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
   3. Architectural Finish: Provide architectural finish in accordance with ACI 301-16, Paragraph 6.3.10.
      a. Textured finish using textured forms or form liners.
      b. Exposed aggregate finish using abrasive blast.
      c. Exposed aggregate by removing retarded surface paste on vertical surfaces.
      d. Acid wash.
      e. Mechanical tooling (bush hammering).
      f. Water blast.

3.14 FINISH OF CURBS AND GUTTERS

A. Finish of Curbs and Gutters:
   1. Tool edges of gutter and top of curb with an edging tool to a radius of 1/2"
   2. Float and finish surfaces with a smooth wood float until true to grade, section and uniform in texture.
   3. Brush floated surfaces with a fine-hair brush using longitudinal strokes.
   4. Immediately after removing the front curb form, rub face of curb with wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. While still wet, brush surface in the same manner as the gutter and curb top.
   5. Finish the top surface of gutter and entrance drives to grade with a wood float.

3.15 MISCELLANEOUS CONCRETE ITEMS

A. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

B. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.

C. Dry Pack Grout:
   1. Pack solid under sill plates where indicated to provide continuous bearing.
   2. Provide dry pack prior to installation of roof framing.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. Testing of concrete materials shall comply with Section 01 4520, CBC Chapter 17A, and CBC Section 1910A.

B. The Owner will employ a testing laboratory to perform tests and to submit test reports. Sampling and testing for quality control during placement of concrete may include the following, as directed by the Architect.

C. Compaction and Moisture Testing sub-grade.
   1. Test sub-grade immediately prior to placing any concrete or placing a vapor barrier as described in Section 31 2000 – Earthwork.

D. Sampling Fresh Concrete: Comply with requirements of ASTM C172.
   1. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
   2. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens are made.
   3. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
   4. Compressive Strength Tests: ASTM C39; one set for each day's pour, but not less than one set for each 50 cubic yards or each 2,000 square feet of surface area of slabs or walls for each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days; and one specimen retained in reserve for later testing if required.
   5. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

E. Batch Plant Inspection:
   1. Continuous batch plant inspection during mixing will be required on this project for structural concrete, including but not limited to footings, foundation walls, retaining walls, columns, and floor slabs in compliance with CBC Section 1705A.3.3.
   2. Batch plant inspection may be waived in accordance with CBC Section 1705A.3.3.1.

F. Reinforcing Steel Testing **will be required on this project**, except for non-structural concrete work. Comply with CBC Section 1910A.2; testing will be waived if mill certificates are provided.

G. Slab Finish Tolerance Testing: Where requested by the Architect, test slabs for finish tolerance in accordance with ACI 117 Tolerance Specifications by Use of the "Dipstick Floor Profiler".

H. Test Results will be reported in writing to Architect and Contractor within 24 hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

I. Non-Destructive Testing: Rebound hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

J. Additional Tests:
   1. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect.
   2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
   3. The Owner shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
   4. The Owner shall be compensated for such additional testing by deducting the additional costs from the General Contractor’s final payment.

END OF SECTION 03 3000

SECTION 05 5000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data:
      a. Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
      b. Submit manufacturers recommended installation procedures.
   2. Shop Drawings: Submit shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

1.3 QUALITY ASSURANCE

A. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.

B. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures" and CBC Section 2204A.1.

C. Codes and Standards: Comply with provisions of the following: California Building Code, 2019 Edition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Comply with following standards, as pertinent.
   1. Steel Sections: ASTM A36.
   2. Steel Tubing: ASTM A500, Grade C cold-formed structural tubing.
   3. Steel Pipe: ASTM A53, Type S, Grade B, standard weight.
   4. Bolts, Nuts, and Washers: ASTM A325, Type 1, galvanized to ASTM A153 where connecting galvanized components.
   5. Welding Materials: AWS D1.1; type required for materials being welded.
   6. Aluminum Sheet: ASTM B209, 5005-H32 minimum; alloy and temper recommended by aluminum producer and finisher for use and finish indicated.
   7. Galvanized Steel Sheet: ASTM A653; G90 coating.
   8. Steel Sheet: ASTM A1008; uncoated, cold rolled commercial steel, exposed or ASTM A879 electrolytic zinc coating over ASTM A 1008, steel sheet substrate.
   9. Stainless Steel Sheet: ASTM A666, Type 304; stretcher-leveled.

2.2 FASTENERS

A. General:
1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.
2. Provide fasteners of type, grade, and class required for the particular use.

B. Bolts, Nuts, and Washers: ASTM A325, Type 1, galvanized to ASTM A153 where connecting galvanized components.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.4 FINISHES

A. Primer: 10-99 by Tnemec or No. 5269 by Rustoleum.

B. Provide zinc coating for those items indicated or specified to galvanized, as follows:
1. ASTM A153 for galvanizing iron and steel hardware.
2. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strips 1/8" thick and heavier.
3. ASTM A386 for galvanizing assembled steel products.
4. ASTM A535 for galvanizing sheet steel.

C. For repair of galvanizing, use a high zinc-dust content paint complying with MIL-P-21035.

2.5 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.

C. Fabricate with accurate angles and surfaces which are true to the required lines and levels, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

D. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use. Cut, reinforce, drill, and tap miscellaneous metal work as required to receive finish hardware and similar items.

E. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

F. Curved work shall be evenly sprung.

2.6 FABRICATED ITEMS

A. Rough Hardware: Provide bent or otherwise custom fabricated bolts, plates, anchors, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting work, and for anchoring or securing work to concrete or other structures.
1. Provide galvanized rough hardware at exterior conditions.

B. Miscellaneous Framing and Supports: Provide miscellaneous framing and supports not a part of the structural steel framework, as required to complete the work.
   1. Fabricate miscellaneous units to shapes, sizes, and profiles indicated, or if not indicated, of required dimensions to receive adjacent work. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware and similar items.
   2. Provide galvanized framing and supports at exterior conditions.

C. Steel Handrails, Guards, and Railings: Provide round pipe or square tubing as indicated on the Drawings.
   1. Round Pipe: 1-1/2" nominal diameter standard weight galvanized steel pipe, 0.145" wall thickness.
   2. Square Tubing: 1-1/2" galvanized steel square structural tubing, 0.1875" wall thickness.
   3. Wall Brackets: No. 377/378 by Julius Blum, or No. 1703-2 by R&B Wagner, with bracket filler for either gypsum board or plaster.
   4. Fabrication:
      a. Provide flush fittings with joints welded and ground smooth and flush. Weld vertical supports to horizontal members in same manner as fittings.
      b. Remove burrs from all exposed cut edges.
      c. Miter or radius all joints as required. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finish surfaces, or use prefabricated bends.
      d. Provide wall returns at ends of wall mounted handrails to with 1/8" of wall.
      e. Close exposed ends by welding 3/16" minimum thickness steel plate in place or with prefabricated fittings.
      f. Provide galvanized steel sleeves for concrete embedment where indicated.
      g. Secure ends of members butted to vertical surfaces with galvanized steel flanges.
      h. Secure handrails to walls with brackets spaced at 5'-0" on center maximum.
      i. Provide vertical posts at the spacing indicated, but not more than 5'-0" on center.
      j. Welding: Accurately miter and cope intersections of posts and rails and weld all around. Thoroughly fuse without undercutting or overlap. Remove spatter, grind exposed welds and contour surfaces to match those adjacent.
      k. Provide pressure relief holes at closed ends.

2.7 SHOP PAINTING

A. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B): SSPC-SP6, Commercial Blast Cleaning.
   2. Interiors (SSPC Zone 1A): SSPC-SP3, Power Tool Cleaning.

B. Cleaning: Clean ferrous and galvanized metal surfaces with proper solvents to remove all grease and other foreign matter which will hinder and/or prevent proper finishing and installation.

C. Application: Apply 1 coat of shop primer to the dry film thickness recommended by the manufacturer to surfaces of metal fabrications except those which are indicated to be embedded in concrete or masonry and in compliance with requirements of SSPC-PA1, Paint Application Specification No. 1, for shop painting.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

A. General:
   1. Set work accurately into position, plumb, level, true, and free from rack.
   2. Anchor firmly into position.
   3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
   4. Grind exposed welds smooth, and touch up shop prime coats.
   5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

B. Primer Repair: Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

C. Galvanizing Repair: Repair all damage to galvanizing as a result of fabrication, handling, and installation, with 2 coats of cold galvanizing paint in accordance with the manufacturer's written instructions.

D. Pipe Railings and Handrails: Unless otherwise indicated or approved by the Architect:
   1. Secure to wall with approved fasteners into solid blocking.
   2. Where on steel stud construction, provide backup plate within the studs and covering not less than three studs.

END OF SECTION 05 5000

SECTION 06 1100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Provide lumber, construction panels, structural composite wood, nails, bolts, screws, framing anchors and other rough hardware, and other items needed, and perform rough carpentry for the construction shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
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.
2. Section 06 4000: Architectural woodwork.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements for the following:
a. Framing anchors.
b. Preservative treatment.
2. Installation Procedures: Submit manufacturers recommended installation procedures.

B. Machine Nail Samples: Contractor shall allow the Inspector to take random samples from actual machine nail containers proposed for use on the project. Samples shall be reviewed and accepted prior to any machine nailing. Nails sampled shall meet the requirements for machine nailing indicated on the Drawings.

1.3 QUALITY ASSURANCE

A. Codes and Standards:
1. All material and workmanship shall comply with CBC Chapter 23 and ANSI/AWC NDS 2018.
2. **Lumber standards:** DOC PS-20-05 American Softwood Lumber Standard, with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review. Factory mark all lumber indicating the specie and grade of each piece.
3. **Inspection Agencies:** All lumber shall be graded in accordance with Standard Grading Rules for West Coast Lumber, No. 17 by West Coast Lumber Inspection Bureau (WCLIB), or Western Lumber Grade Rules, latest edition by Western Wood Products Association (WWPA).
4. **Plywood Panel Standards:** DOC PS–1-09 Construction and Industrial. For products not manufactured under PS-1 provisions, with American Plywood Association (APA) Performance Standard and Policies for Structural-Use Panels, Form No. E445. Plywood used for structural purposes shall be marked "APA W/EXT GLUE" and shall be span-rated sheathing. Factory-mark each plywood panel with APA trademark evidencing compliance with grade requirements.
5. **Preservative Treatment:** Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Rejection:
1. Below-grade material shall not be used as load-carrying members which have been designed for specified allowable stresses and acceptable safety factors.
2. Any material which falls below grade shall be rejected for load-carrying use.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6600.

B. Protection:
1. Deliver the materials to the job site and store, in a safe area, out of the way of traffic, and shored up off the ground surface.
2. Identify framing lumber as to grades, and store each grade separately from other grades.
3. Protect metals with adequate waterproof outer wrapping.
4. Use extreme care in off-loading of lumber to prevent damage, splitting, and breaking of materials.

PART 2 - PRODUCTS

2.1 LUMBER

A. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by DOC PS-20-05, for moisture content specified for each use.
1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19% maximum moisture content at time of dressing and shipment, and at time of use, unless otherwise indicated.

B. Slope of grain of lumber used in tension members shall not exceed 1:8 slope.

C. Framing lumber shall be No. 1 Douglas Fir, unless otherwise indicated on the drawings.

D. Where wood member are in contact with masonry or concrete, use No. 1 Douglas Fir pressure treated with an approved factory preservative treatment as specified in this Section.

E. **ALL 3X AND LARGER MATERIAL SHALL BE "FREE OF HEART CENTER".**

F. Fascia: Provide Hem-Fir material at all finished fascia boards and at fascia boards covered with metal fascia and trim.

2.2 CONSTRUCTION PANELS

A. Plywood: Exterior Grade with exterior glue, graded to conform to DOC PS-1-09.

B. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA A-C PLUGGED and SANDED INT with exterior glue, 3/4" thick.

C. Roof Sheathing: APA Rated Sheathing, C-D, Exposure 1; thickness and span index as indicated.

D. Wall Sheathing: APA Rated Sheathing, C-D, Struct I, Exposure 1; thickness and span index as indicated.

E. Subfloor: APA Rated Sheathing, C-D, Exposure 1, T & G; thickness and span index as indicated.

F. Underlayment: Particleboard, ANSI A208.1, Grade PBU, 3/8" minimum thickness.

2.3 ACCESSORIES AND OTHER MATERIALS

A. Building Paper: Kraft paper; ASTM D227.

B. Sheet Metal Framing Anchors: Shall be as noted on the drawings.

C. Machine Bolts: ASTM A307.

D. Lag Bolts: ASME B18.2.1.

E. Nails:
1. Use **common nails** except as otherwise noted.
2. Comply with ASTM F1667. Minimum dimensions shall be as follows:

Pennywt.	Shank Dia.	Head Dia.	Length
8d	0.131" ± .004"	0.281" ± 10%	2.5" ± 1/16"
10d	0.148" ± .004"	0.312" ± 10%	3.0" ± 3/32"
16d	0.162" ± .004"	0.344" ± 10%	3.5" ± 3/32"

3. All nails for pressure treated or fire-retardant lumber shall be hot-dipped zinc-coated galvanized. Nails with other types of galvanizing may be used if pre-approved by the enforcement agency.

F. Fasteners and Anchors: Size, type, material as indicated and as recommended by applicable standards; unfinished, except as specified below.
1. In Preservative Treated Wood:
   a. Use Categories UC2 and UC3B: Hot-dip zinc coating, types and weights in accordance with the treated wood or anchor manufacturer; ASTM A153 or F2329.
   b. Use Category UC4A: Type 316L stainless steel.
2. In Exposed Exterior Conditions: Type 316L stainless steel.
3. In Concrete or Masonry: Mechanically deposited zinc coating; ASTM B695, Class 55 minimum.

G. Connectors and Hangers: Fabricate from steel with minimum ASTM A653 G90 zinc coating, thickness to suit framing conditions.
1. At Preservative Treated Wood:
   a. Use Categories UC2 and UC3B: Hot-dip zinc coating; ASTM A653, G185 minimum.
   b. Use Category UC4A: Type 316L stainless steel.
2. At Exposed Exterior Conditions: Type 316L stainless steel.

H. Construction Adhesives: Comply with VOC requirements of California Green Building Standards Code, Section 5.504.4.1.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 COMPLIANCE

A. Do not permit materials not complying with the provisions of this Section to be brought onto or to be stored at the job site.

B. Promptly remove non-complying materials from the job site and replace with materials meeting the requirements of this Section.

3.3 WORKMANSHIP

A. Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings and with pertinent codes and regulations.

B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

C. Lumber Selection:
   1. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
   2. Cut out and discard defects which render a piece unable to serve its intended function.
   3. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

D. **Do not shim any framing component unless specifically indicated on the drawings.**

3.4 GENERAL FRAMING

A. General:
   1. In addition to framing operations normal to the fabrication and erection indicated on the Drawings, install wood blocking and backing required for the work of other trades.
   2. Set horizontal and sloped members with crown up.
   3. Do not notch, cut, or bore members for pipes, ducts, or conduits, or for other reasons except as shown on the Drawings or as specifically approved by the Architect.

B. Bearings:
   1. Make bearings full unless otherwise indicated on the Drawings.
   2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support.
   3. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

C. Fire Blocks and Draft Stops: CBC Section 718.
   1. **General:** In combustible construction, firestopping and draft stopping shall be installed to cut off all concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top story and a roof or attic space, and shall subdivide attic spaces, concealed roof spaces and floor-ceiling assemblies. The integrity of all fire and draft stops shall be maintained.
   2. **Fire Stops:** Provide firestopping in the following locations:
      a. In concealed spaces of stud walls and partitions, including furred spaces, at the ceiling and floor levels and at 10'-0" intervals along the length of the wall.
      b. In fire sprinklered buildings having furred spaces without sprinklers, provide minimum 1/2" thick plywood fire stop so spaced (horizontally or vertically) to contain no more than 51 cubic feet of area. Coordinate with fire sprinkler installer.
      c. At all interconnections between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings and cove ceilings;
      d. In concealed spaces between stair stringers at the top and bottom of the run and between studs along and in line with the run of stairs if the walls under the stairs are unfinished;
      e. In openings around vents, pipes, ducts, chimneys, fireplaces and similar openings which afford a passage for fire at ceiling and floor levels, with noncombustible materials.
   3. **Draft Stops:** Provide draft stopping at locations indicated on the drawings.

D. Furring, Stripping, Grounds, and Backing:
   1. All wood furring, stripping, blocking, bucks and grounds shall be furnished and installed by the Contractor where required for support or backing for other materials whether shown or not on the drawings and/or these specifications. All pipes and ducts shall be furred in wherever shown.

2. Provide horizontal and vertical backing and blocking for nailing all joints at walls, parapets, ceilings, soffits, etc. finish materials shall be provided whenever needed throughout the building. Horizontal and vertical backing shall also occur at counter heights, wainscot heights and for securing all fixtures, cabinet work, shelving and all other items that require support from the wall.
3. Furnish and set all wood grounds for plastering, sheet metal and other trades. Grounds shall be of proper size and spacing for the installation of work as noted under the various headings.
4. All blocks, grounds, etc., which are embedded in concrete shall be dipped in creosote after being cut to size and after nails are driven which are to hold them in the concrete.

E. Plywood Installation:
1. Placement:
   a. Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the Drawings.
   b. Center joints accurately over supports, unless otherwise shown on the Drawings.
   c. Stagger panel end joints.
2. Protect plywood from moisture by use of waterproof coverings until the plywood in turn has been covered with the next succeeding component or finish.
3. Installation of plywood shall comply with the requirements of CBC and the APA. If in conflict conform to CBC.

F. Nailing:
1. Use only common wire nails or spikes of the dimension shown on CBC Table 2304.10.1 - Fastening Schedule, except where otherwise specifically noted on the Drawings.
2. For conditions not covered in the Nailing Schedule provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of 2" (nominal) thickness.
3. Nail without splitting wood.
4. Pre-bore as required.
5. Remove split members and replace with members complying with the specified requirements.

G. Bolting:
1. Drill holes 1/32" larger in diameter than the bolts being used.
2. Drill straight and true from one side only.
3. Do not bear bolt heads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

H. Lag Screws: Prebore holes to 40% to 70% of shank diameter at threaded portion, enlarging holes to shank diameter for length of shank.

I. Wood Screws:
1. Preboring is not required but shall not exceed 7/8 x shank diameter and 7/8 x diameter of the screw at the root of the thread.
2. Do not hammer screws into holes, soap may be used to facilitate insertion.

J. Sills and Plates:
1. Install pressure preservative-treated lumber for plates and sills in conformance with CBC Section 2304.10.5.
2. Bolt to foundations and slabs. Level sills with dry-pack, washers placed, and nuts tightened to level bearing.
3. Pack space between sill and concrete with dry-pack cement grout.

END OF SECTION 06 1100

SECTION 06 4000 - ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Provide architectural woodwork where shown on the Drawings, as specified herein, and as needed for a complete and proper installation. Types of woodwork included are:
1. Plastic covered casework.
2. Wood casework.
3. Laminated plastic countertops and splashes.
4. Standing and running wood trim.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 09 9100: Finishing of wood trim and casework.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit 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.
3. Hardware Schedule: Submit schedule with product data sheets for each type of hardware used.
4. Shop Drawings: Submit shop drawings in conformance with *NAAWS* Section 1 - Submittals. For further information refer to www.woodworkinstitute.com.
a. First page shall bear the *Woodwork Institute Certified Compliance Label*.
b. Shop drawings shall be provided in sufficient details to show fabrication, installation, anchorage, colors, and interface of the work of this Section with the work of adjacent trades.
5. Samples: Submit four color chip samples of each proposed material in the correct color and finish.
6. Before delivery to the job-site, the woodwork supplier licensees of the Woodwork Institute shall issue a *Certified Compliance Certificate* with the original submittals indicating the woodwork products furnished for this project and certifying that these products and their installation will fully meet all the requirements of the *NAAWS* grade or grades specified and the Contract Documents.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Manufacturer's recommended cleaning procedures.

1.3 REFERENCES

A. Minimum standards for work within this section shall be in conformance with the Woodwork Institute.

B. North American Architectural Woodwork Standards (NAAWS).

1.4 QUALITY ASSURANCE

A. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, manufacture and install architectural woodwork in strict accordance with the *North American Architectural Woodwork Standards* for the grades specified. All woodwork shall be provided by a single source WI affiliate

manufacturer that is able to provide a WI *Certified Compliance Certificate*. If provisions for the grade specified are in conflict with, or modified by the drawings and/or specifications, the modifications shall govern.

B. Woodwork Institute Cabinet Design Series (CDS): Refer to Appendix A of the *North American Architectural Woodwork Standards.*
   1. CDS numbers have been used to identify the intended design of individual cabinet units.
   2. Dimensions indicated are for nominal outside dimensions and fabricators are permitted a ½" tolerance in length; no tolerance is permitted for depth and height.
   3. Modifications to the Woodwork Institute Casework Design Series are denoted by the letter "M" following the design number.
   4. Apply finished end panels or integral members on exposed ends of cabinets. Close gaps at wall-to-wall installations by filler panels not to exceed 1-1/2" in width.

C. Coordinate the locations required for solid blocking or backing.

1.5 WOODWORK INSTITUTE CERTIFICATIONS

A. Woodwork Institute Certified Compliance Program (CCP):
   1. Before delivery to the job-site, the woodwork supplier licensees of the Woodwork Institute shall issue a *Certified Compliance Certificate* with the original submittals indicating the woodwork products furnished for this project and certifying that these products and their installation will fully meet all the requirements of the *NAAWS* grade or grades specified and the Contract Documents.
   2. Non-licensees of the Woodwork Institute shall provide WI *Certified Tracking Acknowledgment* with the original submittals, that they have arranged for inspection by a WI Inspector after completion of fabrication and installation. If all conditions are found to be compliant, the inspector will issue a *Certified Compliance Certificate*, indicating the millwork products furnished for this project, and certifying that these products and their installation fully meet all the requirements of the grade or grades specified and the Contract Documents.
   3. Each elevation of woodwork and countertop shall bear a certified compliance label.
   4. In addition to the CCP requirements, the millwork fabricator and/or installer shall allow field inspection by a WI Representative.

B. CCP Costs: The millwork fabricator and/or installer shall pay all costs for certified compliance. Issuance of a Certified Compliance Certificate is a prerequisite for final acceptance.

C. Owner reserves the right to request and pay for additional inspections by a representative of the Woodwork Institute to determine that the work of this Section has been performed in accordance with the specified standards. In the event such inspection determines that the work of this Section does not comply with the specified requirements, immediately remove all non-complying items and replace them with items complying with the specified requirements, all at no additional cost to the Owner, and reimburse the Owner for the cost of the additional inspections.

D. Woodwork and/or installation determined to be non-compliant (and not corrected) will be rejected.

1.6 QUALIFICATIONS:

A. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.

B. Fabricator shall be a member/licensee in good standing of the Woodwork Institute.

C. Installer shall be a member/licensee in good standing of the Woodwork Institute.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6600 and Woodwork Institute *Architectural Woodwork Standards,* latest edition.

B. Deliver all materials only when the area of operation is enclosed and plaster and concrete work is dry, and area is broom clean.

C. Work area shall be well ventilated and protected from direct sunlight, excessive heat, rain or moisture. Temperature shall be maintained between 60̊ and 90̊ F and relative humidity between 45% and 65%. The HVAC system shall be on and functioning.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate all fabrication, delivery and installation work with the general contractor and other applicable trades.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 PLASTIC COVERED CASEWORK

A. Construction: Comply with *Architectural Woodwork Standards Section 10 - Casework*.
   1. Grade: Custom.
   2. Construction Style: Style A Frameless.
   3. Construction Type: Type I - Multiple self-supporting units rigidly joined together or Type II - Single length sections to fit access openings at the Contractor's option.
   4. Door and Drawer Front Style: Flush Overlay.
      a. Let in 1/8" reveals for all institution hinges specified, unless otherwise noted.
   5. Door and Drawer Edge Type:
      a. Type A for flush doors and drawers.
      b. Type E for glass doors.
   6. Accessible Sink Cabinet (WI #154): Provide 1" minimum support at bottom edge of sink skirt. Provide 3" base width at freestanding leg of cabinet (refer to detail on the Drawings).
   7. Provide fillers at the tops of uppers, wall hung cabinets and full height cabinets to fill the void between the casework and the wall.

B. Cladding Materials:
   1. General:
      a. Laminate cladding: High-pressure plastic laminate; NEMA LD 3.
      b. Melamine overlay: Thermofused low-pressure melamine overlay.
   2. Exposed Surfaces:
      a. Horizontal surfaces: 0.050" laminate cladding.
      b. Vertical surfaces: 0.028" laminate cladding.
      c. Shelf, drawer, door and cabinet box edging: 3 mm solid-color PVC edging.
   3. Semi-Exposed Surfaces:
      a. Inside cabinet door surface: 0.028" laminate cladding.

b. Inside cabinet backs and sides: Melamine overlay.
c. Shelf tops and bottoms: Melamine overlay.
d. Drawer interior surfaces: Melamine overlay.
e. Shelf, drawer, door and cabinet box edging: 3 mm solid-color PVC edging.
f. All other locations: 0.028" laminate cladding.
g. Special Conditions: Clad backs and sides of cabinets in open knee spaces (i.e., handicap alcoves) with 0.028 laminate cladding to match exposed surface colors, unless noted otherwise.

4. Balance Sheets: Provide plastic laminate balance sheets of thickness required by manufacturer.
5. Colors:
   a. Laminate: As indicated on the drawings.
6. CBC Section 803.11: Laminated products factory-produced with a wood substrate shall comply with one of the following:
   a. The laminated product shall meet the criteria of CBC Section 803.1.1.1 when tested in accordance with NFPA 286 using the product mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
   b. The laminated product shall have a Class A, B or C flame spread index and smoke-developed index, based on the requirements of CBC Table 803.13, in accordance with ASTM E84 or UL 723. Test specimen preparation and mountain shall be in accordance with ASTM E2579.
   c. Melamine: White.
   d. Shelf edging: Match shelf color for semi-exposed, match cabinet color for exposed.
   e. Door and drawer edging: Match plastic laminate color unless otherwise noted.
   f. Open bookcases: Match laminate on both exposed and semi-exposed surfaces.

2.3 LAMINATED PLASTIC COUNTERTOPS, SPLASHES

A. Grades: Comply with *North American Architectural Woodwork Standards Section 11 - Countertops*.
   1. Grade: Custom.

B. Cladding Materials: 0.050" horizontal high-pressure laminate; NEMA LD 3. If post formed laminate is used provide post form grade 0.42 laminate.
   1. CBC Section 803.11: Laminated products factory-produced with a wood substrate shall comply with one of the following:
      a. The laminated product shall meet the criteria of CBC Section 803.1.1.1 when tested in accordance with NFPA 286 using the product mounting system, including adhesive, as described in Section 5.8 of NFPA 286.
      b. The laminated product shall have a Class A, B or C flame spread index and smoke-developed index, based on the requirements of CBC Table 803.13, in accordance with ASTM E84 or UL 723. Test specimen preparation and mountain shall be in accordance with ASTM E2579.

C. Tops and Splashes:
   1. Construction: Fully formed

   2. Front edge:
      a. 180 degree wrap Full Round (3/4" radius).
      b. Exposed ends: Self-edge.
   3. Backsplash:
      a. Type: Integral cove.
      b. Top edge: Waterfall. Self-edge ends.
      c. Height: Minimum 4" unless indicated otherwise on the drawings.
   4. End Splash (where indicated):
      a. Type: Square butt joint.
      b. Top edge: Self-edge coped to backsplash with self-edge ends held short of front edge.

c. No end splash is required when countertop abuts a plastic laminate cabinet side, provide matching color seam sealant at joint.
d. End splash shall be installed on top of the countertop; butting the countertop to the end splash is not acceptable.

5. Splicing: Countertop splices shall be no closer than 48" from a sink.
6. Exposed Edges: All exposed edges including sink and utility cut-outs shall be sealed with an opaque waterproof sealant.

D. Colors: As indicated on the Drawings.

2.4 SHELVES

A. Shelf Thickness: Meet or exceed *North American Architectural Woodwork Standards Section 10 Material, Machining, and Assembly Rules:*
1. 50 psf load capacity for both fixed and adjustable shelves.
2. All shelve widths over 32” shall be constructed using 1” thick material.
3. Thickness of exposed shelves shall match the maximum required thickness of exposed shelves within the same room.

2.5 CABINET HARDWARE

A. Finish: US-26D finish where exposed unless otherwise specified.

B. Hardware Schedule:
1. Hinges: ANSI/BHMA A156.9 Grade 1, WI Grade 1; H08-9XG60 Institutional Hinge by Terry, or 370/450 Series Overlay Hinge by Rockford Process.
2. Doors & drawer pulls: Stanley #4483, Hafele #116.07.622; US 26D.
3. Door and drawer locks: National C8173/C8178, Olympus 100DR/200DW.
4. Regular Drawer slides: Full extension 100# rated, Accuride #7432.
5. File Drawer Slides: Full extension 100# rated, Accuride #3832.
6. Adjustable shelf clips: Hettich 016721 with locating pin, or Hafele 282.11.752 (with screw in each clip).
7. Wire Management Grommets: As manufactured by Doug Mockett & Co.
a. Round grommets: EDP Series 2-1/2" diameter plastic with flip-top cap.
b. Elongated grommets: King Kong Series with flip-top cap.
c. Corner grommets: EDP Series 2-1/2" diameter plastic with flip-top corner cap.
d. Color: Black.
8. Card Holder (CD-1): Brainerd Name Tag Holder, 2-1/2" x 1/2". Provide at each teacher mail slot.
9. Card Holder (CD-2): KV 701 Card Holder. Provide at each flat file drawer.
10. Flipper Door Slide: Accuride #1432 anti-rack cable system
11. Wardrobe hanger rod: Knape and Vogt KV660, length to fit. Wall supports; KV734 and KV735.
12. Magnetic Door Catch: All metal construction.

C. Key door and drawer locks alike by room. Provide a minimum of 6 keys per room. Key each room differently and provide 4 master keys.

2.6 STEEL LEGS

A. Steel Leg Assembly:
1. Mounting Plate: 4-1/2" by 4-1/2" by 3/16" epoxy- coated steel plate with threaded stud and 6 screw holes for mounting to underside of countertop.
2. Leg: 2-3/8" diameter steel leg, 1/16" wall thickness, satin nickel finish, with threaded insert anchoring to mounting plate.
3. Foot: Pressed-in black plastic fitting with +1" of adjustment.

B. Product: #635.61.475 by Hafele.

2.7 STANDING AND RUNNING TRIM

A. Standards: Comply with *North American Architectural Woodwork Standards Section 6 - Interior and Exterior Millwork.*
B. Interior Trim for Transparent Finish:
   1. Grade: Premium.
   2. Species: White Oak.
   3. Shapes: As indicated on the Drawings.
   4. Finishes: As indicated on the Finish Schedule and as specified under Section 09 9100.

C. Interior Trim for Opaque Finish:
   1. Grade: Custom.
   2. Species: Maple or Birch.
   3. Shapes: As indicated on the Drawings.
   4. Finishes: As indicated on the Finish Schedule and as specified under Section 09 9100.

2.8 FABRICATION

A. Fabricate the work of this Section in strict accordance with the approved Shop Drawings and the WI construction requirements for the grade specified.

B. All toe space base boards shall be solid wood.

C. Construct bases with toe kicks as indicated on the Drawings at cabinet sides or ends.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

B. Pre-installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be maintained.

C. Verify adequacy and proper location of any required backing or support framing.

3.2 FIELD MEASUREMENTS

A. Take necessary measurements in the field to assure proper dimensions for the work of this Section.

3.3 INSTALLATION

A. Installation shall only occur after materials have been acclimatized for a minimum of 72 hours. NAAWS section 2.4.4.4.1 shall not apply.

B Install the work of this Section in strict accordance with the approved Shop Drawings and the referenced standards, anchoring all items firmly into position, as noted on Plans.

C. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

D. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
1. Edges of cut-outs subject to moisture shall be sealed with an opaque waterproof sealant, before trim, sink, etc. are installed.

E. Cabinets:
1. Install without distortion so that doors and drawers fit openings properly and are accurately aligned.
2. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
3. Maintain veneer sequence matching (if any) of cabinets.
4. Provide felt silencers on backs of cabinet doors, minimum of 1 per door.
5. Fill openings at tops of cabinets created by scribes and trim.

F. Tops:
1. Anchor securely to base units and other support systems as indicated.
2. **Laminate plastic countertop butt splices are critical. Use same production lots and prematch joints to minimize color variation.**

G. Standing and Running Trim:
1. Install with minimum number of joints possible, using full length pieces from maximum length of lumber available.
2. Stagger joints in adjacent and related members.
3. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint.
4. Scarf end-to-end joints.

3.4 INSPECTION

A. Schedule WI CCP Inspection with at least 7 days prior notice to planned installation start. Notify the Architect and Inspector of the day and time at least 48 hours prior to the inspection.

END OF SECTION 06 4000

SECTION 07 0150 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Remove existing roofing, base flashings, sheet metal flashings, vent stack flashings, rigid insulation, and perimeter nailers down to the deck in areas indicated on the Drawings. Sweep or clean all debris off of the deck.

1.2 ENVIRONMENTAL REQUIREMENTS

A. Do not remove existing roofing system or damaged decking when weather conditions threaten the integrity of the building contents or intended continued occupancy. Maintain continued temporary protection prior to installation of the new roofing system.

1.3 PROTECTION

A. It shall be the Contractor's responsibility to respond immediately to correction of roof leakage during construction. A 4 hour time limit shall be given from the time of notification of emergency conditions. In the event of water penetration during rain or a storm, the Contractor shall provide for repair or protection of the building contents and interior. If the Contractor does not respond or cannot be contacted, the Owner will affect repairs or emergency action and the Contractor shall be back charged for all expenses and damages, if any.

1.4 SCHEDULING

A. Schedule work to coincide with commencement of installation of new roofing system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Protection: Sheet Polyethylene. Provide weights or fasteners to retain sheeting in position.

B. Base Sheet: ASTM D-4601 Type II. Provide weights or fasteners to retain sheeting in position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Roofing Contractor to verify existing site conditions, including roof dimensions.

B. Verify that existing roof surface is clear and ready for work of the Section.

3.2 MATERIALS REMOVAL

A. Remove all gravel, membrane, cant strips, rigid insulation, expansion joints, base flashings, and any other items shown on the drawings. In addition, completely removal of all nails and other debris to leave a smooth, even surface for re-roofing.

B. Under certain conditions, it will be necessary and desirable to incorporate one or more of the following methods for removal of dirt, silt, gravel, debris, roof membrane, and insulation from the roof surface in order to preserve the ecology, eliminate unsightly conditions, and protect the building surfaces:
   1. Roof vacuum systems:
   2. Crane and hopper with dump truck system.
   3. Enclosed chutes with protective shrouds on the building and ground surfaces.

C. All debris dumped from the roof shall be transported from the roof via chutes into dumpsters or trucks, and this debris shall be removed from the premises when vehicles are full at the Contractors cost. No debris shall be transported from the area being worked on over a previously finished roof without an underlayment of 3/4" plywood.

D. All roof equipment not in use or left filled will be parked on the column lines on 3/4" plywood.

E. Contractor shall provide cut off (night tie in) at the end of each day's work. Area cut off shall be clean of all existing gravel.

F. Protect and preserve existing electrical conduit and electrical connections.

G. Remove all debris away from site to authorized disposal facilities.

3.3 TEMPORARY PROTECTION

A. Provide temporary protective sheeting over uncovered deck surfaces.

B. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights or temporary fasteners.

C. Provide for surface drainage from sheeting to existing drainage facilities.

D. Do not permit traffic over unprotected deck surface.

3.5 PREPARATION

A. Verify that the deck is dry, sound, clean and smooth and free of depressions, waves, and projections. Cover all holes over 1" in diameter, cracks over 1/2" in width, loose knots and excessively resinous areas with sheet metal.

B. Replace damaged deck with new materials. Clean deck surfaces thoroughly prior to installation of eaves protection membrane and underlayment.

END OF SECTION 07 0150

SECTION 07 2100 - BLANKET INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide building insulation where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturers recommended installation procedures.

PART 2 - PRODUCTS

2.1 BUILDING INSULATION MATERIALS

A. Fiberglass Insulation: Inorganic (non-asbestos) fibers formed with binders into resilient flexible blankets or semi-rigid batts; manufacturer's standard lengths and widths as required to coordinate with spaces to be insulated.

B. 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:
1. Certain-teed Products Corp.
2. Johns Manville
3. Owens-corning Fiberglass Corp.
4. United States Gypsum Co.
5. FiberTek Insulation.
6. Substitutions: Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

C. Batt Width: Provide widths as required for flanged staple supported, nominal 16" or 24" for wood studs, or friction fit full 16" or 24" for metal studs, or cut to fit as required in other widths.

D. Support: Provide manufacturers recommended supporting systems as required for each installation. All insulation shall be continuously supported in a manner to permanently hold the insulation in place.
1. Wood framing shall be flange and staple supported.
2. Metal framing shall be friction fit supported.
2. Support with RSA polypropylene biaxially oriented netting, 2-1/4" x 1-1/8" mesh.

2.2 INSULATION TYPES

A. Thermal Fiberglass Batts: ASTM C665, Type I.
1. Exterior walls concealed; R-19.
2. Exterior roof/ceiling concealed; R-30.

3. Flame spread - 25, smoke developed - 450; ASTM E84.
4. Combustion Characteristics: Pass; ASTM E136.
5. Recycled Content: Certified to contain minimum of 20% post-consumer and 5% pre-consumer recycled glass product, on average of manufacturer's products.

C. Mineral Wool Sound Attenuation Fire Batts: ASTM C665, Type I, and ASTM E-136.
1. Application: Where indicated in the plans.
2. Sound Attenuation Fire Batts by Owens-Corning, Thermafiber Sound Attenuation Fire Blankets by Certainteed, Sound Attenuation Fire Batt (SAFB) by Johns Manville or approved equivalent.
3. Non-combustible per NFPA Standard 220, ASTM E136; Class A rated interior finish, NFPA 101.

2.3 ACCESSORIES

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

C. Impaling Clips: Galvanized steel clips with washer retainer and clips, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

B. Remove, or protect against, projections in construction framing which may damage or prevent proper insulation.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position.

B. Between Studs:
1. Install insulation tight in spaces and tight to exterior side of mechanical and electrical services with the plane of the insulation.
2. Leave no gaps or voids.
3. Trim insulation neatly to fit spaces.
4. Use wire or metal straps to hold insulation in place.

C. Between Wood Roof Rafters:
1. Install insulation tight in spaces and tight to exterior side of mechanical and electrical services with the plane of the insulation.
2. Leave no gaps or voids.
3. Trim insulation neatly to fit spaces.
4. Use wire or metal straps to hold insulation in place.

D. Between Wood I Joists: Wire up insulation under roof decks by running 16 or 18 gauge wire diagonally or perpendicular to the insulation every 18" to 24".

E. Underside of Roof Deck:
   1. Retain insulation batts in place with impaling clips at 12" on center. Secure impaling clips as recommended by manufacturer.
   2. Tightly abut adjacent insulation.

END OF SECTION 07 2100

SECTION 07 5110 - BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide built-up asphalt roofing system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation. Roofing system includes, but is not limited to:
1. Roofing membrane and related flashings.
2. Rigid insulation.
3. Cover board.
4. Fasteners, walk pads, and other accessories.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 07 6200: Sheet metal flashing and trim.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures which, when approved by the Architect.
3. Installer Certification: Obtain written certification from manufacturer of built-up roofing system certifying that Installer is approved by manufacturer for installation of specified roofing system for this project. Provide original signed copy of certification with submittal package.

1.3 SYSTEM DESIGN

A. Wind Uplift: Meet or exceed the product and securement requirements of Factory Mutual Approval Guide and Loss Prevention Data 1-28, 1-29 and 1-48. Meet wind uplift securement requirements for **1-60** windstorm rating.

B. Solar Reflective Index: Minimum SRI of 75; or minimum solar reflectance of 0.63 and minimum thermal emmitance of 75.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. A single installer ("roofer") shall perform the work of this section; and shall be a firm with not less than 5 years of successful experience in installation of built-up roofing systems similar to those required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials.
2. Installer's Field Supervision: Installer must maintain full-time supervisor/foreman on job site during times that roofing work is in progress. Supervisor must have minimum of five year's experience in roofing work similar to nature and scope to specified roofing.

B. UL Listing: Provide built-up roofing system and component materials which have been tested for application and slopes indicated and are listed by Underwriters' Laboratories, Inc. (UL) for Class A external fire exposure.
1. Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-Up Service.

1.5 PRE-ROOFING MEETING

A. Not less than three nor more than ten calendar days prior to scheduled start of roofing installation, conduct a roofing substrata inspection and pre-roofing meeting at the job site.
   1. Visually inspect all substrata upon which roofing is scheduled to be applied.
      a. Determine general acceptability, and determine areas requiring further preparation.
      b. Determine acceptable remedies for unacceptable areas.
   2. Discuss proposed schedule for installation of the roofing, and reach agreement as to dates of start and finish of installation of the roofing.
   3. Discuss product submittals and warranties.
   4. Discuss interface with the work of other trades.
   5. Discuss proposed methods for installation of the roofing, and equipment and personnel to be used.
   6. Discuss inspection methods to be used.

1.6 SPECIAL WARRANTY

A. Manufacturer's Warranty: Submit 2 executed copies of roofing manufacturer's standard **"No Dollar Limit"** agreement including flashing endorsement, signed by an authorized representative of built-up asphalt roofing system manufacturer, on form which was published with product literature as of date of contract documents, for **10 years after date of substantial completion.**
   1. Warranty includes roofing membrane, flashings, roofing membrane accessories, roof insulation, fasteners, substrate board, walkway products, manufacturer’s expansion joints, manufacturer’s edge metal products, and other single-source components of roofing system marketed by the manufacturer.

B. Special Project Warranty: Upon completion of the Work and as a condition of its acceptance, deliver to the Architect two original copies of the following Special Warranty, signed by the Contractor and the roofing subcontractor:
   1. The undersigned hereby propose, and upon execution of this document by the Owner, agree for a period of 2 years after Substantial Completion of the Work to make immediate repairs as required to stop leaks or correct defects in the work of this Section, within 24 hours after receipt of notice from Owner by telephone, telegram, or letter; and further agree to make such repairs without reference to or consideration of the cause or nature of such leaks or defects.
   2. As a further condition of this 2-year Special Warranty, the undersigned hereby agree to repair or replace any other damaged products and finishes, to return the building to its original condition, and to notify the roof system manufacturer in writing within 30 days that such repairs were made.
   3. Open seams, buckles, curled edges, fishmouths, splits, wrinkles, etc., will be considered as evidence of poor and/or defective workmanship and products.
   4. Repairs required within the stated period will be provided without cost to the Owner; except that repairs required consequent to an act of God, abuse, alterations, or failure of the substrata or the supporting structure (other than caused by defects in the work of this Section) will be paid for by the Owner promptly upon completion of the repair in each instance.
   5. Repairs completed at Owner's cost shall be invoiced to the Owner at prevailing rates, and shall include an itemized breakdown of quantities plus unit cost for labor and materials, and shall include not more than 15% markup for overhead and profit.
   6. This Special Warranty is in addition to the warranty requirements of the Contract Documents and the enforcement of its provisions shall not deprive the Owner of any action, right, or remedy otherwise available to him.

PART 2 - PRODUCTS

2.1 BUILT-UP ASPHALT ROOFING SYSTEM

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. As part of the work of this Section, provide all materials required by the roofing manufacturer for the specified special warranties, and the UL requirements specified.

C. All roofing, except sheet metal work, required for the roof system to be provided shall be manufactured by or approved in writing by the manufacturer of the roof system and such approved roofing shall be included in the roofing manufacturer's warranty.

D. Built-up roof in accordance with all requirements and installation procedures specified by the roofing manufacturer to issue the required warranty:

Built-up Roofing - Wood Deck and Insulated Deck			
Manufacturer	**Spec. Number**	**Ply Sheet**	**Cap Sheet**
Johns Manville	3CID	GlasBase Plus	GlasKap Plus
Malarkey	M3-WI-BBB-H	#501 Modified Base	#601 Cap
GAF	I-1-2-20/30FR	Ruberoid 20	Ruberoid 30 FR
Certainteed	HA-FR-N-B3	Flintlastic Base20	Flexiglas 960
MB Technology	I3HSCIOOGWH	LayflatSBS LF25	SupercapSBS SC100GWH

2.2 ROOF MATERIALS

A. Asphalt: ASTM D312, Type III (steep type) for slopes not greater than 3" per foot.

B. SBS Base Sheet: ASTM D4601, Type II; heavy asphalt-coated fiberglass mat.

C. SBS Cap Sheet: ASTM D3909; asphalt-coated mineral surfaced fiberglass sheet; coated with inert, noncombustible, opaque, ceramic coated granules.

D. Base Flashing: ASTM D3909, SBS-modified, composite polyester or glass fiber reinforced.

E Fasteners:
1. Types as required and approved by the membrane manufacturer for the specific application, listed by UL, and approved by Factory Mutual for securing the roof system to the structural deck.
2. Fasteners: Meet or exceed Factory Mutual Standard 4470 for corrosion resistance.

2.3 COVER BOARD

A. Wood fiberboard: ASTM C208; composed of random laid wood fiber strands and primed on the mopping surface.

1. ASTM C208, Type 2, Grade 1.
2. Flame Spread Index: 75 or less, ASTM E84.
3. Smoke Developed Index: 450 or less, ASTM E84.
4. Board Thickness: 1/2".

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening cover board to roof deck.

2.4 INSULATION

A. Perlite Board: Expanded perlite, cellulosic fibers, binders and waterproofing agents with top surface seal-coated.
1. ASTM C728, Type 1.
2. Flame Spread Index: 75 or less, ASTM E84.
3. Smoke Developed Index: 450 or less, ASTM E84.
4. Compressive Strength: 20 psi.
5. Board Thickness: 3/4" minimum.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, provided by roofing system manufacturer; length as required for thickness of insulation material and penetration of deck substrate.

C. Tapered Insulation: ASTM C1289, provide factory-tapered insulation boards fabricated to slope of 1/4" in 12", unless otherwise indicated.

2.5 ACCESSORY MATERIALS

A. Flashing: Use at least 1 layer of ply sheet and 1 layer of cap sheet specified above.

B. Cant Strips: Preformed fiberboard.

C. Walkway Pads: Manufacturer's standard heavy-duty walkway pads.

D. Nailers: No. 2 or better lumber.
1. Pressure treated rot resistance; AWPA U1-07, Use Category UC2, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
2. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

E. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

F. Roof flashing, cants, and details are drawn to indicate intent only. Roofing subcontractor shall coordinate actual details and materials with roofing manufacturer to comply with roofing manufacturer's requirements for the specified warranty at no additional cost to the Owner. Submit details to the Architect for conceptual review.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 GENERAL INSTALLATION

A. Mandatory Pre-roofing Inspection: Before starting application, the Roofing Contractor shall inspect the roof decks, accompanied by the General Contractor, Inspector of Record, the Architect's Representative, and Representative of Roof Manufacturer. Any defects shall be noted and corrected. All decks shall be smooth, dry and broom clean. Starting work by roofing contractor constitutes acceptance of the roof deck by him.

B. Install the work of this Section in strict accordance with pertinent requirements of governmental agencies having jurisdiction, and with the manufacturer's recommended installation procedures as approved by the Architect.

C. Drainage connections, metal edgings and all items affected by the roofing shall be on the job ready to be installed.

D. Verify that bitumen kettle has a thermometer in good working order.

E. At the end of each day, edge seal the finished portion of the roofing system completed that day, with fabric or felt set into hot bitumen or plastic cement.

3.3 INSULATION

A. Mechanically fasten each layer of insulation to deck to resist uplift pressure at corners, perimeter, and field of roof in accordance with roofing manufacturer's instructions.

B. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards.
   1. Lay subsequent layers of insulation with joints staggered minimum 6" from joints of preceding layer.
   2. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof. Fill gaps exceeding 1/4" with insulation.
   3. On metal deck, place boards perpendicular to flutes with insulation board ends bearing on deck flutes.
   4. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
   5. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 24 inches.

C. Do not apply more insulation than can be covered with membrane in same day.

3.4 COVER BOARD

A. Install cover board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt boards together.
   1. Stagger joints of board from insulation joints minimum of 6".
   2. Mechanically secure board to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturer's written instructions.

3.5 ROOF SYSTEM INSTALLATION

A. Base Sheet:
   1. Starting at the lowest point of the roof, with a full width piece, apply base sheet to the entire roof and up walls to a point 2" above all cants. Mechanically fasten and lap sheets in strict accordance with the manufacturer's written instructions.
   2. Lay sheets in shingle fashion so that direction of water flow is not against the laps. Lay sheets without wrinkles or buckles so that finished roof is free of pockets, blisters, wrinkles, buckles, splits, and curled edges.

B. Valleys and Waterways: Apply an additional layer of ply sheet to valleys and waterways prior to the application of roofing plies. Apply ply sheet in a solid mopping of ashpalt at the nominal rate recommended by the manufacturer. Apply sheet 36" wide minimum and extend at least 8" up the inclines out of the valley.

C. Ply Sheets:
   1. Starting at the lowest point of the roof, with a half width piece, apply base sheet to the entire roof and up walls to a point 2" above all cants in a solid mopping of asphalt, at the nominal rate recommended by the manufacturer. Lap sheets in strict accordance with the manufacturer's written instructions.
   2. Lay sheets in shingle fashion so that direction of water flow is not against the laps. Lay sheets without wrinkles or buckles so that finished roof is free of pockets, blisters, wrinkles, buckles, splits, and curled edges.
   3. Completely cover mopped sheets with mopping of asphalt, eliminate any sheet-to-sheet contact between mopped sheets and no dry contact permitted between a sheet and the substrate upon which it lies.

D. Cap Sheet:
   1. Apply cap sheet after all curb and wall reinforcement is complete, starting at the lowest point of the roof. Apply cap sheet to the entire roof and up walls to a point 2" above all cants in a solid mopping of asphalt, at the nominal rate recommended by the manufacturer. Lap sheets in strict accordance with the manufacturer's written instructions.
   2. Lay sheets in shingle fashion so that direction of water flow is not against the laps. Lay sheets without wrinkles or buckles so that finished roof is free of pockets, blisters, wrinkles, buckles, splits, and curled edges.
   3. Do not permit asphalt exposure on top of adjacent sheet.

E. Base Flashing: Install base flashing in strict accordance with the manufacturer's written instructions for the application conditions using the materials specified.

3.6 CLEAN UP

A. Remove all bituminous materials or markings from the finished surface. Keep the roof and premises clean and free from accumulations of waste materials and rubbish at all times.

3.7 FIELD QUALITY CONTROL

A. During progress of the work of this Section, make visual inspections as necessary, and verify that:
   1. All materials used comply with the specified requirements;
   2. All materials are properly stored and handled;
   3. Bitumen kettles are maintained at proper temperature;
   4. Bitumens are applied uniformly, without voids or skips, and in the proper quantity;
   5. The proper number and types of plies are installed, with the specified overlaps;
   6. The proper number, type, and spacing of fasteners are used;
   7. Associated flashings and sheet metal are installed in a timely manner in accordance with the specified requirements;
   8. All elements of the work of this Section are completed on the same day and not installed in phases.

B. The Owner reserves the right to require test cuts to be made in the installed work of this Section.
   1. Make such test cuts, when so directed by the architect, in dimension of 12" x 12", only at locations where directed by the architect.
   2. Provide temporary protection at the site of test cuts as needed to prevent penetration of water until repairs are made or new roof system is installed.
   3. Upon approval of the test cut sample, immediately repair the site of the test cut to the same degree of protection as is provided by the roofing system.

END OF SECTION 07 5110

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Provide flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through the exterior shell of the building.
   1. The work includes patching of existing work.
   2. The work includes tying in of new work to existing work.

B. Types of flashing and sheet metal work include, but are not limited to:
   1. Metal copings.
   2. Metal wall and counter-flashings.
   3. Gutters, downspouts, and scuppers.
   4. Metal trim/fascia units.
   5. Miscellaneous sheet metal accessories.
   6. Sheet metal expansion joint systems.

C. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Section 07 5110: Built-up asphalt roofing.
   3. Section 07 9510: Premanufactured expansion joint covers.
   4. Section 09 9100: Field painting of flashing and sheet metal.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Shop Drawings: Submit detailed drawings of layout, joining, profiles, terminations, and anchorages of fabricated work. Submit detailed drawings of special accessory components.
   2. Samples: Submit 3 samples, each approximately 12" square, in colors specified.

1.3 QUALITY ASSURANCE

A. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by the Sheet Metal and Air-Conditioning Contractors National Association (SMACNA).

B. Standard commercial items may be used for flashing, trim, reglets and similar purposes provided such items meet or exceed the quality standards specified.

C. Colors: Provide finish selections indicated in the Finish Schedule.
   1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
   2. Manufacturer’s Standard Colors and Finishes: Where the Finish Schedule specifies a manufacturer’s standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as other manufacturer’s “standard colors” from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings.
   3. Custom Colors: Where the Finish Schedule indicates a specific manufacturer’s colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable.

1.4 SPECIAL WARRANTY

A. PVDF (Polyvinylidene Fluoride) Coating Warranty: In addition to the warranty requirements of the Contract Documents, submit 2 original copies of coating applicator's 20-Year warranty. Warrant coating against peeling, blistering, chipping, checking, chalking in excess of a numerical rating of 8 when measured in accordance with ASTM D659, and fading and color change in excess of 5 NBS units when measured in accordance with ASTM D2244.2.

B. Special Project Warranty: Upon completion of the Work and as a condition of its acceptance, deliver to the Architect two original copies of the following Special Warranty, signed by the Contractor and the roofing subcontractor:
   1. The undersigned hereby propose, and upon execution of this document by the Owner, agree for a period of 2 years after Substantial Completion of the Work to make immediate repairs as required to stop leaks or correct defects in the work of this Section, within 24 hours after receipt of notice from the Owner by telephone, telegram, or letter; and further agree to make such repairs without reference to or consideration of the cause or nature of such leaks or defects.
   2. As a further condition of this 2-year Special Warranty, the undersigned hereby agree to repair or replace any other damaged products and finishes, to return the building to its original condition, and to notify the roof system manufacturer in writing within 30 days that such repairs were made.
   3. Repairs required within the stated period will be provided without cost to the Owner; except that repairs required consequent to an act of God, abuse, alterations, or failure of the substrata or the supporting structure (other than caused by defects in the work of this Section) will be paid for by the Owner promptly upon completion of the repair in each instance.
   4. Repairs completed at Owner's cost shall be invoiced to the Owner at prevailing rates, and shall include an itemized breakdown of quantities plus unit cost for labor and materials, and shall include not more than 15% markup for overhead and profit.
   5. This Special Warranty shall be in addition to the warranty requirements of the Contract Documents and the enforcement of its provisions shall not deprive the Owner of any action, right, or remedy otherwise available to him.

PART 2 - PRODUCTS

2.1 FLASHING MATERIALS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Materials and Gauges: Where sheet metal is required, and no material or gauge is indicated on the Drawings, provide highest quality and gauge commensurate with the referenced standards. In no case shall sheet metal be less than 24 gauge.

C. Galvanized Steel Sheet Materials: ASTM A653, with G90 zinc coating; minimum 24 gauge except as otherwise indicated.

D. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gauge required for performance.

2.2 PREMANUFACTURED PARAPET COPING ASSEMBLIES

A. Coping Manufacturer: Subject to compliance with requirements, provide products by:

1. R-Mer Edge Coping by Garland, 1-800-321-9336.
2. Perma-Tite Coping by Metal-Era, 1-800-558-2162.
3. Permasnap Coping by Hickman Engineered Systems, 1-828-676-1700.
4. Presto Lock Coping by Johns Manville, 1-800-445-1500.
5. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01620.

B. Performance Characteristics:
1. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-3 to positive and negative design wind pressure as defined by CBC Section 1504.5.
2. Coping sections shall expand and contract freely while mechanically locked in place on anchor cleats.
3. Coping sections shall lock to anchor cleats by mechanical pressure from support chairs.
4. All coping cover joints shall be underlayed with gutter/support chairs capable of draining water.

C. Materials:
1. Coping: Formed steel sheet, galvanized, 24 gauge thick, minimum; factory finish PVDF coating
2. Anchor Cleat: 20 gauge galvanized steel, 12” wide, with coping support; cleat spaced at 5'-0”on center minimum, mechanically fastened as indicated.
3. Concealed Splice Plates: Material and finish to match coping, 8 inch” wide, with factory applied dual non-curing sealant strips or formed water channels.
4. Fasteners: Stainless steel screw type with a minimum pull-out resistance of 240 #; no exposed fasteners permitted.

D. Fabrication:
1. Factory fabricated to sizes required.
2. Factory fabricated mitered and welded corners, end caps, and wall terminations.
3. Factory formed to radius and arch where indicated.

2.3 PREMANUFACTURED REGLET ASSEMBLIES

A. Reglet Manufacturer: Subject to compliance with requirements, provide products by:
1. Springlock Flashing and Reglets by Fry Reglet Corp.
2. Snap-Tite System by Mm Systems Corp.
3. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01620.

B. Materials:
1. Reglet: 24 gauge galavanized steel; ASTM A653 with G90 zinc coating.
2. Counter Flashing: 24 gauge galavanized steel; ASTM A653 with G90 zinc coating; factory prefinished.
3. Provide prefabricated prefinished inside and outside corners, sealed watertight.

2.4 FABRICATED FLASHINGS

A. Fascia: Fabricate profile as indicated, 24 gauge minimum thickness.
1. 6" wide concealed back-up plate, formed to exact profile of fascia and secure plate in place prior to installation.
2. Install continuous bead of sealant each side of joint and set fascia in place leaving 1/4" space between sections.

B. Exposed Downspouts: Fabricate profile as indicted, 24 gauge minimum thickness.
1. Provide strainers with outlet tubes.

C. Crickets: 22 gauge minimum thickness.
   1. Fabricate as indicated similar to SMACNA Figure 4-18, Detail 2.

D. Drip Edges: Fabricate as indicated, 24gauge minimum thickness.

E. Continuous Cleats: Form from same material as the unit which the cleat anchors, 20 gauge minimum thickness.

2.5 FINISHES

A. Factory Finish PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; 70% Kynar 500 resin or Hylar 5000 resin.

   1. 2-Coat Finish: Dry Film Thickness, ASTM D1400; 0.15 mil primer coat plus 0.70 mil color coat, 0.85 mil total minimum thickness.
   2. Color: As indicated on the Finish Schedule.
   3. Provide factory applied strippable plastic film for protection during fabrication and installation.

2.6 MISCELLANEOUS MATERIALS

A. Nails, Rivets, and Fasteners: Same metal as flashing/sheet metal or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

C. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet

D. Roofing Cement: ASTM D 2822, asphaltic.

E. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.

F. Solder: For use with steel provide 50-50 tin/lead solder (ASTM B32), with rosin flux.

G. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.7 FABRICATION

A. General: Fabricate in accordance with the SMACNA Architectural Sheet Metal Manual.
   1. Form sheet metal accurately and to the dimensions and shapes required, finishing molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.
   2. Unless otherwise specifically permitted by the Architect, turn exposed edges back 1/2".
   3. Shop fabricate work to the greatest extent possible.

B. Fabricate and form work to fit substrates. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

C. Fabricate to shapes indicated in 10'-0" lengths except where shorter lengths are required by construction or sheet size.

D. Corners: Shop prefabricate interior and exterior turns, and other changes in direction using epoxy seam sealer and rivets to rigidly secure the assembly and render watertight.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 WORKMANSHIP

A. General: Comply with manufacturer's written instructions and with SMACNA Architectural Sheet Metal Manual, 2003 Edition. Anchor units securely in place by methods indicated, providing for expansion of metal units; conceal fasteners where possible; and set units true to line and level. Install work with laps, joints, and seams which will be permanently watertight and weatherproof.
1. Where lap seams are indicated, lap according to pitch, but not less than 3".
2. Make flat and lap seams in the direction of flow.

B. Joints:
1. Join parts with rivets or sheet metal screws where necessary for strength and stiffness.
2. Provide suitable watertight expansion joints for runs of more than 40'-0", except where closer spacing is indicated on the Drawings or required for proper installation.

C. Separations:
1. Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
2. Where sheet metal work will be in contact with masonry, concrete, or stone, evenly coat contact surfaces with non-sagging mastic. Where sheet metal work will be embedded in mortar joints, evenly coat both sides with non-sagging mastic.

D. Embedment: Embed metal in connection with roofs in a solid bed of sealant, using materials and methods described in Section 07 9210 of these Specifications or other materials and methods approved by the Architect.

3.4 COPING INSTALLATION

A. Snap-On Coping Cap Detail:
1. Install miters first.
2. Position base flashing of the roofing membrane over the wall edge covering nailers completely, fastening 8" on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
3. Install minimum 16 gauge, 16" long anchor chair at a maximum of 60" on center.
4. Install 6" wide splice plate by centering over 16" long by specified width anchor chair. Apply two beads of sealant to either side of the splice plate's center, approximately 2" from the coping cap joint. Install

coping cap by hooking outside hem of coping on outside face of anchor chair. Press downward on inside edge of coping until "snap" occurs and hem is engaged on the entire chair.

B. Installing contractor shall check as-built conditions and verify the manufacturer's coping details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the coping manufacturer's installation guide when setting copings.

C. Installer shall use mechanical fasteners with minimum 240 # (109 kg) pull-out resistance suitable for parapet substrates.

3.5 CLEANUP

A. After completion, clean all exposed work of scraps, stains, and dirt. After cleaning, wash with clean water and wipe dry.

END OF SECTION 07 6200

SECTION 07 7200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide roof accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation. Roof accessories include, but are not limited to the following:
   1. Roof hatches.
   2. Automatic smoke vents.
   3. Roof curbs.

B. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Section 07 5110: Built-up asphalt roofing.
   3. Section 07 9510: Premanufactured expansion joint covers.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturers recommended installation procedures.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
   1. Operation and Maintenance manuals in accordance with requirements of Section 01 7820.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 ROOF CURBS

A. Manufactured Curbs, Equipment Rails, Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counter-flashing, internal reinforcing, and top side and edges formed to shed water; as manufactured by The Pate Company, ThyBar Corporation, or Vent Products Inc.
   1. Construction: 14 gage galvanized sheet metal.
   2. Finish: Factory prime coated for finish painting at the job site.
   3. Insulation: 1-1/2" rigid glass fiber, located on outside face of curb.
   4. Wood Nailer: Preservative treated wood nailer along top of curb.
   5. Mounting: Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   6. Curb Height: 8" from finished surface of roof, minimum.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, anchoring all items firmly into position for long life under hard use.

C. Put operating components through at least five complete operating cycles, adjusting as required, and achieving optimum ease of operation.

END OF SECTION 07 7200

SECTION 07 7220 - ROOF CURBS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide roof curbs where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturers recommended installation procedures.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 ROOF CURBS

A. Manufactured Curbs, Equipment Rails, Roof Mounting Assemblies: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counter-flashing, internal reinforcing, and top side and edges formed to shed water; as manufactured by The Pate Company, ThyBar Corporation, or Vent Products Inc.
   1. Construction: 14 gage galvanized sheet metal.
   2. Finish: Factory prime coated for finish painting at the job site.
   3. Insulation: 1-1/2" rigid glass fiber, located on outside face of curb.
   4. Wood Nailer: Preservative treated wood nailer along top of curb.
   5. Mounting: Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   6. Curb Height: 8" from finished surface of roof, minimum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, anchoring all items firmly into position for long life under hard use.

END OF SECTION 07 7220

SECTION 07 8400 - FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide firestopping where shown on the Drawings, in all penetrations through fire rated walls, floors, and ceiling, and as specified herein, and as needed for a complete and proper installation. The Work of this Section includes, but is not limited to:
   1. Through penetration firestops and smoke stops for all fire-rated bearing and non-bearing wall and floor assemblies, both blank (empty) and those accommodating penetrating items such as cables, conduits, pipes, ducts, etc.
   2. Membrane penetration for fire-rated walls.
   3. Architectural/construction joint firestops within walls, floors, or the intersections of floors to exterior walls, or the intersection of top of walls to ceilings.
   4. Top of wall firestopping in all fire-rated partitions.

B. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Section 07 9210: Sealants and caulking.
   3. Section 22 0000: Plumbing.
   4. Section 23 0000: General Mechanical Provisions.
   5. Section 26 6000: General Conditions for Electrical Work.
   6. Section 27 0000: Communication Systems General.

C. Completely coordinate with work of all other trades.

D. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure and complete installation.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturers recommended installation procedures.
   3. UL Tested Systems: Submit drawings showing typical installation details for the methods of installation. Indicate which firestop materials will be used and thickness for different hourly ratings. Indicate construction of wall or floor assemblies, size, F-rating, T-rating, and remarks.
   4. Engineering Judgements: Submit manufacturer's drawings for all non-standard applications where no UL tested system exists. Indicate the "tested" UL system upon which the judgement is based so as to assess the relevance of the judgement to some known performance.

1.3 PERFORMANCE REQUIREMENTS

A. Firestopping Systems (Materials and Design):
   1. Conform to both Flame (F) and Temperature (T) ratings as determined by tests conducted in accordance with ASTM E814 in a configuration that is representative of field conditions.
   2. F ratings shall be a minimum of 1-hour but not less than the fire resistive rating of the assembly being penetrated.
   3. T ratings shall be based on measurement of the temperature rise on penetrating item(s).

B. Firestopping materials and systems shall be capable of closing or filling through-openings created by:
   1. The burning or melting of combustible pipes; cable jacketing, or pipe insulation materials, or;
   2. Deflection of sheet metal due to thermal expansion (electrical and mechanical ductwork).

C. Firestopping shall be flexible, allowing for normal pipe movement and shall not shrink upon drying as evidenced by cracking or pulling away from contact surfaces.

D. Firestopping shall be moisture resistant and shall not dissolve in water after curing.

E. Penetrations containing loose electrical, data, or communications cabling shall be protected using firestopping systems that allow unrestricted cable changes without damage to seal.

F. Materials shall not require ampacity derating in power cable installations.

PART 2 - PRODUCTS

2.1 FIRESTOPPING MATERIALS

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:
   1. 3M Ceramic Materials
   2. Tremco
   3. Morgan Thermal Ceramics
   4. USG
   5. RectorSeal Corp.
   6. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Wall, Floor, and Ceiling Penetrations: ASTM E814.
   1. Provide systems designed specifically for the penetration condition, materials, and required fire rating.
   2. Through-penetration fire stops may be used for membrane penetrations.
   3. The F rating shall apply to all through-penetrations and shall not be less than the required fire-resistance rating of the assembly penetrated.
   4. The T rating shall apply to those through-penetration location required to have T ratings as specified in CBC Sections 714 and shall not be less than the required fire-resistance rating of the assembly penetrated.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

B. Verify that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturers recommended installation procedures to comply with the designated and required firestop rating.

B. Conditions Requiring Firestopping:
   1. General: Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.
   2. Through-Penetrations: Install firestopping in all penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.
   3. Membrane-Penetrations: Where required by CBC Section 714, protect all membrane-penetrations in rated walls with firestopping.
   4. Construction Joints/Gaps: Provide firestopping:
      a. Between the edges of floor slabs and exterior walls.
      b. Between the tops of walls and the underside of floors.
      c. In the control joints in masonry walls and floors.
      d. In expansion joints.

C. Dam Construction: When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material shall be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.

END OF SECTION 07 8400

SECTION 07 9210 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Throughout the Work, seal and caulk joints where shown on the Drawings and elsewhere as needed to provide a positive barrier against passage of moisture and air.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 03 3000: Cast-In-Place Concrete.
3. Section 07 8400: Firestopping of penetrations in fire-rated walls.
4. Section 09 9100: Painting.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturers recommended installation procedures.
3. Samples: Submit samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used. Provide minimum of 4 samples of each manufacturers standard color for each application. Provide sample of each installation type for Architect approval prior to beginning installation. Repeat samples until acceptable installation is approved by the Architect.

1.3 QUALITY ASSURANCE

A. Rejection of Installed Caulking and Sealants: Indication of lack of skill on the part of installers shall be sufficient grounds for rejection of installed caulking and to require its immediate removal and complete re-caulking at no additional cost to the Owner.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6600.

B. Do not retain at the job site material which has exceeded the shelf life recommended by its manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Comply with VOC requirements of California Green Building Standards Code, Sections 5.504.4.1 and 5.504.4.2.

2.2 SEALANTS AND CAULKING

A. Silicone Sealant:
1. White Mildew Resistant: 786 White by Dow Corning, Sanitary 1700 White by General Electric, 863 White by Pecora.
2. General Exterior: 791 by Dow Corning, Silpruf by General Electric, 864 by Pecora, Spectrum 2 by Tremco.

B. Polyurethane Sealant:
1. General Use: DynaTrol II by Pecora, Dymeric by Tremco, Sikaflex-2c,NS/SL by SIKA.
2. Self-leveling Type: NR-201 by Pecora, Sonalastic SL1 by Sonneborn, Sikaflex 1cSL by Sika.

C. Acrylic Latex Sealant: AC-20+ Silicone by Pecora, Sonolac by Sonneborn.

D. Colors: Colors for each sealant installation will be selected by the Architect from standard colors normally available from the specified manufacturer.
1. In concealed installations use standard gray or black sealant.
2. Provide black sealant at glazing pockets.

2.3 ACCESSORY MATERIALS

A. Primers: Non-staining type, recommended by manufacturer to suit application.

B. Back-up Materials: Non-absorbent, non-staining, and specifically recommended for application by sealant manufacturer.

C. Bond Preventative Materials: Pressure sensitive tape recommended by sealant manufacturer to suit application.

D. Masking Materials: Appropriate masking tape which will effectively prevent application of sealant on surfaces not scheduled to receive it, removable without damage to substrate or staining.

E. Joint Cleaner: Non-corrosive, non-staining type recommended by sealant manufacturer; compatible with joint forming materials.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work will be performed. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare all surfaces to receive sealants and caulking in strict accordance with the manufacturer's written requirements. Use solvents and primers where recommended by the manufacturer.

B. Clean all concrete joints, full depth free of debris and dust.

3.3 INSTALLATION

A. Install joint backing to achieve a neck dimension of no greater than 1/3 the joint width. Install in strict accordance with the manufacturer's written instructions.

B. Install bond breaker where joint backing is not used.

C. Mask adjacent surfaces to prevent contact of sealant with adjoining surfaces which would be stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape after tooling without disturbing joint seal.

D. Install sealant to manufacturer’s instructions.

E. Measure joint dimensions and size materials to achieve required width/depth ratios.

3.4 PRODUCT USAGE BY LOCATION

A. Where more than 1 type of sealant is listed, the Contractor may use either listed product that is best suited in accordance with the sealant manufacturer's written recommendations for the joint location and type and the surfaces to be sealed with particular attention given to prevent staining. Provide sealants and caulking as follows:
   1. Exterior, general use: Polyurethane or Silicone.
   2. Interior, wet areas: Mildew Resistant Silicone.
   3. Interior, general use and painting: Acrylic latex.
   4. Expansion and control joints, vertical and overhead surfaces: Polyurethane or Silicone.
   5. Expansion and control joints, horizontal surfaces: Self-leveling Polyurethane.
   6. Interior concrete slab (where slab is finished floor, fill all crack control joints): Polyurethane.
   7. Exterior concrete walks and courts (where indicated on the plans): Polyurethane.
   8. Horizontal surfaces, traffic: Self-leveling Polyurethane.
   9. Glazed tile and/or masonry: Polyurethane or Silicone.
   10. Plumbing fixtures: Mildew Resistant Silicone.
   11. Glazing to metal frame: Black Silicone.

3.5 CLEANING AND REPAIRING

A. Clean adjacent soiled surfaces.

B. Repair or replace defaced or disfigured finishes caused by sealant work.

END OF SECTION 07 9210

SECTION 08 1110 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide hollow metal doors, and hollow metal door and window frames, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
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.
2. Section 08 7100: Hardware requirements and templates.
3. Section 08 8100: Glass for vision panels, sidelights, and windows.
4. Section 09 9100: Field Painting

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturers recommended installation procedures.
3. Shop Drawings: Submit details of each frame type, elevations of door designs, details of openings, and details of construction, installation, and anchorage.

1.3 QUALITY ASSURANCE

A. Provide all products of this Section from a single manufacturer.

B. Comply with ANSI/SDI A250.8-2003 and HMMA 861-14.

1.4 FIRE AND SMOKE RATINGS

A. Fire and Smoke Rated Door Assemblies: Where fire-rated or smoke-rated assemblies are indicated or required, provide door and frame assemblies that have been tested, listed, and labeled by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
1. Side-hinged or Pivoted Swinging Doors: UL 10C.
2. Doors in Fire-rated Corridors and Smoke Barriers: 20 minute fire protection rating; UL 10C without hose stream test.
3. Door in Exit Enclosures and Exit Passageways: UL 10C; maximum transmitted temperature end point of not more than 450ºF above ambient at end of 30 minutes of standard fire test exposure.
4. Smoke and Draft Control Doors: UL 10C and UL 1784.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Steelcraft, (805) 837-4111.
2. Stiles Custom Metal, Inc., (209) 538-3667.
3. Ceco Door Products, (510) 489-1700.

4. Curries, (559) 432-5537.
5. Security Metal Products, (310) 641-6690.
6. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 METAL DOORS

A. Exterior Flush Doors:
1. ANSI/SDI A250.8, Level 3, Model 2 (seamless), minimum 16 gauge (0.067") faces.
2. Top Closure: 16 gauge flush end channel closure with seal against moisture entry.
3. Bottom Closure: 16 gauge recessed end channel with drainage openings.
4. Galvanizing: Hot-dipped zinc coating; ASTM A653 with A60 or G60 coating.
5. Reinforce doors internally with 18 gauge steel hat section ribs.
   a. Weld reinforcing to each door face with spot welds to faces spaced 4" on center.
   b. Ends of ribs welded together full width of the supporting web span.
   c. Insulate space between ribs with 2 lb. density polyurethane bonded to both faces; ASTM C591.
6. Reinforce for finish hardware provided under Section 08 7000; ANSI/SDI A250.8.

B. Exterior Stile-and-Rail Doors: Unitized, true tube type construction with joints continuously welded and ground smooth.
1. ANSI/SDI A250.8, Level 3, Model 3, minimum 16 gauge (0.067") faces.
2. Core: 2 lb. density polyurethane bonded to both faces; ASTM C591, U-factor of 0.10.
3. Top Closure: Flush end channel closure with seal against moisture entry.
4. Bottom Closure: Recessed end channel with drainage openings.
5. Galvanizing: Hot-dipped zinc coating; ASTM A653 with A60 or G60 coating.
6. Reinforce for finish hardware provided under Section 08 7000; ANSI/SDI A250.8.

C. Interior Doors: Full flush or stile-and-rail design as indicated.
1. ANSI/SDI A250.8, Level 3, Model 2 (seamless), minimum 16 gauge (0.053") faces.
2. Core: 2 lb. density polyurethane bonded to both faces; ASTM C591, U-factor of 0.10.
3. Galvanizing: Hot-dipped zinc coating; ASTM A653 with A60 or G60 coating.
4. Reinforce for finish hardware provided under Section 08 7000; ANSI/SDI A250.8.

D. Finish:
1. After fabrication, fill all tool marks and surface imperfections, sand and dress smooth.
2. Grind, fill, and dress all weld joints.
3. Coat surface with factory primer for field finishing; ANSI/SDI A250.10.

2.3 METAL FRAMES

A. Type and Design:
1. Provide frames in the dimensions and types shown on the Drawings, non-labeled or labeled as indicated, in 16 gauge (0.053") for interior frames and 14 gauge (0.067") for exterior frames.
2. Galvanizing: Hot-dipped zinc coating; ASTM A653 with A60 or G60 coating.
3. **Face welded construction.**
4. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.
5. Reinforce for finish hardware provided under Section 08 7000; ANSI/SDI A250.8.
6. Frames Wider than 48": Reinforce with steel channel fitted tightly into frame head, flush with top.
7. Frames Installed Back-to-Back: Reinforce with steel channels anchored to floor and overhead structure.

B. Finish:

1. After fabrication, fill all tool marks and surface imperfections, sand and dress smooth.
2. Grind, fill, and dress all weld joints.
3. Coat surface with factory primer for field finishing; ANSI/SDI A250.10.
4. Remove all areas of rust to bare metal; reprime prior to finish paint.

C. Frame Anchors:
1. Wood Stud Anchor: 18 gauge galvannealed steel, "lock-in" type.
2. Closed Metal Stud Wall Anchor: 18 gauge galvannealed steel, "lock-in" or factory welded type.
3. Wire Masonry Anchors: 3/16" diameter wire, "lock-in" type.
4. Masonry T-Anchors: 18 gauge galvannealed steel, "lock-in" type.
5. Existing Wall Anchor: 18 gauge galvannealed steel, "lock-in" or factory welded type.
6. Base Anchor: 16 gauge galvannealed steel, welded-in or adjustable; provide a minimum of 2 fasteners in each anchor.
7. Mullion Base Anchor: 16 gauge galvannealed steel, mullion slides over; provide a minimum of 2 fasteners in each anchor.
8. Corner Post Base Anchors: 12 gauge galvannealed steel, corner post slides over; provide a minimum of 2 fasteners in each anchor.

2.4 FINISH HARDWARE

A. Coordinate anchorage hardware and secure templates from the finish hardware supplier.

2.5 ACCESSORIES

A. Removable Glazing Stops (at window frames only):
1. Formed 20 gauge (0.032") sheet steel, butted corners; secured to frame with countersunk #6 zinc-coated tamper-proof screws.
2. Chemically treat and paint with a rust inhibitive primer all metal surfaces to which glazing stops are secured and the inside of the glazing stops to installation.

B. Glazed Light Frames:
1. 20 gauge (0.042") cold rolled steel frame, tightly mitered corners. At exterior locations, provide galvanized frames. Locate screws on room side.
2. Provide labeled frames at fire rated assemblies.
3. Finish: Factory baked enamel; custom color as selected by the Architect.
4. Model LoPro by Anemostat or approved equal.

C. Interior Door Louvers:
1. 18 gauge (0.042") cold rolled steel frame, tightly mitered corners, inverted Y non-vision louver, 50% free area. Locate screws on inside side.
2. Prime finish for field painting under Section 09 9100.
3. Model AFDL by Anemostat or approved equal.

D. Exterior Door Louvers:
1. 18 gauge (0.042") cold rolled galvanized steel frame, tightly mitered corners, 22 gauge galvanized internal louver, 50% free area. Locate screws on inside side.
2. Prime finish for field painting under Section 09 9100.
3. Model AFDL by Anemostat or approved equal

E. Transom Louvers:
1. 18 gauge (0.042") cold rolled steel frame, tightly mitered corners, inverted Y non-vision louver, 50% free area. At exterior locations, provide galvanized frames and attached mesh insect screens. Locate screws on inside side.

2. Prime finish for field painting under Section 09 9100.
3. Model AFDL-T by Anemostat or approved equal.

2.6 PREPARATION FOR HARDWARE

A. Coordinate anchorage hardware and secure templates from the finish hardware supplier.

B. Reinforcement: Reinforce components for hardware installation in accordance with ANSI/SDI A250.8 except where more stringent requirements are called for within this specification.
1. Provide box or channel type lock and closer reinforcements, continuous from top to bottom of door and welded to face sheets.

C. Punch single leaf frames to receive 3 silencers; provide one silencer per leaf at the head of double leaf frames unless gasketing is specified for that specific opening.

D. Factory prepare hardware locations in accordance with Section 08 7100.

E. Plaster Guards: 26 gauge galvanized steel plaster/dust guards, welded to frame at finish hardware cutouts where mortar, plaster, dust or other materials might obstruct hardware operation and to close off interior of openings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 FIRE RATED ASSEMBLIES

A. Install fire-rated doors and frames in accordance with their listings and NFPA 80.
1. Install smoke and draft control doors in accordance with NFPA 105.

3.3 FRAME INSTALLATION

A. Install frames and doors in accordance with the manufacturer's written recommendations and ANSI/SDI A250.8.

B. Set welded frames in position prior to beginning metal stud partition work; brace frames until permanent anchors are set.

C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels. Place frames prior to construction of enclosing walls and ceilings; provide minimum 3 anchors per jamb at hinge and strike locations.
1. Where indicated in the plans, secure frames in place with screw fasteners at frame anchors to wall framing or post-installed expansion anchors at masonry and concrete. Countersink fasteners, fill with body putty, sand smooth and flush with no voids or ridges. Conceal installed fasteners so as to be invisible at exposed faces.

D. Set frames accurately into position, plumbed (within 1/8" in 10'), aligned, and braced securely until permanent anchors are set.
1. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door

clearances and header braces for grouted frames.

3.4 DOOR INSTALLATION

A. Install doors per manufacturer's recommendation.

B. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware.

C. Clearances at edge of doors.
1. Between door and frame at head and jambs: 1/8".
2. At meeting edges pairs of doors and at mullions: 1/8".
3. At sills without thresholds: 5/8" maximum above finish floor.
4. At sills with thresholds: 1/8" above threshold.

3.5 ADJUST AND CLEAN

A. Remove dirt and excess sealants, mortar or glazing compounds from exposed surfaces.

B. Final Adjustments: Adjust moving parts for smooth operation.
1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection.
2. Leave work in complete and proper operating condition.
3. Remove defective work and replace with work complying with the specified requirements.

C. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer submitted by the manufacturer.

D. Fill all dents, holes, etc. with metal filler, sand smooth and flush with adjacent surfaces - reprise and paint to match specified finish.

END OF SECTION 08 1110

SECTION 08 3100 - ACCESS DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide ceiling and soffit access door where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturer's recommended installation procedures.

1.3 EXTRA MATERIALS

A. Keys: Provide for the Owner's use, 1 complete set of all tools and keys for each door that come packaged with the doors. Provide identification tag with each door key indicating key location.

B. Deliver keys to the Inspector of Record. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 CEILING/SOFFIT ACCESS DOORS

A. Non-Rated Flush Ceiling / Soffit Access: Access units with flanged frame flush with gypsum board and plaster ceilings and soffits:
   1. Construction: 14 gage steel door and flanged frame.
   2. Finish: Factory primed for painting on the job site.
   3. Locking: Provide each unit with cylinder locks and two keys per unit.
   4. Size: 22" by 36".
   5. Acceptable products:
      a. Model TM by J.L. Industries.
      b. Model DSC-214M by Karp Associates.
      c. Model L-DW by Larsen's Manufacturing.
      d. Style M by Milcor.
      e. Model NT by Nystrom.
      f. UF-5000 by Acudor Access Doors.

2.3 WALL ACCESS DOORS:

A. Provide wall access doors where needed for access to mechanical and electrical installations, and where indicated on the drawings.

B. Non-Rated Flush Wall Access: Access units with flanged frame flush with gypsum board or plaster assemblies.
   1. Rating: Provide access doors having the same fire rating as the surface being pierced.
   2. Construction: 14 gage steel door and frame, with self-closing and latching spring closer.
   3. Finish:
      a. For gypsum board and plaster surfaces, factory primed for painting on the job site.
      b. For tile surfaces and toilet rooms, stainless steel with satin finish.
   4. Locking: Provide each unit with cylinder locks and two keys per unit.
   5. Size: As required, 12"x12" minimum.
   6. Acceptable products:
      a. Model TM by J.L. Industries.
      b. Model DSC-214M by Karp Associates.
      c. Model L-MPG by Larsen's Manufacturing.
      d. Style M by Milcor.
      e. Model NT by Nystrom.
      f. UF-5000 by Acudor Access Doors.

C. Fire Rated Flush Wall Access: Fire rated access units with flanged frame flush with gypsum board or plaster assemblies listed by U.L. or Warlock-Hersey.
   1. Rating: Provide access doors having the same fire rating as the surface being pierced.
   2. Construction: 14 gage steel door and frame, with self-closing and latching spring closer.
   3. Finish:
      a. For gypsum board and plaster surfaces, factory primed for painting on the job site.
      b. For tile surfaces and toilet rooms, stainless steel with satin finish.
   4. Locking: Provide each unit with cylinder locks and two keys per unit.
   5. Size: As required, 12"x12" minimum.
   6. Acceptable products:
      a. Model FD by J.L. Industries.
      b. Model KRP-150FR by Karp Associates.
      c. Model L-FRAP by Larsen's Manufacturing.
      d. Style UFR by Milcor.
      e. Model IT by Nystrom.
      f. FW-5060 by Acudor Access Doors.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, anchoring all items firmly into position for long life under hard use.

C. Put operating components through at least five complete operating cycles, adjusting as required and achieving optimum ease of operation.

END OF SECTION 08 3100

SECTION 08 7100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Door Hardware.

B. Related Sections:
Section 06 2000 - Rough Carpentry: Finish Hardware Installation
Section 07 9200 - Joint Sealers – exterior thresholds
Section 08 1100 - Metal Doors and Frames

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. Access doors and panels, except cylinders where detailed.
8. Corner Guards.

1.2 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
B. ADA – Americans with Disabilities Act of 2010
C. BHMA – Builders Hardware Manufacturers Association
D. CBC – 2019 California Building Code.
E. DHI – Door and Hardware Institute
F. NFPA – National Fire Protection Association
NFPA 80 – Fire Doors and Windows
NFPA 105 – Smoke and Draft Control Door Assemblies
NFPA 252 – Fire Tests of Door Assemblies
G. UL – Underwriters Laboratories
UL10C – Positive Pressure Fire Tests of Door Assemblies.
UL 305 – Panic Hardware
H. WHI – Warnock Hersey Incorporated State of California Building Code
I. Local applicable codes

J. SDI – Steel Door Institute
K. NAAMM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Section 01 3300. 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. 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. Date of jobsite visit.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

C. Make substitution requests in accordance with specification section 01 2580. Include product data and indicate benefit to the Project. Furnish operating samples on request.
1. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

D. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Operation and maintenance manuals in accordance with requirements of Section 01 7820, for each type of hardware.

E. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:
1. A recognized architectural door hardware supplier with warehousing facilities in the Project's vicinity that has a record of successful in-service performance for supplying door hardware that is similar in quantity, type, and quality to that specified for this Project, and who employs an experienced architectural hardware consultant who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
    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: New, 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.
1. Note: scheduled resilient seals may exceed selected door manufacturer’s requirements.
2. See 2.6.D for added information regarding resilient and intumescent seals.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers’ instructions.
1. Where scheduled item is now obsolete, bid and furnish manufacturer's updated item at no additional cost to the project.

1.5 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.

1.6 PROJECT CONDITIONS:

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 as the same operation and quality as type specified, subject to Architect's approval.

B. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
   1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 SEQUENCING AND COORDINATION:

A. Coordinate with concrete.

B. Reinforce walls for wall-mounted hardware, including wall stops and stainless steel guard rails.

C. Coordinate finish floor materials and floor-mounted hardware.

D. 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.

E. Furnish manufacturer templates to door and frame fabricators.
   1. Ensure proper reinforcement in metal doors and frames to support machine screws for panic hardware and door closers.

F. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.
   1. Confirm that wood door manufacturers furnish necessary UL10C compliant seal packages.

1.8 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:

1.	Locksets:	Three years.
2.	Exit Devices:	Three years mechanical.
3.	Closers:	Thirty years.
4.	Other Hardware:	Two years.

1.9 COMMISSIONING:

A. Conduct these tests prior to request for certificate of substantial completion:

   1. Test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

1.10 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 34" to 44" above the finished floor, per California Building Code, Section 1010.1.9.2 and 11B-404.2.7.
   1. Locate panic hardware between 36" to 44" above the finished floor.

B. Handles, pull, latches, locks, other operating devices: readily openable without tight grasping, tight pinching, or twisting of the wrist to operate. California Building Code 1010.1.9.1 and 11B-309.4.

C. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per 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 lbs.

D. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door, per California Building Code Section 11B-404.2.8.1.

E. Smooth surfaces at bottom 10” of push sides of doors, facilitating push-open with wheelchair footrests, per California Building Code Section 11B-404.2.10.

F. Door opening clear width no less than 32”, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 34” and the hardware projects no more than 4”. California Building Code Section 11B-404.2.3, 11B-404.2.4, and 1010.1.1.

G. Door opening height shall not be less than 80 inches. Doors closers and door stops shall be permitted to be 78 inches minimum above the floor. California Building Code Section 11B-404.2.3 and 1010.1.1.1.

H. Thresholds: floor or landing no more than 1/2” below the top of the threshold of the doorway. Change in level between 1/4“ and 1/2”: beveled to slope no greater than 1:2 (50 percent slope). California Building Code Section 11B-404.2.5.

I. Floor stops: Do not locate in path of travel. Locate no more than 4” from walls.

J. Pairs of doors: limit swing of one leaf to 90 degrees to protect persons reading wall-mounted tactile signage.

K. New Buildings on a K-12 Public School campus shall be provided with locks which allow the doors to classrooms and any other room with an occupant load of five or more persons to be locked from the inside. Locks shall conform to the specification and requirements of Section 1010.1.11. Exceptions include doors that are normally locked from the outside, relocatable moved within the same campus, and reconstruction projects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives	Bommer
Continuous Hinges	(IVE)Ives	Select
Key System	(SCH) Schlage	Owner's Standard
Locks	(SCH) Schlage	Owner's Standard
Exit Devices	(VON) Von Duprin	Owner's Standard
Closers	(LCN) LCN	Owner's Standard
Silencers	(IVE) Ives	Trimco
Kickplates	(IVE) Ives	Trimco
Stops & Holders –	(IVE) Ives	Trimco
Overhead Stops	(GLY) Glynn-Johnson	None available
Thresholds	(NGP) National Guard	Zero
Seals & Bottoms	(NGP) National Guard	Zero

2.2 HINGING METHODS:

A. Note: 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 concealed 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.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:
1. 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.

2.3 LOCKSETS and LATCHSETS:

A. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.
1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
2. Locking Spindle: stainless steel, integrated spring and spindle design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
4. Latchbolt: solid steel.
5. Backset: 2-3/4" typically, more or less as needed to accommodate frame, door or other hardware.
6. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2” clearance from lever mid-point to door face.
7. Strikes: 16 gage curved steel, bronze or brass with 1” deep box construction, lips of sufficient length to clear trim and protect clothing.
8. Lock Series and Design: Schlage D series, “Rhodes” design.
9. Certifications:
   a) ANSI A156.2, 1994, Series 4000, Grade 1.
   b) UL listed for A label and lesser class single doors up to 4ft x 8ft.
10. Comply with CBC Section 11B-309.4.

2.4 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. 0.75-inch throw deadlocking latchbolts.

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 5-lb. maximum operating force.
8. Flush end cap design as opposed to typical "bottle-cap" design end cap.
9. Glazing bead kits as necessary for high profile vision light frames.
10. Comply with CBC Section 11B-309.4. SFM Standard 12-10-3, section 12-10-302.

2.5 CLOSERS

A. Surface Closers:
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 and adjustable. Place closers 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. Advanced Variable Backcheck (AVB): where scheduled, these units commence backcheck at approximately 45 degrees.
7. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per 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 15lbs.
8. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
9. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: rigid main and forearm, reinforced elbow.
10. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
11. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to –30 degrees F, furnish data on request.
12. Non-flaming fluid, will not fuel door or floor covering fires.
13. Pressure Relief Valves (PRV): unsafe, not permitted.

2.6 OTHER HARDWARE

A. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

B. 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.

C. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor 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.

D. Seals: Finished to match adjacent frame color. Resilient seal material: polypropylene, nylon brush, or solid high-grade neoprene. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material’s thickness and durability. Proposed substitutions: submit for approval.
1. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
2. Non-corroding fasteners at in-swinging exterior doors.
3. Fire-rated Doors, Resilient Seals: UL10C compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal plus the adhesive applied seal. Adhesive applied seals alone are deemed insufficient for this project where rigid housed seals are scheduled.

E. Thresholds: As scheduled and per details. Comply with CBC Section 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material’s thickness. Proposed substitutions: submit for approval.
1. Exteriors: Seal perimeter to exclude water and vermin. Use Dow Corning 795 Silicone or approved equal. Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
2. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

F. 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.

G. 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.

2.7 FINISH:

A. Generally BHMA 626 Satin Chromium.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

A. Key System: Schlage classic “C” keyway, interchangeable core throughout. 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 to determine system keyway(s), keybow styles, and structure. Furnish Owner’s written approval of the system.

1. Existing master key system.
2. 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.
3. Temporary cylinders/cores remain Supplier’s property.
4. Furnish 10 construction keys.
5. Furnish 2 construction control keys.

B. Key Cylinders: furnish 6-pin solid brass construction.

C. Cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.

D. 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.

E. Bitting List: use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Experienced craftsperson with a resume of successful projects. Can readily differentiate between number 2 and number 3 phillips-drive screws and screwdrivers. Can readily differentiate between #10-24 machine screws and drywall screws, and can explain correct usages of these items.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
   1. Notify Architect of any code conflicts before ordering material.
   2. Locate levers, key cylinders, t-turn pieces, touchbars, locks and other operable portions of latching hardware between 34 inches to 44 inches above the finished floor, per CBC Section 11B-404.2.7.
   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.

D. Existing frames and doors scheduled to receive new hardware: carefully remove existing hardware, tag and bag, and turn over to Owner.
   1. Metal doors/frames: Weld or fasten with screws: filler pieces in existing hardware cut-outs and mortises not scheduled for re-use by new hardware. Leave surfaces smooth - - no applied patches.

3.3 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.
   5. Drawings typically depict doors at 90 degrees, doors will swing to maximum allowable. Install door closers to maximum allowable swing in conjunction with door stops.

B. Locate floor stops no more than 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.

C. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.

3.4 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 to be repaired or replaced to Owner's satisfaction.
   2. Adjust doors to fully latch with no more than 1 pound of pressure.

3.5 DEMONSTRATION:

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 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.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

HW SET: 01

1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	PANIC HARDWARE	AXCD98NL-OP-PA	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 (DOGGING)	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR910NL	630	IVE
1	EA	SURFACE CLOSER	4111 H- EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP

HW SET: 02

1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	PANIC HARDWARE	AXCD98NL-OP-PA	626	VON
1	EA	RIM CYLINDER	20-057-ICX (SPECIFY A, B OR C)	626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 (DOGGING)	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR910NL	630	IVE
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	613 MS/LA	AL	NGP

RE-USE EXISTING WALL STOP & HOLDER

HW SET: 03

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SEC LOCK	ND95TD RHO	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP

HW SET: 04

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SEC LOCK	ND95TD RHO	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	EA	DOME STOP	FS438 435 436 437 AS REQU'D	626	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP

HW SET: 05

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SEC LOCK	ND95TD RHO	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW	630	IVE
1	EA	DOME STOP	FS438 435 436 437 AS REQU'D	626	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP

HW SET: 06

3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM SEC LOCK	ND95TD RHO	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP	FS438 435 436 437 AS REQU'D	626	IVE
1	SET	SEALS	5050 HEAD AND JAMBS		NGP

END OF SECTION 08 7100

SECTION 08 8100 - GLASS GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide glazing and glazing accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 07 9210: Sealants and caulking.
3. Section 08 1110: Glazing for vision panels in metal doors and frames is specified in this Section.
4. Section 08 1400: Glazing for vision panels in wood doors is specified in this Section.
5. Section 08 5110: Glazing for aluminum windows is specified in this Section.
6. Section 09 9100: Field painting of metal panels.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation.
3. Samples: Submit 2 samples, 4" x 4" in size, of each type of glass and gasket proposed for use.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Manufacturer's recommended cleaning procedures for each type of glazing panel.

1.3 QUALITY ASSURANCE

A. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:
1. Flat Glass Marketing Association:
a. "Glazing Sealing Systems Manual";
b. "Glazing Manual".

B. Identification of Safety Glazing:
1. Identify each light of safety glass material installed in hazardous locations as defined in CBC 2406.3 by a label that complies with CBC 2403.1 and which will specify the labeler, whether manufacturer or installer, and state that safety glazing material has been utilized in such installations.
2. The label shall be legible and visible from the inside of the building after installation and shall be acid etched, sand blasted, ceramic fired laser etched, or embossed.

C. Provide tinted or coated glazing panels by one and the same manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01 6600.

B. During storage and handling of glass, provide cushions at edges to prevent impact damage.

1.5 SPECIAL WARRANTY

A. In addition to the warranty requirements of the Contract Documents, submit 2 original copies of glazing manufacturer's written warranty, countersigned by the glazing subcontractor and the Contractor, covering warranties listed below and including removal of the failed or deteriorated glazing, furnishing the matching replacement glazing, and properly installing the matching replacement glazing.
   1. Coated Single Pane Glass: Warranty glass for **10 years** against coating deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 GLASS

A. General:
   1. For all glass, provide the type and thickness shown on the Drawings or specified herein.
   2. Where type or thickness, or both, are not shown on the Drawings or specified herein, provide type and thickness directed by the Architect.

B. Primary Glass:
   1. Provide primary glass complying with ASTM C1036.
   2. Clear Float Glass: Type I, class 1 (transparent), quality q3 (glazing select).
   3. Tinted Float Glass: Type I, class 2 (heat absorbing and light reducing), quality q3 (glazing select), of tint as indicated or specified.

C. Tempered Glass: Grade B (fully tempered), style I (uncoated surfaces), type I (float), class 1 (transparent), quality q3 (glazing select). All tempered glass is to be safety glass and meet human impact loads indicated below.
   1. Tints: Tints as indicated or specified.
   2. Sizes and Cutting:
      a. Prior to tempering, cut glass to required sizes as determined by accurate measurements of the openings to be glazed, making allowances for required edge clearances.
      b. Cut and process edges in accordance with the glass manufacturer's recommendations.
      c. Do not cut or treat edges in the field.

D. Human Impact Loads: Individual glazed areas, including glass mirrors, in hazardous locations as defined by CBC Section 2406.4 shall comply with CBC Sections 2406.1 through 2406.5.

2.3 OTHER MATERIALS

A. Provide other materials, including but not limited to shims, setting blocks, glazing tape, etc., not specifically described but required for a complete and proper installation, as recommended by the manufacturer.

2.4 EXTERIOR GLAZING ASSEMBLIES

A. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure air barrier:
   1. In conjunction with joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier seal.
   3. To maintain a continuous air barrier throughout the glazed assembly from glass pane to heel bead of

glazing sealant.

2.5 GLAZING PANEL TYPES

A. **Type A:** 1/4" thick, clear, fully tempered glass.

C. **Type C:** 1/4" thick, fire-protection rated, safety rated, specialty tempered glazing material.
1. Basis of Design: SuperLite I by SaftiFirst, 888-653-3333.
2. Locations: Glazed lights in interior and exterior 20-minute fire-rated corridor doors.
3. Performance Requirements:
   a. Fire Rating: 20 minutes without hose stream.
   b. Meets NFPA 80, NFPA 252, NFPA 257, UL 9, UL 10B and UL 10C.
   c. Testing Laboratory: Nationally recognized independent testing laboratory.
4. Appearance: Optically clear.
5. Glazing Method: As required for fire rating.
6. Safety Certification: CPSC 16 CFR 1201 Category I or II.

D. **Type D:** 3/4" thick, fire-resistance rated glazing.
1. Basis of Design: SuperLite II-XL 45 by SaftiFirst, 888-653-3333.
2. Locations:
   a. Glazing panels in interior 3/4-hour fire-rated transom and/or sidelight assemblies.
   b. Glazing panels in interior 3/4-hour fire window assemblies.
3. Performance Requirements:
   a. Fire Rating: 45 minutes with hose stream.
   b. Meets ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL 9, UL 10B, UL 10C and UL 263.
   c. Testing Laboratory: Nationally recognized independent testing laboratory.
4. Makeup:
   a. Outdoor Lite: Clear fully tempered glass.
   b. Interlayer: Manufacturer’s proprietary clear fire-resistive intumescent material.
   c. Indoor Lite: Clear fully tempered glass.
5. Appearance: Optically clear.
6. Glazing Method: As required for fire rating.
7. Safety Certification: CPSC 16 CFR 1201 Category I or II.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

B. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
1. Remove protective coatings which might fail in adhesion or interfere with bond of sealants.
2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
3. Prime surfaces to receive glazing compounds in accordance with manufacturers' recommendations.

3.2 INSTALLATION

A. Inspect each piece of glass immediately prior to start of installation.
   1. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
   2. Do not remove labels from glass until so directed by the Architect.
   3. Install glass so distortion waves, if present, run in the horizontal direction.

B. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass manufacturer.
   1. Use blocks of proper size to support the glass in accordance with the manufacturer's recommendations.
   2. Provide spacers for all glass sizes larger than 50 united inches, to separate glass from stops; except where continuous glazing gaskets or felts are provided.
      a. Locate spacers no more than 24" apart, and no closer than 12" to a corner.
      b. Place spacers opposite one another.
      c. Make bite of spacer on glass 1/4" or more.

C. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.

D. Do not use two different glazing materials in the same joint system unless the joint use is approved by the Architect.

E. Mask, or otherwise protect, surfaces adjacent to installation of sealants. Provide black continuous caulking sealant bead at all glass to metal frame joints, over exposed edge of tape, interior and exterior.

F. Miter-cut and seal the joints of glazing gaskets in accordance with the manufacturer's recommendations, to provide watertight and airtight seal at corners and other locations where joints are required.

3.3 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.

3.4 CLEAN-UP

A. Clean glass thoroughly prior to final acceptance. Take special care not to remove materials which may scratch glass. **Scratched glass will be rejected and replaced prior to acceptance.**

END OF SECTION 08 8100

SECTION 09 0175 - PREPARATION OF EXISTING SURFACES FOR PAINTING AND WALLCOVERING

PART 1 - GENERAL

1.1 SUMMARY

A. Clean, repair, and prepare existing surfaces scheduled for painting or wallcovering as specified below, as indicated on the Drawings, and as required by the finish material manufacturer.

B. Related Sections
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2 Section 09 7200: Wall covering.
3 Section 09 9100: Painting.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 GENERAL REQUIREMENTS

A. Perform cleaning, repair, and preparation procedures in strict accordance with the finish material manufacturers' recommendations.

B. Remove removable items which are in place and are not scheduled to receive paint or which must be removed to be painted. Following completion of painting in each space or area, reinstall the removed items by using workmen who are skilled in the necessary trades.

3.3 CLEANING

A. General Cleaning:
1. Clean each surface to be painted prior to applying paint or surface treatment.
2. Remove dirt and other foreign substances. Remove oil and grease with clean cloths and cleaning solvent of low toxicity and flash point in excess of 200 degrees F, prior to start of mechanical cleaning.
3. Schedule the cleaning so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Exterior Cleaning and Pretreatment:
1. Clean all exterior surfaces thoroughly with an approved cleaner and water blasting equipment.
2. After water blasting, completely kill and remove mildew accumulation with a mildew stain remover such as X-14 by White Laboratories, or approved equal.

3.4 PREPARATION OF EXISTING SURFACES

A. Previously Painted Surfaces:
1. Prepare all existing surfaces for proper bond between new paint and existing surface, as recommended by the paint manufacturer.
2. Remove all blistered, peeling and scaling paint to a sound substrate and sand to produce a smooth transition from substrate to existing paint.
3. **Feather edge sand where existing finishes have been removed and the immediate adjacent area has sharp or raised edges.** Sand smooth all chips or runs (highs and lows) so that surface transitions are not visible from a distance of 5'-0".
4. Remove heavy chalk.
5. Sand all glossy areas and dust clean.
6. Clean and spot prime bare and repaired areas. Spot prime with manufacturer's recommended "stain killer" all marks which may bleed through surface finishes.
7. Remove invisible residue on protected areas such as eaves and ceilings using soap and water.
8. Seal all joints.

B. Gypsum Board:
1. Sand all joint compound surfaces smooth and flush with surface with fine grit sand paper.
2. Fill nicks, scratches, holes, and uneven spots with spackling compound and after dry, sand flush with surface.
3. Remove all sanding dust.
4. Where removal of existing wall coverings or other finishes damages the gypsum board substrate, repair damage by filling or floating surfaces to provide acceptable surface for new finishes.

C. Masonry and Cement Plaster:
1. Allow patched areas to dry at least 30 days prior to cleaning in preparation for painting.
2. Patch holes and cracks flush with surface.
3. Remove all loose plaster down to a solid surface. Coat all broken, cracked, damaged or areas where plaster has been removed with Weld-Crete by LARSEN PRODUCTS CORP. or approved equal, apply a cement plaster finish coat consisting of 1 part plastic cement to 3 parts sand to match the existing finish. "V" out, fill, and finish flush all cracks and texture to match adjoining surface.
4. Remove glaze, efflorescence, laitance, surface deposits, and other foreign matter.

D. Wood, Painted Finish:
1. Set all finish nails. Patch and fill all holes and surface imperfections.
2. Remove surface deposits of sap and pitch by scraping and cleaning with mineral spirits.
5. Fill cracks, holes, and scratches with suitable wood filler or spackling compound. When dry, sand flush with surface.

E. Wood, Stained Finish:
   1. Remove existing hardware, catalog, and store for reuse.
   2. Sand existing surfaces to remove existing finishes and prepare for new finishes.
   3. Sand smooth all wood surfaces exposed to view, using the proper sandpaper and remove dust. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.

F. Metal:
   1. Thoroughly clean surfaces until free from dirt, oil, and grease. Remove all mill scale, rust formation, etc.
   2. On galvanized surfaces, use solvent for the initial cleaning, and then treat the surface thoroughly with phosphoric acid etch. Remove etching solution completely before proceeding.
   3. Allow to dry thoroughly before application of paint.

G. Concrete:
   1. Thoroughly clean surfaces.
   2. Fill cracks and void using approved methods.
   3. Fill all holes and cracks with an approved patching compound for the size of patch required. Provide Star Stucco patching compound or approved equal.
   4. Allow patched areas to dry at least 30 days prior to cleaning in preparation for painting.
   5. Prior to painting, the material shall be dry to the extent that a proper, long lasting, and non-blistering bond will be assured. Should the dryness of the substrate be in question, test the substrate in the presence of the paint manufacturer's representative. Do not paint substrate in question until dryness condition improves to meet the paint manufacturer's requirements.

H. Glazing Compounds: Remove all loose and deteriorated glazing compounds and repair with an approved glazing compound prior to painting.

END OF SECTION 09 0175

SECTION 09 0560 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide floor preparation and moisture testing as specified herein and as needed for a complete and proper flooring installation. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Carpet tile.
   4. Thin-set ceramic tile and stone tile.

B. This Section includes:
   1. Preparation of new and existing concrete floor slabs for installation of floor coverings.
   2. Testing of concrete floor slabs for moisture and pH.
   3. Remediation of concrete floor slabs due to unsatisfactory moisture or pH conditions.
      a. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
   4. Removal of existing floor coverings where indicated on the Drawings.

C. The Owner’s independent testing shall conduct the following tests:
   1. Vapor Emissions Testing.
   2. Relative Humidity Testing.
   3. Ph (Alkalinity) Testing.

D. Related Sections:
   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.
   2. Section 01 2100: Cash allowances.
   3. Section 03 3300: Cast-in-place concrete floor slabs.
   4. Section 09 6110: Moisture control treatment for flooring (cash allowance).
   5. Section 09 6500: Resilient flooring.

1.2 CASH ALLOWANCE

A. Refer to Section 01 2100 for cash allowance requirements related to moisture control for flooring.

1.3 REFERENCES

A. All work shall be performed in accordance with the Drawings and Specifications, and with the following standards:
   1. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens); 2008.
   2. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.
   3. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2010.
   4. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2009.

5. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; May 2011.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.5 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
1. Moisture and pH limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report: Include:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and pH test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report to Architect.
7. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.

1.6 QUALITY ASSURANCE

A. Moisture and pH testing will be performed by an independent testing agency employed and paid by Owner.

B. Contractor may perform adhesive and bond test with his own personnel or hire a testing agency.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Coating intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment or with only the addition of a skim coat of patching compound or adhesive, as specified in Section 09 6110.

PART 3 - EXECUTION

3.1 ORDER OF OPERATIONS

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
      a. Do not attempt to remove coating or penetrating material.
      b. Do not abrade surface.
   3. Preliminary cleaning.
   4. Moisture vapor emission tests.
   5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. pH tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   7. Specified remediation, if required.
   8. Patching, smoothing, and leveling, as required.
   9. Other preparation specified.
   10. Adhesive bond and compatibility test.
   11. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
   3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable

to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

A. Where removal of existing floor coverings in indicated, comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows:
1. Place 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.6 pH TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements. This procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   1. Use a wide range pH paper, its associated chart, and distilled or deionized water.
   2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.
   3. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.7 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Concrete Subfloors:
   1. Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8" in 10'-0" variation from level or slopes shown on the Drawings.
   2. Clean cracks, control joints, and other non-moving joints.
   3. Broom clean or vacuum the surfaces to be covered, and inspect the subfloors.
   3. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
   4. Seal patching compound with sealer recommended by the manufacturer and compatible with the flooring products specified.
   5. Do not fill expansion joints, isolation joints, or other moving joints.
   6. Prohibit traffic until patching compound is cured and sealed.

3.8 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.9 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 0560

SECTION 09 2900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Provide gypsum drywall and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Section includes:
1. Gypsum wallboard and accessories.
2. Joint treatment and accessories.
3. Tackboard.

C. Related Sections:
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.
2. Section 06 1100: Rough carpentry.
3. Section 07 8400: Firestopping of penetrations of fire-rated construction.
4. Section 07 5110: Substrate board for Class A built-up roof system.
5. Section 09 0175: Preparation of existing surfaces for painting and wall covering.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.

1.3 REFERENCES

A. All work shall be performed in accordance with the Drawings and Specifications, and with the following standards:
1. GA-214 - Recommended Levels of Gypsum Board Finish; Gypsum Association; 2007.
2. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.
3. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association.
4. GA-600 - Fire Resistance Design Manual; Gypsum Association.

1.4 QUALITY ASSURANCE

A. Drywall installer shall coordinate with General Contractor to ensure that substrates at the ceiling line, base, and door/window frames are within a tolerance of straight, not-to-exceed 1/8" in 10', as indicated by a 10' straight edge. General Contractor shall shim as required prior to drywall installer accepting substrates. Failure to maintain the tolerances will require removal and reinstallation at no additional cost to the Owner.

B. Mock-Ups:
1. At a location on the site where approved by the Architect, provide a mock-up gypsum wallboard panel.
a. Make the panel approximately 2'-0" square.
b. Provide one mock-up panel for each gypsum wallboard finish used on the Work.
c. Revise as necessary to secure the Architect's approval.
2. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.

C. Rated Construction: Comply with the requirements of the indicated system design number and/or test number to furnish the required rating for:
   1. Fire-rated construction.
   2. Sound-rated construction.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 GYPSUM WALLBOARD

A. Fire-Resistant Gypsum Wallboard: Paper-faced gypsum panels, ASTM C1396; sizes to minimize joints in place; edges tapered, ends square cut; Type X, 5/8" thick in all locations unless otherwise noted.

B. Water-Resistant, Fire-Resistant, Gypsum Wallboard: Water-resistant gypsum backing board, ASTM C1396; sizes to minimum joints in place; edges tapered, ends square cut; Type X, 5/8" thick, in widths and lengths as will result in a minimum of joints. Use at walls and ceilings of all restrooms, locker rooms, kitchens (and related food preparation and clean up rooms), unless otherwise note.

2.3 METAL TRIM

A. Finishing Accessories: ASTM C1047; galvanized steel or rolled zinc, unless otherwise indicated.

B. Casing Beads:
   1. Provide channel shapes with an exposed wing, and with a concealed wing not less than 7/8" wide.
   2. Provide bullnose shapes where shown on Drawings, as manufactured by Flannery, Inc., Clinch-On Corner Bead Co.

C. Corner Beads:
   1. Provide angle shapes with wings not less than 7/8" wide and perforated for nailing and joint treatment at horizontal edges.
   2. Provide bullnose shapes at vertical edges and where indicated on the Drawings.

D. Edge Beads at Ceiling Perimeter:
   1. Provide angle shapes with wings not less than 3/4" wide.
   2. Provide concealed wing perforated for nailing, and exposed wing edge folded flat.
   3. Exposed wing may be factory finished in white color.

E. Reveals: Extruded aluminum, alloy 6063-T5, with prepunched mounting flanges tapered to receive joint bedding, tape and top coat. Factory chromate conversion coating. As manufactured by Fry Reglet Corp., Gordon Inc., MM Systems Inc.

2.4 FASTENING DEVICES

A. Wood Framing: No. 6 Type W, bugle-head screws, length as required for single or multi-layer application; ASTM C1002.

B. Metal Framing: No. 6 Type S, bugle-head screws, length as required for single or multi-layer application; ASTM C1002.

2.5 JOINTING SYSTEM

A. Provide a jointing system, including reinforcing tape and compound, designed as a system to be used together and as recommended for this use by the manufacturer of the gypsum wallboard approved for use on the Work. ASTM C 475.

B. Jointing compound may be used for finishing if so recommended by its manufacturer.

C. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

2.6 TEXTURE

A. Primer: Manufacturer's recommended acrylic latex coating. Tuff Hide by USG.

B. Texture Material: Manufacturer's recommended product for the finish texture specified.

2.7 TACKBOARD

A. 1/2" thick, with factory-primed face, specifically formulated as a backing for vinyl wallcovering.
   1. Side to which the vinyl wallcovering will be bonded shall be smooth, laminating quality.
   2. Class II (Flame Spread 26-75).

B. Acceptable Products:
   1. Industrial Insulation Board by Wood Fiber Industries.
   2. Micore 300 Board by USG Interiors, Inc.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. General:
   1. Install gypsum wallboard in accordance with the Drawings and with separate boards in moderate contact but not forced in place.
   2. At internal and external corners, conceal cut edges of the boards by overlapping covered edges of abutting boards.
   3. Stagger boards so that corners of any four boards will not meet at a common point except in vertical corners.

B. Ceilings:
   1. Install gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
   2. Maximum Fastener Spacing: 12" on center for screw fastening.

C. Walls:
   1. Install gypsum wallboard in vertical direction, plumb and square and in full height single piece sheets wherever possible.

a. Gypsum wallboard may be installed in horizontal direction behind vinyl covered tackboard panels.
2. Make end joints, where required, over framing, furring members, or solid backing.
3. Butt factory edges together. Do not butt a factory edge with a cut edge.
4. Maximum Fastener Spacing: 16" on center for screw fastening.

D. Tackboard:
1. Install tackboard over gypsum board or plywood in vertical direction, plumb and square and in full height single piece sheets wherever possible.
2. Use maximum size sheets to minimize joints. Cut sheets only as required.
3. Open all fiberboard packages and place fiberboard pieces singly around the room at least 24 hours before application.
4. Apply tackboard allowing 1/8" gap between boards and fasten to studs as noted in 3.2.C.
5. Provide fiberglass or polyester tape at joints.

3.3 JOINT TREATMENT

A. General:
1. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.
2. Unless specified otherwise, treat all joints on gypsum face panels. Refer to level of finish required below.
3. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.
4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.

B. Embedding Compounds:
1. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.
2. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.
3. After this treatment has dried, apply the number of coats of embedding compound to joints and fastener heads for the level of finish specified for the surface, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged.
4. Sand between coats as required.
5. When thoroughly dry, sandpaper to eliminate ridges and high points.

C. Finishing Compounds:
1. After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads.
2. Feather the finishing compound to not less than 12" wide.
3. When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care to not scuff the paper surface of the wallboard or raise the nap of the gypsum board paper facing.

D. Tackboard:
1. Hand tape joints in tackboard with a hardening-type joint compound having a maximum hardening time of approximately 1-1/2 hours.
2. Apply compound so as to force material into the 1/8" gap between boards.
3. Allow tape embedding application to thoroughly dry prior to the finish application. The finish application shall be Kaiser Dual-Purpose Pre-Mix Joint Compound.

E. Backing Board: 5/8" Type “X” gypsum board, unless otherwise noted.
1. Treat all joints behind fiberglass reinforced panels.
2. Joints behind vinyl covered tackable panels are not required to be treated.

F. Gypsum Board at Fire Rated Construction: Comply with UL fire listed assemblies, or other fire rated assemblies.

3.4 LEVELS OF FINISH

A. The following descriptions of levels of finish are in accordance with GA-214. Finish gypsum board and tackboard in accordance with the Gypsum Construction Handbook as published for the construction industry by United States Gypsum Company.

B. **Level 1:** Embed tape in joint compound at all joints and interior angles. Surface free of excess joint compound. Tool marks and ridges are acceptable.
1. Provide Level 1 finish on surfaces hidden above a ceiling or soffit at sound walls, fire-rated walls, and exterior walls.
2. Provide Level 1 finish on surfaces hidden behind tack board.

C. **Level 3:** Embed tape in joint compound, and provide one additional coat of compound, over all joints and interior angles. Provide two separate coats of compound over accessories and fasteners. All joint compound shall be smooth and free of tool marks and ridges.
1. Provide Level 3 finish on all exposed finished or unfinished gypsum board surfaces not specified to receive Level 4 or 5 finish.
2. Provide Level 3 finish behind fiberglass reinforced panels installed over gypsum backing board.

D. **Level 4:** Embed tape in joint compound, and provide two additional coats of compound, over all joints and interior angles. Provide three separate coats of compound over accessories and fasteners. All joint compound shall be smooth and free of tool marks and ridges. All joint compound shall be smooth and free of tool marks and ridges.
1. Provide Level 4 finish where vinyl wall covering or dry-erase wall covering is installed on gypsum board surfaces.

E. **Level 5:** Embed tape in joint compound, and provide two additional coats of compound, over all joints and interior angles. Provide three separate coats of compound over accessories and fasteners. All joint compound shall be smooth and free of tool marks and ridges. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
1. Provide Level 5 finish on all tackboard surfaces to receive field-applied vinyl wallcovering.

3.5 CORNER TREATMENT

A. Internal Corners: Treat as specified for joints, except fold the reinforcing tape lengthwise through the middle and fit neatly into the corner.

B. External Corners:
1. Install the specified corner bead, fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard.
2. Space the fasteners approximately 6" on centers, and drive through the wallboard into the framing or furring member.
3. After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for level of finish specified for the surface, feathering the joint compound out from 8" to 10" on each side of the corner.

3.6 OTHER METAL TRIM

A. General: The Drawings do not purport to show all locations and requirements for metal trim. Carefully study the Drawings and the installation, and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in this Work.

3.7 TEXTURE

A. Exposed Wall Surfaces for Paint: Provide fine orange peel finish approved by Architect on exposed gypsum board surfaces.

B. Exposed Ceiling and Soffit Surfaces for Paint: Provide fine orange peel finish approved by Architect on exposed gypsum board surfaces.

C. Provide the manufacturer's recommended primer/sealer to surfaces to receive texture prior to texturing.

3.8 MARKING AND IDENTIFICATION (CBC 703.7)

A. At all accessible concealed floors, floor-ceilings and/or attic spaces with fire walls, fire barriers, fire partitions, smoke barriers and/or smoke partitions or any other wall required to have protected openings or penetrations provide signs or stencil as follows:
   1. Located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
   2. Letting shall be not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color stating, "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS".

3.9 CLEANING UP

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

END OF SECTION 09 2900

SECTION 09 3000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide tile where called for on the Drawings, as specified herein, and as needed for a complete and proper installation. Section includes:
   1. Tile for floor applications
   2. Tile for wall applications
   3. Tile wall base
   4. Trim, accessories and setting materials

B. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
   2. Section 07 9210: Sealing and caulking of expansion joints and other joints.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturers recommended installation procedures.
   3. Samples:
      a. Tile: Submit sufficient samples of each size, color, and texture to demonstrate the maximum range of sizes, colors, textures, and flatness. Tiles delivered to the job or installed in the Work, and which do not fall within the accepted range, shall be removed from the site and be replaced promptly with acceptable materials.
      b. Trim shapes and base: Review any unusual installation conditions with the Architect for approval prior to commencing the work.
   4. **Verify availability of all parts, in all colors required, at time of submittal.**

B. Contract Closeout Submittals: Submit in accordance with Section 01 7700.
   1. Manufacturer's recommended cleaning procedures.

1.3 QUALITY ASSURANCE

A. Applicable Standards: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this Specification to the extent they are specified herein. Unless otherwise specified, use the latest edition.
   1. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile - Version; 2014.
   2. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.
   3. Tile Council of America (TCA): Comply with the Handbook for Ceramic Tile Installation.

B. Colors: Provide finish selections indicated in the Finish Schedule.
   1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
   2. Manufacturer’s Standard Colors and Finishes: Where the Finish Schedule specifies a manufacturer’s standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as

other manufacturer's "standard colors" from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings.

3. Custom Colors: Where the Finish Schedule indicates a specific manufacturer's colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable.

C. Blending:
   1. Require the tile manufacturer to blend tiles at the factory.
   2. Provide additional blending at the job site as needed to secure the Architect's approval.
   3. All materials of each specific type and color **shall be from the same dye-lot or run.**
   4. Provide additional lighting if necessary prior to starting tile installations.

D. Provide only tile cartons which have been grade-sealed by the manufacturer in accordance with ANSI A137.1, and with grade-seals unbroken.

E. On manufactured grouts, provide labels certifying compliance with the referenced standards.

1.4 SITE CONDITIONS

A. Install mortar, and set and grout the tile, only when temperature is at least 50° F and rising in the space.

B. Protection:
   1. Protect adjacent surfaces during progress of the work of this Section.
   2. Close rooms and spaces to traffic of all types until mortar and grout have set for 72 hours.

C. Illuminate the work area during installation, providing the same level and angle of illumination as will be available for final inspection.

1.5 EXTRA MATERIALS

A. Materials: Provide for the Owner's use, an extra stock of approximately 3% of each type, color, pattern, and size of material installed. Package each type of material separately, distinctly marked, and protected against deterioration and damage.

B. Deliver materials to the Inspector of Record along with an inventory list of items provided. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01620.

B. Manufacturers: As indicated on the Finish Schedule.

2.2 CERAMIC TILE

A. Except as may be otherwise specified or approved by the Architect, provide floor tiles **with coefficient of friction of 0.60** or higher in accordance with pertinent provisions of ASTM C1028.

B. Ceramic Mosaic Floor Tile, Unglazed:
   1. Type: Ceramic Mosaic
   2. Size: 2"x 2"
   3. Catalog number and/or color: See Finish Schedule
   4. **Note:** Provide ceramic mosaic with 7.5% abrasive content at shower floors.

C. Provide standard trim shapes as required.
   1. Provide all bases, caps, stops, returns, trimmers, and other shapes indicated or required to produce a completely finished installation.
   2. Unless otherwise noted on the Drawings, provide color and finish matching the adjacent tile.
   3. **All interior and exterior wall corners shall be standard bullnose units** unless otherwise noted.
   4. Verify with Architect any conflicting conditions prior to installation.

2.3 INSTALLATION MATERIAL

A. All materials, including mortar bed, metal lath, membranes, bond coats, etc. shall be in strict compliance with the CTA Handbook for Ceramic Tile Installation.

B. Portland Cement Mortar Bed: Provide materials in accordance with ANSI A108.1 and the TCA setting method specified below.
   1. Membrane: 15 pound roofing felt or 4 mil polyethylene film (required in wet areas only)
   2. Portland Cement: ASTM C150, Part 1.
   3. Lime: ASTM C206, Type S or ASTM C207, Type S.
   4. Sand: ASTM C144.
   5. Water: Potable.

C. Bond Coat:
   1. Latex-Portland Cement Mortar: ANSI A118.4. Ardex X77 Microtec fiber reinforced tile and stone mortar by Ardex Americas, Super Flex by TEC, ReFlex by Bostik, 254/255 by Laticrete, or Kerabond/Keralastic by Mapei, with manufacturers recommended acrylic latex additive.
   2. Epoxy: 100% solids; chemical, stain, and shock resistant; ANSI A118.3. Ardex WA Epoxy adhesive and grout by Ardex Americas, AccuColor EFX Epoxy by TEC, ExPoxy Ezclean by Bostik, Latapoxy 300 by Laticrete International, or Kerapoxy by Mapei Corp.

D. Grout:
   1. Epoxy Grout: 100% solids; chemical, stain, and shock resistant; ANSI 118.3. Ardex WA Epoxy grout and adhesive by Ardex Americas, AccuColor EFX Epoxy by TEC, EzPoxy Exclean by Bostik, Latipoxy 300 by Laticrete, or Kerapoxy by Mapei.

2.4 METAL TRIM

A. Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive; by Schluter-Systems or Profilitec.
   1. Applications:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Wall corners, inside and outside.
      d. Transitions between floor finishes of different height.
      e. Thresholds at door openings.
      f. Borders and other trim as indicated on the Drawings.

2.6 CAULKING

A. Ceramic Tile Caulk:
1. Sanded: Polyblend Ceramic Tile Caulk by Custom Building Products, Ardex SX 100% Silicone sealant for tile and stone by Ardex Americas or approved equal.
2. Non-Sanded: Polyblend Ceramic Tile Caulk by Custom Building Products, Ardex SX 100% Silicone sealant for tile and stone by Ardex Americas or approved equal.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.**

B. Coordinate with other trades as needed to assure that proper substrata are provided to receive the work of this Section.

C. Where a Portland cement mortar setting bed will be installed, do not commence installation of the setting bed until substrata are within the following tolerances:
1. Horizontal surfaces: Level within 1/4" in ten ft in all directions;
2. Vertical surfaces: Plumb within 1/4" in eight ft in all directions.

D. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
1. Horizontal surfaces: Level within 1/8" in 10'-0" in all directions;
2. Vertical surfaces: Plumb within 1/8" in 8'-0" in all directions.

E. Condition of surfaces to receive tile:
1. Verify that surfaces to receive mortar setting bed 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 the tile have been installed before proceeding with installation of mortar bed or tile.

F. Tile at Dissimilar Materials:
1. Where tile will be set over dissimilar substrates, i.e. wood and masonry in the same plane, provide and install Dal-Seal CIS - Crack isolation sheet membrane, or approved equal.
2. Provide for 1/4" full depth gap between tile and metal door frames. Fill with mildew resistant silicone sealant.
3. Provide for movement of dissimilar substrate materials by using mildew resistant silicone sealant at nearest grout joint.

3.2 SETTING METHOD

A. Use setting method of the types indicated and required in accordance with TCA Handbook of Ceramic Tile Installation as specified below.

B. Interior Walls:
1. **Wood or Metal Stud and Metal Lath:** W231 with latex Portland cement bond coat on a cured mortar bed; membrane, plain lath, mortar bed and scratch coat - ANSI A108.1B, tile - ANSI A108.1B, and grout - ANSI

A108.10. Provide expansion joints and cold joints at all interior and exterior corners in accordance with TCA Movement Joint Design Essentials EJ171.

C. Interior Floors:
1. **Concrete:** F112 with latex Portland cement mortar bond coat on a cured mortar bed; mortar bed bond coat, mortar bed - ANSI A108.1B, tile - ANSI A108.1B, and grout - ANSI A108.10.

D. Interior Base Only, No Wall Tile Above:
1. **Studs and Gypsum Board:** W221 with latex Portland cement mortar bond coat on a cured mortar bed; membrane, self-furring metal lath, mortar bed with scratch coat - ANSI A108.1B, tile - ANSI A108.1B, and grout - ANSI A108.10.

3.3 TILE INSTALLATION

A. General:
1. **Prior to installation, verify layout of patterns and transitions with the architect for approval.**
2. Comply with pertinent provisions of the referenced standards and the product manufacturer's installation recommendations, except as otherwise directed by the Architect or specified herein.
3. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.
4. Do not install tile floors over membrane until the membrane has been tested and accepted.
5. Mix and use proprietary materials in strict accordance with the manufacturers' printed instructions.
6. Prepare the surfaces, set, fit, grout, and clean the work of this Section in strict accordance with the referenced standards and the manufacturers' recommendations.
7. Provide adequate lighting to assure workman visibility for uniform tile setting.

B. Install in accordance with pertinent provisions of the standards listed in 1.3 above, pressing and beating tile into place to obtain 100% coverage by mortar on back of each tile. Back-butter tiles if necessary to achieve 100% coverage.

C. Limits of Tile:
1. Extend tile into recesses and under equipment and fixtures to form complete covering without interruptions.
2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

D. Joining Pattern:
1. Lay tile in grid pattern unless otherwise indicated on the Drawings or directed by the Architect.
2. **Align joints** when adjoining tiles on floor, base, trim, and walls are the same size.
3. Layout tile work, and center the tile fields both directions in each space or on each wall area.
4. Adjust to minimize tile cutting.
5. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size.
6. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes, and alignments shown:
1. Horizontal surfaces: 1/8" in ten ft in all directions;
2. Vertical surfaces: 1/8" in eight ft in all directions;
3. Adjacent tiles flush.

3.4 THRESHOLDS

A. EDGE STRIPS: Install edge strips at openings where threshold has not been called for, but where tile floor abuts other flooring material at same level.

B. Where thresholds are detailed to be installed over tile, install with a full bedding of bonding mortar.

3.5 GROUTING

A. General:
1. Do not begin grouting floor tiles until they are firmly set and, in no case, in less than 48 hours after they have been installed.
2. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
3. When using proprietary grout, adhere strictly to the manufacturer's directions unless otherwise specified or approved by the Architect.

B. Installation:
1. Mix grout by hand or with a slow-speed drill motor not exceeding 300 rpm, achieving a stiff non-slumping, uniform consistency, and using the minimum amount of liquid to achieve a workable mix.
2. Force the maximum amount of the approved grout into joints in accordance with pertinent recommendations contained in ANSI standards specified.
3. Fill the joints of cushion-edge tile to depth of the cushion; fill joints of square-edge tile flush with the surface.
4. Fill all gaps and skips.
   a. Do not permit mortar or mounting mesh to show through grouted joints.
   b. Provide hard finished grout which is uniform in color, smooth, and without voids, pin holes, or low spots.
5. Leave tile clean.

3.6 CAULKING

A. Locations:
1. Caulk all tiled inside and outside corners with sanded caulking, color to match grout, in lieu of grout.
2. Caulk transition from wall tile to ceiling and wall with sanded caulking, color to match grout, in lieu of grout.
3. Caulk intersection of wall and ceiling tile to door and window frames with sanded caulking, color to match grout, in lieu of grout.

3.7 CURING

A. Damp cure all tile installations, including portland cement grouts, for 72 hours minimum.
1. Cover with 40 pound kraft paper.
2. Do not use polyethylene sheets directly over tile on horizontal surfaces.

3.8 CLEANING AND POLISHING

A. After completion of setting and grouting, thoroughly clean and polish the tile.
1. Do not use acid or acid cleaners to clean tile.
2. When epoxy resin grout is thoroughly cured, steam clean paraffin coating per manufacturer’s recommendations.
3. When the tile is thoroughly clean and dry, polish glazed tile with clean dry cloths.

3.9 PROTECTION AND REPLACEMENT

A. Protect finished tile work while other work in the area is in progress. Do not permit traffic on tile floors for 7 days after laying tile. Protect tile floors from traffic with heavy, non-staining paper held in place with non-staining masking tape.

B. Replace cracked, chipped, broken, and otherwise defective tiles.

C. Remove work not complying with requirements of the Contract Documents or the referenced standards, and promptly replace with work which does comply.

END OF SECTION 09 3000

SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide acoustical ceilings where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 01 3560: High Performance Criteria Summary
3. Section 09 2900: Gypsum Wallboard System

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturers recommended installation procedures.
3. Samples: Submit four 4" x 4" samples of all acoustic ceiling tiles and/or panels specified. Submit two samples of all ceiling suspension system components. If other than components and manufacturer specified are submitted, provide four samples of each component system.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Manufacturer's recommended cleaning procedures.

1.3 QUALITY ASSURANCE

A. Comply with ASTM C635, 636 and E580, CBC Section 1617A.1.21

B. Fire Performance Characteristics: Provide acoustical ceiling components identical to those tested for the following fire performance characteristics, according to ASTM test method indicated, by an independent testing and inspecting agency acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate marking of testing and inspection agency.
1. Surface Burning Characteristics:
a. Flame Spread: 0-25; ASTM E84.
b. Smoke Developed Index: 0-450; ASTM E84.

C. Colors: Provide finish selections indicated in the Finish Schedule.
1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
2. Manufacturer’s Standard Colors and Finishes: Where the Finish Schedule specifies a manufacturer’s standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as other manufacturer’s “standard colors” from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings at no additional costs to the Owner.

3. Custom Colors: Where the Finish Schedule indicates a specific manufacturer's colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable at no additional costs to the Owner.

D. Ceiling grid installer shall coordinate with General Contractor to insure that substrates at the ceiling line are within a tolerance of straight, not-to-exceed 1/8" in 10', as indicated by a 10' straight edge. General Contractor shall shim as required prior to ceiling installer accepting substrates. Failure to maintain the tolerances will require removal and reinstallation at no additional cost to the Owner.

1.4 EXTRA MATERIALS

A. Materials: Provide for the Owner's use, an extra stock of 2 full boxes of each type, color, pattern, and size of material installed. Package each type of material separately, distinctly marked, and protected against deterioration and damage.

B. Deliver materials to the Inspector of Record along with an inventory list of items provided. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 SUSPENDED ACOUSTICAL CEILING SYSTEM

A. Suspension Systems: ASTM C635 and E580 Section 5; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required for a complete suspension system.

B. Acceptable Suspension System Products:
1. Series 1250 heavy-duty by Chicago Metallic Corp., ESR-2631:
   a. Main runner: No. 270.
   b. Cross runner: No. 1254 or 1274.
   c. Perimeter clip: No. 1496.
2. Prelude XL Heavy-duty by Armstrong, ESR-1308:
   a. Main runner: No. 7301.
   b. Cross runner: No. XL-7342.
   c. Perimeter clip: BERC-2.

3. Color:
   a. White at 2' x 4' grid
   b. Black at Ceiling Types C and D.

C. Acceptable Acoustical Ceiling Panel Products: ASTM E1264, Class A.
1. **Type "B":** School Zone Fine Fissured - No. 1714 (NRC 0.70) by Armstrong; 24"x48"x3/4"; square edge lay-in; flame spread 0-25; color white.
2. **All acoustical ceiling panels within the same room shall come from the same die lot.**

2.3 ACCESSORIES

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans wherever possible.

3.3 SUSPENSION SYSTEM INSTALLATION

A. Except as modified by requirements of governmental agencies having jurisdiction, recommendations of the manufacturer as approved by the Architect, or specific directions of the Architect, install in accordance with ASTM C636 and E580 Section 5, CBC Section 808, and pertinent UL design requirements.

B. Hanger Wires:
1. Provide 12 gauge minimum hanger wires for up to and including 4'-0" x 4'-0" grid spacing along main runners. Splices are not permitted in any hanger wires unless specifically approved by DSA.
2. Provide 12 gauge hanger wires at ends of all main and cross runners within 8" from the support and within 1/4 of length of end tee, whichever is least, for perimeter of ceiling area. End connections for runners which are designed and detailed to resist the applied horizontal forces may be used in lieu of 12 gauge hanger wires, subject to DSA review and approval.
3. Provide trapeze or other supplementary support members at obstructions to main hanger spacing.
4. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas.
5. Provide counter-sloping wires for hanger wires which are more than 1 in 6 out of plumb.

C. Perimeter Attachment:
1. Ceiling grid members may be attached to not more than two adjacent walls. Ceiling grid members shall be at least 3/4" free of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners shall be free and a minimum of 3/4" clear of wall.
2. At perimeter of ceiling area where main or cross runners are not connected to adjacent wall, provide interconnection between runners at free end to prevent lateral spreading.
    a. Metal strut or a 16 gauge wire with a positive mechanical connection to the runner may be used.
    b. Where the perpendicular distance from the wall to the first parallel runner is 12" or less, this interlock is not required.

D. Bracing Wires: Provide sets of four 12 gauge splayed bracing wires oriented 90 degrees from each other at following spacing:
1. Provide sets of bracing wires at a spacing not more than 12'-0" x 12'-0" on center.
2. Provide bracing wires at locations not more than 6'-0" from each perimeter wall and at edge of vertical ceiling offsets.
3. Slope of splayed bracing wires shall not exceed 45 degrees from plane of ceiling and shall be taut without causing ceiling to lift. Splices in bracing wires shall not to be permitted without special DSA approval.
4. Fasten a strut to main runner at the convergence of the splayed wires, extended to and fastened to roof or floor structural members above or to such other framing deemed acceptable to enforcement agency.

a. Place these vertical restraint points not more than 12'-0" x 12'-0" on center.
b. Provide vertical struts at locations not more than 6'-0" from each perimeter wall and at the edge of vertical ceiling offsets.

E. Hanger and Bracing Wire Fastening:
1. Fasten hanger wires with not less than 3 tight turns.
2. Fasten bracing wires with 4 tight turns.
3. Make all tight turns within a distance of 1-1/2 inches.
4. Install hanger or bracing wire anchors to the structure in such a manner that the direction of the wire aligns as closely as possible with the direction of the forces acting on the wire.

F. Hanger and Bracing Wire Separation: Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4 inches nominal diameter, to hanger wires using connectors acceptable to DSA.

G. Light Fixtures:
1. Attach all light fixtures to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures.
2. Flush or recessed light fixtures and air terminals or services weighing **less than 56 pounds** may be supported directly on the runners of heavy-duty grid system but, in addition, shall have a minimum of two 12 gauge slack safety wires attached to fixture at diagonal corners and anchored to structure above. All 4'-0" x 4'-0" light fixtures shall have slack safety wires at each corner.
3. All flush or recessed light fixtures and air terminals or services weighing **56 pounds or more** shall be independently supported by not less than 4 taut 12 gauge wires each attached to fixture and to structure above regardless of the type of ceiling grid system used. The four taut 12 gauge wires, including their attachment to the structure, above shall be capable of supporting four times weight of the unit.

H. Wall Angles:
1. Install wall angles and edge moldings of type indicated at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.
2. Screw attach moldings to substrate at intervals not over 16" on center and not more than 3" from ends.
3. Leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".
4. Miter corners accurately and connect securely.

3.4 FIELD TESTING

A. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for **hanger wires**, **1 out of 10 shall be field tested for 200 pounds of tension.**

B. When drilled-in concrete anchors are used for **bracing wires**, **1 out of 2 shall be field tested for 440 pounds in tension.** Shot-in anchors in concrete are not permitted for bracing wires. If any shot-in or drilled-in anchor fails, all adjacent anchors shall be tested.

C. Drilled-in or shot-in anchors require special DSA approval when used in prestressed concrete.

3.5 ACOUSTICAL CEILING PANEL INSTALLATION

A. Arrange acoustical units and orient directionally-patterned units with pattern running in one direction.

3.6 ACOUSTICAL TILE INSTALLATION

A. Install acoustical tile by adhering to substrate, using amount of adhesive and procedure recommended by tile manufacturer including removal of loose dust from backs of tile by brushing and then priming them with thin coat of adhesive.

B. Maintain tight butt joints, aligned both directions, and coordinated with ceiling fixtures.

C. Scribe and cut tile to fit accurately at ceiling edges and penetrations.

3.7 CLEANING UP

A. In addition to other stipulated requirements for cleaning, completely remove finger prints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

B. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 5100

SECTION 09 6110 - MOISTURE CONTROL TREATMENT FOR FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under a cash allowance, provide moisture control treatment applied over new or existing interior concrete slabs where resilient flooring is indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.
2. The Owner's independent testing laboratory shall conduct vapor emission, relative humidity, and pH testing before application of the moisture control treatment as specified herein.

B. Related Sections:
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.
2. Section 01 2100: Cash allowances.
3. Section 03 3300: Cast-in-place concrete floor slabs.
4. Section 09 0560: Common work results for flooring preparation; pH, relative humidity, and vapor emission testing.
5. Section 09 6500: Resilient flooring.

1.2 ALLOWANCES

A. Cash Allowance for Moisture Control for Flooring: The Work of this Section is included in the cost of the moisture control treatment cash allowance specified in Section 01 2100.

1.3 DEFINITIONS

A. As used in this Section, "pounds" shall be defined as "pounds of water per 1,000 square feet per 24 hour period" as described in ASTM E907 and F1869.

B. Alkalinity shall be expressed as a "pH range of 1-14" as described in ASTM F710.

1.4 SYSTEM DESCRIPTION

A. Moisture control treatment shall form adhesion to damp, dry and wet concrete surfaces to restrict water vapor emission levels to a maximum of 3.0 pounds and allow adhesion to alkaline environments.

B. Moisture control treatment shall be compatible with all types of floor covering products and systems.

C. Application includes:
1. Concrete preparation
2. Moisture control treatment, minimum of 2 coats.
3. Cementitious top coat under carpet and resilient flooring.

1.5 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.

2. Installation Procedures: Submit manufacturers recommended installation procedures.
3. Installer Certification: Submit wet signature certification from manufacturer certifying that Installer is approved by manufacturer for installation of specified system for this project and is certified to install each component of the specified system.
4. Certified Testing: Submit manufacturers ASTM performance testing completed within 3 years of project application per ASTM E96, ASTM D1308, and ASTM D4541.
5. Warranty: Submit a copy of the actual warranty which will be issued for the Work; a sample warranty will not be acceptable. Submit full disclosure of all warranty exclusions and conditions. When warranty exclusions and conditions are not written on the actual warranty document, submit separate endorsement.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Special Warranty: In addition to the warranty requirements of the Contract Documents, provide manufacturer's 10-year labor and material warranty.
2. Installer Certification: Provide certification signed by the system installer and countersigned by the system manufacturer certifying that the moisture control treatment was installed in accordance with the Contract Documents and the manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer: Firm regularly engaged in manufacture of moisture control treatment.

B. Installer: Company specializing in application of moisture control treatment, trained by the manufacturer of the products, and certified to install each component of the specified system.
1. Provide references including project name and location, telephone number and name of Owner and General Contractor, size of project, and date of completion.
2. Evidence of success shall include project pictures and pH and calcium chloride test results performed by an independent testing laboratory after installation of the system.

C. Environmental Requirements: Material and equipment shall comply with current regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

1.7 PREINSTALLATION MEETING

A. Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.8 SPECIAL WARRANTY

A. In addition to the warranty requirements of the Contract Documents, provide a 10-year labor and material warranty, non-prorated.

B. Application of product shall yield water vapor emission, relative humidity, and an alkalinity rate less than flooring manufacturer tolerances during the warranty period.

C. The manufacturer shall warrant the moisture control treatment against failure due to alkalinity and/or moisture emanating from the concrete. Warranty shall cover labor and material for repair or replacement of treatment, floor coverings or resinous materials, adhesives and patching compounds damaged by moisture, alkalinity, or improper system application at no cost to Owner.

E. Warranty shall not exclude concrete shrinkage cracks after application, non-compatibility with specified admixtures, concrete silicates or resin treatments, or ACI 318 or ACI 201 limitations.

F. Warranty shall be extended to future flooring updates or changes a cementitious topcoat is applied. Moisture control treatment manufacture shall provide written acceptance of the flooring change.

PART 2 - PRODUCTS

2.1 MOISTURE CONTROL TREATMENT

A. Moisture Control Treatment: Manufacturer's formulation of chemicals and resins mechanically restricting water vapor emission up to 95%, capillary action of up to 25.0 lbs., alkaline resistant; and capable of application on damp, dry and wet concrete substrates; crack treatment; minimum thickness recommended by the manufacturer.
1. Synthetic30fs by Synthetics International, (866) 646-0356.
2. Diamond-VRS by Diamond Stone Products, LLP, (888) 817-8663.
3. Vapor-Guard DC by Advanced Moisture Control, (949) 788-1490.
4. VAP I 2000 by Koester American Corporation, (757) 425-1206.
5. Substitutions: Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Physical Characteristics:
1. ASTM E96 Water Vapor Transmission, wet method: 0.60 US perms.
2. ASTM D4541 Concrete Adhesion: 600 psi (100% concrete cohesive failure).
3. ASTM D1308 Acid/Alkali Resistance: 14pH solution - 100% Resistant.
4. ASTM F1869 Calcium Chloride Testing: 3.0 pounds per 1,000 square feet or less.

2.2 CEMENTITIOUS TOP COAT

A. Self-leveling, Portland cement based coating, minimum 4,000 psi at 28 days, as recommended by moisture control treatment manufacturer to provide a smooth flooring substrate.

PART 3 - EXECUTION

3.1 VAPOR EMISSIONS, RELATIVE HUMIDITY, AND ALKALINITY PRE-TESTING

A. The Owner’s independent testing shall provide testing materials and conduct vapor emissions, relative humidity, and pH (alkalinity) testing in accordance with Section 09 0560.

B. On the basis of testing results, and at the Owner's direction, proceed with the work of this Section under Section 01 2100 - Cash Allowances.

3.2 SURFACE PREPARATION

A. Slab surfaces shall be solid, free from loose particles, cracks, pits rough projections, and foreign matter detrimental to the vapor emissions and alkalinity control system.

B. Cracks, joints, low spots, and high spots shall be prepared as recommended by the system manufacturer.

C. Shot blast concrete surfaces to remove surface contaminates, curing products, and hard dense non-porous layers to an ICRI#3 (100 grit) texture. Grind near walls and edges by industrial grinder with vacuum connection. Vacuum and remove dust, sand and debris.

D. Vacuum, blow and remove dust, sand and debris from slab surface and joints.

3.3 MOISTURE CONTROL TREATEMENT INSTALLATION

A. Joint and Crack Treatment: Coat cracks and joints. Apply manufacturer approved crack and joint compound in accordance with manufacturer's installation instructions.

B. Apply moisture control treatment product over entire surface to produce maximum penetration, alkalinity resistance and specified vapor reduction level in accordance with the manufacturer's written instructions. Coverage rate shall be as recommended by the manufacturer.

C. Cementitious Topcoat: Apply at a rate of up to 1/8" thickness to promote flooring adhesion using a non-porous primer. Primer shall be capable of securing product to moisture control treatment surface.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Manufacturer's representative shall visit the construction site for:
   1. Preinstallation meeting; and
   2. During installation to inspect product installation for compliance with the manufacturer's instructions.

3.5 PROTECTION

A. Protect the finished installation from damage.

B. Repair damage to moisture control treatment surfaces prior to installation of finished flooring.

END OF SECTION 09 6110

SECTION 09 6500 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide resilient flooring, base, and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: 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. Section 09 0560: Floor preparation and moisture testing.
2. Section 09 6110: Moisture control treatment (contract allowance).

C. Special Coordination Requirements: Coordinate finish flooring manufacturer's concrete slab requirements with the work of Section 03 3000 - Cast-in-Place Concrete.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturers recommended installation procedures.
3. Samples: Submit 4 samples of each resilient flooring product specified on the Finish Schedule (including rubber transition strips).

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Manufacturer's recommended cleaning procedures.

1.3 QUALITY ASSURANCE

A. Fire Test Performance: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.
1. Critical Radiant Flux (CRF): Not less 0.45 watts / sq. cm.; ASTM E648.
2. Flame Spread: Not more than 75 per ASTM E84.
3. Smoke Developed: Not more than 450 per ASTM E84.
4. Smoke Density: Not more than 450 per ASTM E662.

B. Colors: Provide finish selections indicated in the Finish Schedule.
1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
2. Manufacturer’s Standard Colors and Finishes: Where Finish Schedule specifies a manufacturer’s standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as other manufacturer’s “standard colors” from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings.
3. Custom Colors: Where Finish Schedule indicates a specific manufacturer’s colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable.

1.4 EXTRA MATERIALS

A. Materials: Provide for the Owner's use, an extra stock of materials as follows:

1. Tile Products: Provide an extra stock of approximately 5% of each type, color, pattern, and size of material installed.
2. Base, Edge, and Stair Tread/Nosings: Provide an extra stock of approximately 5% of each type, color, and size of material installed.
3. Package separately, distinctly marked, and protected against deterioration and damage.

B. Deliver materials to the Inspector of Record along with an inventory list of items provided. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Provide colors and patterns as selected by the Architect from standard colors and patterns of the approved manufacturer in the specified type.

C. Except as may be otherwise specified or approved by the Architect, provide resilient flooring **with coefficient of friction of 0.60** or higher; ASTM D2047.

D. High Performance Criteria: See Section 01 3560.

2.2 RESILIENT MATERIALS

A. Luxury Vinyl Tile:
1. Dimension: 4" x 36" x 1/8".
2. See Finish Schedule for types and patterns.
3. Coefficient of friction greater than 0.5 per ASTM D2047.

2.3 RESILIENT ACCESSORIES

A. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style B cove, by Roppe.
1. Size and color as shown on Drawings and Finish Schedule.
2. Provide longest lengths possible for minimum splicing. Provide premolded corners at outside square corners, including base cabinet alcoves and outside corners.
3. Provide continuous base around radius corners to a minimum of 6" before any splice.

B. Stair Tread and Nosing:
1. Where shown on Drawings, provide square edge, service weight, rubber treads by Roppe continuous across opening.
2. Provide visually-impaired marking at top and bottom treads.
3. Color to as noted on drawings.

2.4 OTHER MATERIALS

A. Provide edge strips and other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Adhesives: Provide waterproof and stabilized type adhesive as recommended by the manufacturer of the resilient materials; low-VOC.
1. Allowable moisture limit of 90% internal relative humidity.

2. Appropriate for the pH conditions of the substrate.

C. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109 or ASTM C472, whichever is appropriate.

D. Concrete Slab Primer: Provide non-staining type as required and as recommended by the manufacturer of the material being installed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and Ph.
   1. Test in accordance with Section 09 0560.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
   3. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0560.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Concrete Subfloors:
   1. Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8" in 10'-0" variation from level or slopes shown on the Drawings.
   2. Clean cracks, control joints, and other non-moving joints.
   3. Broom clean or vacuum the surfaces to be covered, and inspect the subfloors.
   4. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
   5. Seal patching compound with sealer recommended by the manufacturer and compatible with the flooring products specified.
   6. Do not fill expansion joints, isolation joints, or other moving joints.
   7. Prohibit traffic until patching compound is cured and sealed.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

A. General:
1. Install materials only after finishing operations, including painting, have been completed and after permanent air conditioning system is operating.
2. Maintain reference markers, holes, and openings that are in place or plainly marked for future cutting by repeating on the finish surface as marked in the subfloor. Use chalk or other non-permanent marking device.
3. Inspect flooring materials to be installed. Defective materials will be subject to rejection and such rejection shall not be considered as grounds for additional compensation or time extension.

B. Starting installation constitutes acceptance of sub-floor conditions.

3.4 BASE INSTALLATION

A. Installation:
1. Install base where indicated on drawings.
2. Use factory-preformed exterior corners at square vertical outside corners only and factory-preformed or job-mitered interior corners.
3. Apply adhesive to insure contact not more than 1/4" from top of base.
4. Apply base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required.
5. Provide minimum length pieces of 12".
6. Take precautions to eliminate telegraphing of adhesive through the surface of installed base material.

3.5 CLEANING AND PROTECTING

A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.

B. Resilient Tile:
1. Strip, seal, wax and buff finished flooring to a clean and uniform appearance as recommended by the manufacturer, using stripper and wax as approved by the Owner.
2. Provide the manufacturer's recommended number of coats of recommended sealer/wax on floor, then buff to a uniform appearance.

END OF SECTION 09 6500

SECTION 09 7720 - VINYL-COVERED TACKBOARD PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide vinyl covered tackboard where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Work: 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.

1.2 SUBMITTALS

A. Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Submit manufacturer's recommended installation procedures.
3. Samples: Submit 4 samples of each vinyl-covered tackboard specified on the Finish Schedule.

B. Contract Closeout Submittals: Manufacturer's recommended cleaning procedures.

1.3 QUALITY ASSURANCE

A. Provide each type of tackboard as produced by a single manufacturer including recommended primers, adhesives, and sealants.

B. Colors: Provide finish selections indicated in the Finish Schedule.
1. Acceptable Manufacturers: The products and manufacturers specified in the Finish Schedule are for purposes of establishing color and quality. Refer to each Specification Section for additional manufacturers and Section 01 2500 for substitution requirements.
2. Manufacturer’s Standard Colors and Finishes: Where the Finish Schedule specifies a manufacturer’s standard color or finish, the Architect makes no guarantee that matching colors or finishes are available as other manufacturer’s “standard colors” from the listing of acceptable manufacturers. The Contractor shall be responsible for providing colors matching those indicated on the Drawings.
3. Custom Patterns and Colors: Where the Finish Schedule indicates a specific manufacturer’s pattern and/or colors, other acceptable manufacturers shall provide matching custom colors where a standard color is not acceptable.

1.4 EXTRA MATERIALS

A. Materials: Provide for the Owner's use, an extra stock of approximately 10% of each type, color, and pattern of material installed with an appropriate amount of the proper adhesive. Package each type of material separately, distinctly marked, and protected against deterioration and damage.

B. Deliver materials to the Inspector of Record along with an inventory list of items provided. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers:
1. Koroseal, (888) 520-2810.
2. Global Products Tackboard by Western Building Materials, (559) 454-8500.
3. Lamvin Inc., (800) 446-6329.
4. Chatfield-Clarke, (714) 823-4297.
5. Nelson Adams (NACO), (909) 879-0421.
6. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Vinyl Covered Tackboard:
1. Vinyl Wall Covering:
a. Heavy duty (VWC-MD), Type II, total weight not less than 20 oz. per sq. yd., vinyl coating with Koroklear coating, fabric backing of osnaburg or drill.
b. Pattern/texture: Woven fabric look.
c. Color: As indicated on the Finish Schedule.
2. Panel Sizes: 1/2” thick; 8, 9 or 10 foot lengths (as required for minimum horizontal joints); depending on ceiling height; width of 48" minimum; cut panel size in any direction.

C. Flame Spread Characteristics: Provide materials bearing UL label and marking indicating fire hazard classification of wall covering as determined by ASTM E84 or UL 723. Provide materials with the following flame spread ratings:
1. Vinyl Covering: Class A; Flame spread of 25 or less, smoke-developed less than 450.

D. Accessory items:
1. Adhesives: Provide manufacturer's recommended adhesive, primer, and sealer, produced expressly for use with selected wall covering on substrate as shown on drawings. Provide materials which are mildew-resistant and non-staining.
2. Plastic Moldings and Trim: Provide moldings and trim around door and window frames and around all other building features which penetrate vinyl covered tackboard (such as fire extinguisher cabinets).
a. Plastic edge moldings shall be covered with factory applied veneer to match color and texture of vinyl wall covering.
b. Provide plastic moldings at the bottom of tackboard panels where shown in the detail drawings.
c. Provide manufacturers standard moldings for outside and inside corners and end caps at exposed edges.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which work of this section will be performed. Correct conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Maintain constant minimum temperature of 60 degrees F (16 degrees C) at areas of installation for at least 72 hours before and 48 hours after application of materials.

B. Illuminate areas of installation using buildings' permanent lighting system; temporary lighting alone will not be acceptable.

C. Acclimatize board materials by removing from packaging in area of installation not less than 24 hours before application.

D. Remove switch plates, wall plates, and surface-mounted fixtures in areas where board is to be applied.

3.3 INSTALLATION

A. All vinyl wall covering shall be factory installed on 1/2" thick tackboard.

B. Corners of edge moldings around doors and windows shall be carefully cut at 45 degrees to provide tight fitting mitered corners. Sloppy corners will be not be permitted. Putty fill of gaps is not acceptable.

C. Provide metal edge moldings at outside corners.

D. Apply glue to backside of panels or to gypsum board in a uniform coat completely covering entire surface. Provide all temporary bracing required to ensure that vinyl covered tackboard is totally adhesive to gypsum board underlayment.

E. Cut the fiberboard backing, where required, so that the vinyl covering is left longer than the backing. Wrap the vinyl around the cut surface and glue. All finished panels shall have all edges wrapped.

F. Where vinyl covered tackboard is to be covered with rubber base, the maximum "gap" between concrete slab and tackboard shall be 3/8" the minimum "gap" shall be 1/8" (to prevent moisture from wicking up into tackboard). Provide non porous (metal or hardwood) backing for rubber base in resulting gap).

G. **Tackboard shall extend behind all blackboards and future cabinet work.** Tackboard **shall not** extend behind cabinet work that is part of this contract unless Drawings say otherwise.

H. Horizontal joints shall not be permitted unless indicated on the Drawings.

3.4 ADJUST AND CLEAN

A. Replace removed plates and fixtures; verify cut edges of wall coverings are completely concealed.

B. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

C. Remove and reglue any panels which show movement when "pushed" toward wall plain.

END OF SECTION 09 7720

SECTION 09 7730 - FIBERGLASS REINFORCED PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide fiberglass wall panels where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 09 9100: Priming of gypsum board and CMU surfaces.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.

B. Contract Closeout Submittals: Manufacturer's recommended cleaning procedures.

PART 2 - PRODUCTS

2.1 WALL PANELS

A. Textured Gloss Panels shall be finished panels 4' x 8' or 10' x 3/32" as required for installation with no horizontal seams, color as indicated on finish schedule. See Drawings for location.
1. Panels shall be solid fiberglass reinforced polyester construction. Class A; Flame spread of 25 or less, smoke-developed less than 450.
2. Adhesive shall be per manufacturer's standards, meeting requirements of ASTM C557-65T, non-toxic, non-flammable and per State Fire Marshal Standards.
3. Color: As noted on the Finish Schedule

B. 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:
1. Glasbord by Crane Composites, Inc.
2. FiberLite FRP - Wall Panels by Nudo.
4. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 OTHER MATERIALS

A. Provide manufacturer's standard prefinished vinyl clad moldings and trim in harmonizing colors at all joints, corners, and edges.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Securely install the approved products in accordance with the manufacturer's recommendations as approved by the Architect, setting panels straight, plumb, level, and true to the lines and levels shown on the Drawings, and as specified to the by the manufacturer.

B. Install maximum length materials wherever possible.

C. Finish butt joints, wall juncture, wall/ceiling and wall/curb joints with the manufacturer's standard trim pieces and the specified sealant, tooling to a smooth finish.

D. When installed as a wainscot, position panels in a horizontal railroad style to minimize seams.

E. When indicated to be installed backside (smooth side) out, select panels free of mars and scratches.

3.2 CLEANING

A. Upon completion of each buildings work, remove all debris from building and site. Remove all excess mastic and caulking materials from finished surfaces and adjacent surfaces.

END OF SECTION 09 7730

SECTION 09 9100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. General: Paint and finish all exposed surfaces using the combination of materials listed on Painting Schedule in Part 3 of this Section, as specified herein, and as needed for a complete and proper installation.
   1. Surface preparation, priming, and painting specified in this Section are in addition to shop priming and surface treatment specified in other sections.
   2. Paint exposed surfaces whether or not colors are designated in schedules. Paint exposed surfaces to match adjacent materials or areas, in the color selected by the Architect.
   3. **Painting of Patch Work:**
      a. Drawings do not indicate all existing areas or all portions of individual existing areas required to be painted because of patch work, but give the general intent for the work required.
      b. Paint all new work within previously painted existing areas as part of the work of this Section regardless of the trade installing new work and causing patching work.
      c. Paint entire overall surface from corner to corner regardless of the extent of new work and patch work.
      d. In existing areas where 2 or more walls or 1 wall and 1 ceiling surface are new or require painting because of patching, paint entire area including all new work and all previously painted existing surfaces.

B. Work Included: The following list is not totally inclusive and does not exclude work not stated herein but required to be painted in the specifications, Finish Schedule, and drawings. Unless otherwise specified, work to be painted under this Section includes, but is not limited to:
   1. Work specifically noted as requiring a paint finish in the drawings and specifications, and on the Finish Schedule.
   2. Priming of gypsum board and CMU substrates for fiberglass reinforced panels.
   3. Concrete, sealer where indicated.
   4. Concrete, stairs
   5. Interior and exterior metal fabrications, both galvanized and shop primed.
   6. Wood trim.
   7. Wood casework.
   8. Interior and exterior ferrous metal.
   9. Interior and exterior galvanized metal.
   10. Galvanized flashings and sheet metal.
   11. Metal doors and frames.
   12. Wood doors.
   13. Cement plaster.
   14. Gypsum board.
   15. Acoustical ceilings/surfaces.
   16. Exposed surfaces of glazing stops, including those visible after glazing is installed.
   17. Exposed mechanical items including:
      a. Piping, pipe hangers, and supports.
      b. Tanks.
      c. Ductwork and insulation.
      d. Mechanical equipment, and supports.
      e. Accessory items.
   27. Exposed electrical conduit, raceways, fittings, panels, and switchgear.

C. Work Not Included:
1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.
2. Surfaces of prefinished metals, anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section unless indicated on the Drawings.
3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.
5. Do not paint concrete which has been sandblasted unless specifically noted for painting.
6. Do not paint galvanized gratings.

D. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under pertinent other Sections.
3. Section 07 9210: Joint Sealants.
4. Section 09 0175: Preparation of existing surfaces for painting and wall covering.

E. Definitions: "Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.
3. Samples: Following the selection of colors and glosses by the Architect, submit Samples for the Architect's review.
a. Provide four Samples of each color and each gloss for each material on which the finish is specified to be applied, approximately 8" x 10" in size.
b. Provide wood stain samples on specified wood for color selection or approval.
c. If so directed by Architect, submit Samples during progress of the Work in the form of actual application of the approved materials on actual surfaces to be painted.
d. Revise and resubmit each Sample as requested until the required gloss, color, and texture are achieved. Such Samples, when approved, will become standards of color and finish for accepting or rejecting the work of this Section.
e. Do not commence finish painting until approved Samples are on file at the job site.

B. Contract Closeout Submittals: Manufacturer's recommended cleaning procedures.

1.3 QUALITY ASSURANCE

A. Comply with applicable codes and regulations of governmental agencies having jurisdiction, including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.

B. Paint Coordination:
1. Provide finish coats which are compatible with the prime coats actually used and specified.
2. Review other Sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.

3. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
4. Provide barrier coats over noncompatible primers, or remove the primer and reprime as required.
5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General:
1. Do not store flammable materials inside buildings.
2. Mix paint in a location and manner that will protect the environment and facilities.
3. Provide ventilation needed to comply with OSHA requirements.

1.5 SITE CONDITIONS

A. Do not apply exterior materials during fog, rain, or mist, or when inclement weather is expected within the dry time specified by the manufacturer. No exterior or interior painting shall be performed until the surfaces are thoroughly dry and cured. Do not apply paint when temperature is below 50̊F. Avoid painting surfaces when exposed to direct sunlight.

1.6 EXTRA MATERIALS

A. Upon completion of the work of this Section, deliver to the Owner an extra stock equaling 5% of each color, type, and gloss of paint used in the Work, tightly sealing each container, and clearly labeling with contents and location where used.

B. Deliver materials to the Inspector of Record along with an inventory list of items provided. Obtain and forward to the Architect, a signed receipt from the Inspector accepting delivery.

PART 2 - PRODUCTS

2.1 PAINT MATERIALS

A. Products specified are for establishing the type, design, and quality required and are based on products of **Sherwin-Williams.** Other product systems approved for use are by Pittsburg Paints**,** Dunn-Edwards, and Frazee. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.
1. Where products are proposed other than Sherwin-Williams, submit a new painting schedule compiled in the same format used for the Painting Schedule included in this Section.
2. Approved specifications of materials for the other referenced manufacturers may be obtained from the Architect.

B. Undercoats and Thinners:
1. Provide undercoat paint produced by the same manufacturer as the finish coat, unless specified otherwise.
2. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits.
3. Provide undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

C. Paint Systems: The specified standard is 100% acrylic premium top-of-the line paint, except where surfaces are specified to receive industrial coatings.

2.2 COLOR SCHEDULES

A. Refer to the Finish Schedule on the Drawings.

2.3 APPLICATION EQUIPMENT

A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and in accordance with all current Environmental Protection Agency standards and regulations.

2.4 JOINT SEALANTS

A. Provide in accordance with Section 07 9200.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 MATERIALS PREPARATION

A. Mix, prepare, and store painting and finishing materials in accordance with the manufacturer's written recommendations.

3.3 SURFACE PREPARATION

A. General:
   1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturers' recommendations.
   2. Remove removable items which are in place and are not scheduled to receive paint finish.
   3. Following completion of painting in each space or area, reinstall the removed items by using workmen who are skilled in the necessary trades.
   4. Clean each surface to be painted prior to applying paint or surface treatment.
   5. Remove dirt and other foreign substances. Remove oil and grease with clean cloths and cleaning solvent of low toxicity and flash point in excess of 200 degrees F, prior to start of mechanical cleaning.
   6. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Metal:
   1. Thoroughly clean surfaces until free from dirt, oil, and grease per SSPC-SP 1. Remove all mill scale, rust formation, etc.
   2. On galvanized surfaces, use solvent for the initial cleaning, and then treat the surface thoroughly with etching solution. Remove etching solution completely before proceeding. **Prime etched metals the same day cleaning was performed.** If any oxidation (white rust) has formed, sand and remove all forms of

contamination. If the galvanized has been passivated or stabilized, the surface must be abraded, i.e. Brush-Off Blast Clean per SSPC-SP7 or chemically treated.

3. Allow to dry thoroughly before application of paint.
4. Primers specified for structural steel and metal fabrications are standalone systems. Apply full paint system as specified in this Section even if metal comes preprimed or shop primed.

C. Prefinished Metal:
1. Solvent clean per SSPC-SP 1. Abrade substrate to remove gloss and obtain minimum surface profile of 1.0 mil. Solvent wipe to remove dust.

D. Concrete:
1. Thoroughly clean surfaces.
2. Prior to painting, the material shall be dry to the extent that a proper, long lasting, and non-blistering bond will be assured. Should the dryness of the substrate be in question, test the substrate in the presence of the paint manufacturer's representative. Do not paint substrate in question until dryness condition improves to meet the paint manufacturer's requirements.
3. Where floors are to be sealed, provide surface preparation per SSPC-SP13/NACE 6.

E. Masonry and Cement Plaster:
1. Allow to dry at least 30 days prior to cleaning in preparation for painting.
2. Remove glaze, efflorescence, laitance, surface deposits, and other foreign matter.

F. Gypsum Board: Remove all sanding dust.

G. Wood, Painted Finish:
1. Remove surface deposits of sap and pitch by scraping and cleaning with mineral spirits.
2. Seal all knots and pitch pockets with the paint manufacturer's recommended materials prior to prime coat.
3. Sand smooth all wood surfaces exposed to view, using the proper sandpaper and remove dust. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
4. After prime coat is dry, fill cracks, holes, and scratches with suitable wood filler or spackling compound. When dry, sand flush with surface.
5. Do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture meter.

H. Wood, Stained Finish:
1. Apply paste wood filler to open grained wood prior to sanding.
2. Sand smooth all wood surfaces exposed to view, using the proper sandpaper and remove dust. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
3. Apply wash coat of sealer, sand and remove dust.
4. Lightly sand and clean between finish coats as recommended by the paint manufacturer.
5. Seal tops, bottoms, and edges of cutouts on wood doors.

3.4 JOINT SEALANT

A. Refer to Section 07 9200.

B. Joint locations:
1. Intersection of interior painted wall / ceiling surface to door and window frames.
2. Intersection of exterior wall finish to door and window frames, color to match adjacent wall finish.
3. Intersection of painted wall / ceiling surface to dissimilar wall /ceiling surface (painted or unpainted).

3.5 PAINT APPLICATION

A. General:
   1. Touchup or reprime shop-applied prime coats which have been damaged, and touchup bare areas prior to start of finish coats application.
   2. Slightly vary the color of succeeding coats.
      a. Do not apply additional coats until the completed coat has been inspected and approved.
      b. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
   3. Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
   4. On removable panels and hinged panels, paint the back sides to match the exposed sides.
   5. Finish to be smooth.

B. Priming: Primers specified for structural steel and metal fabrications are standalone systems. Apply full paint system as specified in this Section even if metal comes preprimed or shop primed.

C. Drying: Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.

D. Brush Applications:
   1. Brush out and work the brush coats onto the surface in an even film.
   2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.
   3. Ferrous and non-ferrous metals may be sprayed on first coat(s) but final coat shall be applied with brush or roller.

E. Spray Application:
   1. Except as specifically otherwise approved by the Architect, confine spray application to wall surfaces, large expanse areas and similar surfaces where hand brush work would be inferior.
   2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
   3. Do not double back with spray equipment to build up film thickness of two coats in one pass.
   4. Ferrous and non-ferrous metals may be sprayed on first coat(s) but final coat shall be applied with brush or roller.

F. Roller Application:
   1. Apply paint with short nap roller on all metal doors. Color as specified (same interior and exterior).
   2. Remove all surface applied door trim prior to painting.
   3. Roller marks, lap marks, runs, sags, fuzz, lint or other surface imperfections will not be acceptable.
   4. Ferrous and non-ferrous metals may be sprayed on first coat(s) but final coat shall be applied with brush or roller.

G. For completed work, match the approved Samples as to texture, color, and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.

H. Exposed Mechanical and Electrical Items:
   1. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, exposed plumbing vents and flues, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
   2. Paint visible duct surfaces behind vents, registers, and grilles flat black.
   3. Exposed vents and flues: Apply two coats of heat-resistant paint approved by the Architect.
   4. Factory finished items that match color scheme may be approved for leaving unpainted by Architect.

I. Exposed Pipe and Duct Insulation:

1. Apply one coat of latex paint on insulation which has been sized or primed under other Sections; apply two coats on such surfaces when unprepared.
2. Match color of adjacent surfaces unless otherwise noted.
3. Remove band before painting, and replace after painting.

J. Hardware: Paint prime coated hardware to match adjacent surfaces, unless otherwise noted. Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the Architect.

K. Wet Areas:
1. In toilet rooms and contiguous areas, add an approved fungicide to paints.
2. For oil base paints, use 1% phenolmercuric or 4% tetrachlorophenol.
3. For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.

L Miscellaneous:
1. Use "stipple" finish where enamel is specified.
2. Ferrous Metal: When metal comes shop primed or preprimed, always reprime with a solvent primer or Direct-to-Metal (DTM) primer. Sand or remove all visible rust.
3. **Wood Trim: Backprime exterior wood trim prior to installation with the paint manufacturer's recommended exterior wood primer.**
4. Touch-up shall be performed using the same application method as the original final coat application.

3.6 PROTECTION

A. Protect floors, furnishings, equipment, finish hardware, name or information plates, dials, gauges, tile, or other such surfaces not requiring painting from spotting, spillage, or damage of any kind. Clean, repair, or replace any damaged surfaces as directed by the Architect.

B. Remove, loosen, or mask hardware, fixture canopies, outlet covers, switch plates, and other similar items as required for painting work and then replace.

C. Using workmen skilled in these trades, move equipment adjacent to walls to permit wall surfaces to be painted, and following completion of painting, replace and reconnect.

3.7 CLEANING

A. Upon completion of all paint work, clean paint from all glass surfaces leaving a sharp clean line.

B. Remove paint spots, oil, or stains.

3.8 PAINTING SCHEDULE

A. General: Provide paint systems as specified below.
1. Products specified in this schedule are based upon products of **Sherwin-Williams** and are specified for establishing the type and quality of products required. Refer to Paragraph 2.1.A of this Section.
2. See Finish Schedule for colors and gloss.
3. Abbreviations: (F) = Flat, (LL) = Low Luster, (SGE) = Semi-Gloss Enamel; (ESE) = Eggshell Enamel; (GE) = Gloss Enamel; (SL) = Stain/Lacquer

B. Exterior Metal, Ferrous (SGE):
1. First coat: B66-310, Pro Cryl Universal Primer
2. Second coat: B66 Series DTM Semi-Gloss
3. Third coat: B66 Series DTM Semi-Gloss

C. Exterior Metal, Galvanized and Aluminum (SGE):
   1. First coat: B71Y1, DTM Wash Primer
   2. Second coat: B66 Series, DTM Semi-Gloss
   3. Third coat: B66 Series, DTM Semi-Gloss

D. Exterior Metal, Prefinished Aluminum (SGE):
   1. First coat: B5100150, Extreme Bonding Primer
   2. Second coat: B66 Series, DTM Semi-Gloss
   3. Third coat: B66 Series, DTM Semi-Gloss

E. Exterior Metal, Prefinished Ferrous (SGE):
   1. First coat: B5100150, Extreme Bonding Primer
   2. Second coat: B66-350, Sher-Cryl HPA Semi-Gloss
   3. Third coat: B66-350, Sher-Cryl HPA Semi-Gloss

F. Exterior Cement Plaster and Concrete (LL):
   1. First coat: A24W300, Loxon Masonry Primer
   2. Second coat: A6 Series, A100 Exterior Flat
   3. Third coat: A6 Series, A100 Exterior Flat

G. Exterior Concrete Block (F):
   1. First coat: B42W46, Heavy Duty Block Filler
   2. Second Coat: A6 Series, A100 Exterior Flat
   3. Third coat: A6 Series, A100 Exterior Flat

H. Exterior Wood (F):
   1. First coat: B42W41, A100 Exterior Latex Wood Primer
   2. Second coat: A6 Series, A100 Exterior Flat
   3. Third coat: A6 Series, A100 Exterior Flat

I. Exterior Wood - Solid Color Stain (F):
   1. First coat: A15 Series, Woodscapes Exterior Acrylic Solid Color Stain
   2. Second coat: A15 Series, Woodscapes Exterior Acrylic Solid Color Stain

J. Interior Primer Only behind FRP or VWC:
   1. Gypsum Drywall: B28W200, Prep Rite 200 Latex Primer
   2. Concrete Block: B42W46, Heavy Duty Block Filler

K. Interior Flat Wall Paint (F):
   1. Gypsum Drywall:
      a. First coat: B28-2600, Pro Mar 200 Zero Primer
      b. Second coat: B30-3600, Pro Mar 200 Zero Flat
      c. Third coat: B30-3600, Pro Mar 200 Zero Flat
   2. Concrete Block:
      a. First coat: B42W46, Heavy Duty Block Filler
      b. Second coat: B30-3600, Pro Mar 200 Zero Flat
      c. Third coat: B30-3600, Pro Mar 200 Zero Flat
   3. Acoustic Surfaces:
      a. First Coat: B30WJ6851 Showcase Plus
      b. Second Coat: B30WJ6851 Showcase Plus

L. Interior Egg-Shell Enamel (ESE):

1. Gypsum Drywall:
   a. First coat: B28-2600, Pro Mar 200 Zero Primer
   b. Second coat: B20-2600, Pro Mar 200 Zero EG
   c. Third coat: B20-2600, Pro Mar 200 Zero EG
2. Concrete Block:
   a. First coat: B42W46, Heavy Duty Block Filler
   b. Second coat: B20-2600, Pro Mar 200 Zero EG
   c. Third coat: B20-2600, Pro Mar 200 Zero EG
3. Cement Plaster:
   a. First coat: A24, Loxon Masonry Primer
   b. Second coat: B20-2600, Pro Mar 200 Zero EG
   c. Third coat: B20-2600, Pro Mar 200 Zero EG
4. Ferrous Metal:
   a. First coat: B66-310, Pro Cryl Universal Primer
   b. Second coat: B20-2600, Pro Mar 200 Zero EG
   c. Third coat: B20-2600, Pro Mar 200 Zero EG
5. Galvanized Metal:
   a. First coat: B71Y1, DTM Wash Primer
   b. Second coat: B20-2600, Pro Mar 200 Zero EG
   c. Third coat: B20-2600, Pro Mar 200 Zero EG

M. Interior Semi-Gloss Enamel (SGE):
1. Ferrous Metal:
   a. First coat: B66-310, Pro Cryl Universal Primer
   b. Second coat: B6601551, Multi-Surface Acrylic
   c. Third coat: B6601551, Multi-Surface Acrylic
   d. Note: Where trim paint is an extension of or same as exterior color, use the same paint specified under “Exterior Metals”.
2. Galvanized Metal:
   a. First coat: B71Y1, DTM Wash Primer
   b. Second coat: B6601551, Multi-Surface Acrylic
   c. Third coat: B6601551, Multi-Surface Acrylic
   d. Note: Where trim paint is an extension of or same as exterior color, use the same paint specified under “Exterior Metals”.
3. Wood Doors and Trim:
   a. First coat: B5100150, Extreme Bonding Primer
   b. Second coat: B6601551, Multi-Surface Acrylic
   c. Third coat: B6601551, Multi-Surface Acrylic
4. Prefinished Aluminum:
   a. First coat: B5100150, Extreme Bonding Primer
   b. Second coat: B6601551, Multi-Surface Acrylic
   c. Third coat: B6601551, Multi-Surface Acrylic
5. Concrete Block:
   a. First coat: B42W46, Heavy Duty Block Filler
   b. Second coat: B31-2600, Pro Mar 200 Zero SG
   c. Third coat: B31-2600, Pro Mar 200 Zero SG
6. Gypsum Drywall:
   a. First coat: B28-2600, Pro Mar 200 Zero Primer
   b. Second coat: B31-2600, Pro Mar 200 Zero SG
   c. Third coat: B31-2600, Pro Mar 200 Zero SG

N. Interior Gloss Enamel (GE):
1. Ferrous Metal:

a. First coat: B66-310, Pro Cryl Universal Primer
b. Second coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
c. Third coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel

2. Galvanized Metal:
   a. First coat: B71Y1, DTM Wash Primer
   b. Second coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
   c. Third coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
   d. Note: Where trim paint is an extension of or same as exterior color, use the same paint specified under “Exterior Metals”.
3. Wood Doors and Trim:
   a. First coat: B5100150, Extreme Bonding Primer
   b. Second coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
   c. Third coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
4. Concrete Block:
   a. First coat: B42W46, Heavy Duty Block Filler
   b. Second coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
   c. Third coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
5. Gypsum Drywall:
   a. First coat: B5100150, Extreme Bonding Primer
   b. Second coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel
   c. Third coat: B21W351, Pro Classic Waterborne Interior Gloss Enamel

O. Stain and Lacquer (SL):
1. Wood Doors and Trim (transparent):
   a. Stain: A49 Series, Wood Classics Oil Stain
   b. First coat: B44MJ91, Lacquer Sealer
   c. Second coat: B44FJ86, Semi-Gloss Lacquer
   d. Third coat: B44FJ86, Semi-Gloss Lacquer
2. Wood Trim (opaque):
   a. First coat: A15 Series, Woodscapes Acrylic Solid Color Stain
   b. Second coat: A15 Series, Woodscapes Acrylic Solid Color Stain

P. Acoustic Surfaces:
1. First coat: B30WJ6851, Showcase Plus Interior Flat
2. Second coat: B30WJ6851, Showcase Plus Interior Flat

Q. Exposed (Sealed) Concrete Floors:
1. General Polymers clear floor coating and resinous flooring.
2. Epoxy Flooring: SW Armorseal 8100.

END OF SECTION 09 9100

SECTION 10 1115 - MARKER BOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide markerboards where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturer's recommended installation procedures.

B. Contract Closeout Submittals: Manufacturer's recommended cleaning procedures.

PART 2 - PRODUCTS

2.1 MARKER BOARDS

A. Liquid marker boards, porcelain enamel-coated 24 gage steel writing surface on 1/2" industrial grade particle board with moisture retardant barrier back sheet.
   1. Clear anodized aluminum trim with wrapped and mitered corners.
   2. Box style marker trough with end caps, 2" high map rail with black cork insert, map hooks (1 for every 2 linear feet), and one flag standard per room.
   3. Size: As indicated on Drawings and **continuous up to 16' wide without joints**.
   4. Low gloss, glare free, multi-media writing and projection surface.

B. Acceptable Products:
   1. Series 10-150 by Aarco Products Inc., (800) 246-6038.
   2. 202 Series by MooreCo, Inc., (800) 749-2258.
   3. Series 4 by Claridge Products and Equipment, Inc., (800) 434-4610.
   4. BTS Series by Platinum Visual Systems, (800) 498-2990.
   5. Series A-B1 by ADP Lemco, Inc., (800) 575-3626.
   6. Series 2000, By Nelson Adams (NACO) 909-879-0421.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Provide one box of 12 assorted colored markers for each markerboard, and one eraser set for each 12 foot length of markerboard or portion thereof.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

END OF SECTION 10 1115

SECTION 10 1400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide identifying devices where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Room identification signage (room name, room number).
   2. Tactile exit signage.

B. Related Sections:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
   1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
   2. Installation Procedures: Submit manufacturer's recommended installation procedures.
   3. Shop Drawings: Submit shop drawings showing details of installation and anchorage sufficient to enable proper interface with the work of other trades.
   4. Samples:
      a. Provide color chip samples to match colors specified.
      b. Provide sample of sign for example of quality and design characteristics.

1.3 QUALITY CONTROL

A. Code References:
   1. Raised Characters: 11B-703.2.
   2. Braille: Section 11B-703.3.
   3. Visual Characters: Section 11B-703.5.
   4. Pictograms: Section 11B-703.6.
   5. Symbols of Accessibility: Section 11B-703.7.
   6. International Symbol of Accessibility: Section 11B-703.7.2.1.
   7. Inspection: Tactile signs shall be field inspected for compliance after installation 11B-703.1.1.2.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

B. Acceptable Products: Design of plexiglass signs is based on the use of manufacturer’s standard products: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
   1. ASI Sign Systems.
   2. Inland Pacific.

3. Innerface Architectural Signage, Inc.
4. Mohawk Sign Systems.
5. Vomar Products, Inc.
6. Best Signs, Inc.

2.2 SIGNS

A. **Type "B" - Room Name, Room Number, or Tactile Exit Signs:**
1. Type B1: 4"H x Length as Required (LAR).
2. Type B2: 4"H x LAR.
3. Type B3: 5-1/2"H x LAR.
4. Type B4: 4"H x LAR, text: “EXIT”
5. Material: 1/8" acrylic plastic base plaque, integral color (single piece, not laminated), 1/4" radius corners, 1/32" raised letters and numbers.
6. Color: Black with white lettering.
7. Attachment:
   a. Exterior: Epoxy and minimum of 2 vandal resistant screws
   b. Interior: Epoxy
8. Letter style: Calibri, all capital letters.
9. Text: Refer to the Door Schedule and related details on the Drawings.
10. Numeral height: 2".
11. Letter height: 1". Except at access doors for automatic sprinkler riser rooms and fire pump rooms which require 2” minimum height with a minimum stroke of 3/8”.
12. Braille: Contracted (Grade 2) braille symbols on all room name and number signs per Section 11B-703.3.

B. **Type "F" - Listening Assistance Sign:**
1. Size: 10" x 8".
2. Material: 1/8" acrylic plastic base plaque, integral color (single piece, not laminated), 1/4" radius corners, 1/32" raised letters and numbers.
3. Color: International Blue with white symbols and text.
4. Attachment: Double stick tape four edges with 4 vandal resistant screws.
5. Letter style: Calibri, all capital letters.
6. Letter height: 5/8".
7. Text: As indicated on the Drawings.

2.3 BRAILLE REQUIREMENTS

A. Braille Symbols:
1. Contracted (Grade 2) braille.
2. Braille Dots:
   a. Base diameter: 0.059” to 0.063”.
   b. Distance between two dots in the same cell: 0.100”.
   c. Distance between corresponding dots in adjacent cells: 0.300”.
   d. Raise dots 0.025” to 0.037” above the background.
   e. Distance between corresponding dots from one cell directly below: 0.395” to 0.400”.
   f. Dots shall have domed or rounded tops.

2.4 TACTILE CHARACTER REQUIREMENTS

A. Raised Character Proportions per CBC Section 11B-703.2.4 and 11B-703.2.6:
1. Width of upper-case letter "O" shall be a minimum of 60% and a maximum of 110% of the height of the upper-case letter "I".
2. Stroke thickness of upper-case letter "I" shall be 15% maximum of the height of the character.

B. Visual Character Proportions per CBC Section 11B-703.5.4 and 11B-703.5.7:
   1. Width of upper-case letter "O" shall be a minimum of 60% and a maximum of 110% of the height of the upper-case letter "I".
   2. Stroke thickness of upper-case letter "I" shall be a minimum of 10% and a maximum of 20% maximum of the height of the character.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, using only the approved mounting materials, and locating all components firmly into position, level and plumb.

B. Mounting Location and Height. Install signs on the nearest wall adjacent to the latch side of the door. Where there is no wall or space on the latch side, including at double doors, place signs on the nearest adjacent wall, preferably on the right.
   1. Mount signs 48" minimum above the finish floor or ground surface, measured from the baseline of the lowest line of Braille and 60" maximum above the finish floor or ground surface measured from the baseline of the highest line of raised characters.
   2. Determine mounting location such that a person may approach within 3" of signage without encountering protruding objects or standing within the swing of the door.

C. At locations where an exit sign and a room identification sign are back to back on glass, align both signs and make signs the same size.

D. At locations where a sign is mounted on glass with no opposing sign, provide blank sign of the same size to conceal mounting adhesive.

E. Where signs are mounted on split-faced masonry, grind masonry to provide smooth surface to mount signs.

END OF SECTION 10 1400

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide fire protection specialties where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.
3. Shop Drawings: Submit shop drawings as needed to depict the space required for these items, and their interface with the work of other trades.

B. Contract Closeout Submittals: Manufacturer's recommended operating instructions in accordance with requirements of Section 01 7820.

1.3 DEFINITIONS

A. Light (Low) Hazard Location: Locations where total amounts of Class A combustible materials is of minor quantity, including offices, classrooms, and assembly halls.

B. Extra (High) Hazard Location: Locations where the total amounts of Class A combustibles or Class B flammable are present in storage, production, or use, and/or finished product over and above those expected and classed as Ordinary (Moderate) Hazards, including laboratories, woodworking and vehicle repair.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 SURFACE MOUNTED FIRE EXTINGUISHER BRACKETS

A. J.L. Industries No. MB810 or MB818.

2.3 FIRE EXTINGUISHER CABINETS AT LIGHT (LOW) HAZARD LOCATIONS

A. Semi-recessed Cabinets at 2 X 4 Walls: J.L. Industries Cosmopolitan 8137W17, 2-1/2" projection, stainless steel, #4 satin finish, rolled edge construction with corners welded and ground smooth.

B. Recessed Cabinets at 2 X 6 (and larger) Walls: J.L. Industries Cosmopolitan 8135W17, 3/8" projection, stainless

steel with #4 satin finish, flat trim construction with corners welded and ground smooth.

C. Where cabinets occur in fire-rated construction, provide J.L. Industries FIRE-FX option; ASTM E814, labeled for 1-hour combustible and 2-hour non-combustible construction. WHI- TEST# 631-021201 / 631-021202

2.4 FIRE EXTINGUISHER CABINETS AT EXTRA (HIGH) HAZARD LOCATIONS

A. Semi-recessed Cabinets at 2 X 4 Walls: J.L. Industries Cosmopolitan 1037W17, 3" projection, stainless steel, #4 satin finish, rolled edge construction with corners welded and ground smooth.

B. Recessed Cabinets at 2 X 6 (and larger) Walls: J.L. Industries Cosmopolitan 1035W17, 3/8" projection, stainless steel with #4 satin finish, flat trim construction with corners welded and ground smooth.

C. Where cabinets occur in fire-rated construction, provide J.L. Industries FIRE-FX option; ASTM E814, labeled for 1-hour combustible and 2-hour non-combustible construction. WHI- TEST# 631-021201 / 631-021202.

2.5 FIRE EXTINGUISHER CABINETS AT KITCHEN K-RATED EXTINGUISHERS

A. Semi-recessed Cabinets at 2x4 Walls: J.L. Industries Cosmopolitan 2032W17, 4" projection, stainless steel with #4 satin finish, rolled edge construction with corners welded and ground smooth.

B. Recessed Cabinets at 2x6 (and larger) Walls: J.L. Industries Cosmopolitan 2037W17, 2-1/2" projection, flat trim construction with corners welded and ground smooth, stainless steel with #4 satin finish.

C. Where cabinets occur in fire-rated construction, provide J.L. Industries FIRE-FX option; ASTM E814, labeled for 1-hour combustible and 2-hour non-combustible construction. WHI- TEST# 631-021201 / 631-021202

2.6 COMBINATION FIRE EXTINGUISHER / FIRE HOSE CABINETS

A. Semi-recessed Cabinets at 2 X 4 Walls and 2x6 Fire Rated Walls: J.L. Industries Crownline 6237W17-1403, 2-1/2" projection, stainless steel, #4 satin finish, rolled edge construction with corners welded and ground smooth.

B. Recessed Cabinets at 2 X 6 (and larger) Walls: J.L. Industries Crownline 6235W17-1403, 3/8" projection, stainless steel with #4 satin finish, flat trim construction with corners welded and ground smooth.

C. Where cabinets occur in fire-rated construction, provide J.L. Industries FIRE-FX option; ASTM E814, labeled for 1-hour combustible and 2-hour non-combustible construction. WHI- TEST# 631-021201 / 631-021202

D. Fire Hose and Rack Assembly: J.L. Industries HRA100B Fire Hose and Rack Assembly, 1-1/2" hose and valve.
   1. Hose: FM-approved 500 lb test, single jacket polyurethane-lined hose, 100' length.
   2. Fog Nozzle: UL-rated industrial fog nozzle.
   3. Valve and Rack: Cast brass coupling angle valve, escutcheon and nipple; red enamel pin rack; UL-rated.
   4. 100 gpm at 65 psi at nozzle.
   5. Class II service.

2.7 FIRE EXTINGUISHERS

A. Light (Low) Hazard Locations: Provide one multi-purpose, dry chemical, 5 lb. fire extinguisher, **UL rating of 3A-40BC** at each cabinet.
   1. Heavy duty steel cylinder, metal valve and siphon tube, replaceable molded valve stem seal, corrosion and impact resistant epoxy finish, visual pressure gauge, pull pin, upright grip operation.
   2. JL Industries, Cosmic 5E or approved equal.

B. Extra (High) Hazard Locations: Provide one multi-purpose, dry chemical, 10 lb. fire extinguisher, **UL rating of 4A-80BC** at each cabinet.
   1. Heavy duty steel cylinder, metal valve and siphon tube, replaceable molded valve stem seal, corrosion and impact resistant epoxy finish, visual pressure gauge, pull pin, upright grip operation.
   2. JL Industries, Cosmic 10E or approved equal.

C. Kitchens: Wet chemical fire extinguisher, 6 liter fire extinguisher, **UL rating of "K"**.
   1. Heavy duty stainless steel cylinder construction, metal valve and siphon tube, corrosion and impact resistant epoxy finish.
   2. Visual pressure gauge, pull pin, upright grip operation.
   3. Protective nozzle tip orifice seal, industry standard discharge horn and nozzle design.
   4. Nameplate showing only class "K" symbol, non-metallic nozzle tip finger guard.
   5. Installed fire extinguisher shall be within 30'-0" of the kitchen hood system.
   6. JL Industries, Saturn 15 or approved equal.

D. Service, charge, and tag each fire extinguisher not more than five calendar days prior to the Date of Substantial Completion of the Work as that Date is established by the Owner.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Owner, anchoring all components firmly into position for long life under hard use.

C. Locate bracket-mounted extinguishers where directed by the Owner and the Fire Department official.

END OF SECTION 10 4400

SECTION 11 5310 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide fume hood and base cabinet, and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 22 0000: Plumbing
3. Section 23 0000: Heating, Ventilating, and Air Conditioning
4. Section 26 7000: Electrical Work

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.
3. Shop Drawings: Submit detailed drawings as needed to depict the space required for these items, and their interface with the work of other trades.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Operation and Maintenance manuals in accordance with requirements of Section 01 7820.
2. Manufacturer's recommended cleaning procedures.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Approved Manufacturers:
1. Lab Crafters, Inc.
2. Kewaunee Scientific Corp.
3. Labconco.
4. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 FUME HOODS

A. Fume Hood Superstructure:
1. Interior: Epoxy resin lining and baffle with open center slot and adjustable upper and lower exhaust slots, deflector vane.
2. Exterior: Cold-rolled steel, phosphate coated with factory baked-on chemical-resistant synthetic resin finish.
3. Integral Work Top: 1" thick, epoxy resin top with lipped edges, with integrally cup drain at rear.
4. Sash: Counterbalanced with 1/4" thick clear tempered glass.
5. Performance: 480 CFM, 0.10" static pressure drop (through hood only).
6. Acceptable Products: Model No. HBRV4-ADA, 48", by Lab Crafters, Inc.

B. Service Fitting Package: 4 remote controlled service fittings, 1 each air, gas, vacuum, and cold water.

C. Accessories:
1. Air Velocity Alarm: Corrosion-resistant sensor mounted in hood lining and velocity monitor mounted on hood fascia. Provide integral with lab fume hood.
2. Lighting: 2-tube fluorescent with switch.
3. Electrical Outlets: 2 - 120 VAC GFI duplex receptacles.
4. Blower switch with warning light.
5. Blower warning light.

D. Base Cabinet:
1. Provide integral with lab fume hood: radiused-edge, fully overlay doors and drawers, smooth steel finish, 3/8" satin finish stainless steel wire pulls.
2. 32" High Base Cabinet: Provide 1 base cabinet at each hood, provide integral with lab fume hood.
3. 32" High Wall Pedestal Leg: Provide 1 wall pedestal leg at each hood, provide integral with lab fume hood.
4. 36" Long Adjustable Rail: Provide 2 adjustable rail (front and back) at each hood, provide integral with lab fume hood.
5. Provide all related casework accessories including outboard and inboard fillers to provide a finished and complete assembly that supports the fume hood.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures, anchoring all components firmly into position for long life under hard use.

3.3 DEMONSTRATION

A. Upon completion and prior to the acceptance of the work of this Section, schedule and conduct a meeting with the Owner and his personnel to train and thoroughly familiarize them with information necessary to operate and maintain the work. Include, but do not limit the training to:
1. Operation and maintenance manuals;
2. Safety procedures and requirements;
3. Manufacturer's recommended cleaning procedures;
4. System operation and features;
5. System maintenance.

B. Demonstration Meeting:
1. Demonstrate each type of equipment through a minimum of 2 cycles.
2. Prepare and execute In-Service Certification form and submit with closeout documentation.

END OF SECTION 11 5310

SECTION 12 3650 - LABORATORY COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide epoxy resin tops, fume hood and base cabinet, and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 06 4000: Casework for epoxy resin tops.
3. Section 22 0000: Plumbing

1.2 SUBMITTALS

A. General: Submit in accordance with Section 01 3300.
1. Product Data: Submit manufacturer's descriptive literature and product specifications for each product. Include data to indicate compliance with the specified requirements.
2. Installation Procedures: Submit manufacturer's recommended installation procedures.
3. Shop Drawings: Submit detailed drawings as needed to depict the space required for these items, and their interface with the work of other trades.

B. Contract Closeout Submittals: Comply with requirements of Section 01 7700.
1. Operation and Maintenance manuals in accordance with requirements of Section 01 7820.
2. Manufacturer's recommended cleaning procedures.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 LABORATORY TOPS, SPLASHES, AND SINKS:

A. Standards: Comply with WI Section 17C - Laboratory Tops and Sinks - Epoxy Resin.

B. Tops and Splashes: Epoxy resin units using maximum lengths to minimize butt joints.
1. Material Thickness: 1".
2. Top Front Edge: Flat, Lipped (raised 3/16" minimum above work surface, at all front edges and other edges without back or end splashes), Universal with drip groove.
3. Splash Type: Integral, Square butt.
4. Splash Height: Minimum 4" unless otherwise indicated on the drawings
5. Color: Black.

C. Sinks: Epoxy resin units with molded interior corners coved to 1-1/2" radius and bottom pitched to outlet opening.
1. Mounting: Underside mounted with epoxy welded joint to top and manufacturer's standard steel sink

supports.
2. Type: Single tub.
3. Size: 10”x12”x6” deep at teacher demonstration tables, 18”x14”x6” deep at classrooms, and 24”x14”x10” deep at common rooms with one 6” deep at accessible locations one per room.
4. Color: Black
5. Outlet: 1-1/2" diameter by 2-1/2" long threaded outlet with removable strainer and stopper.
6. Plumbing trim is specified in Division 15. Provide holes as needed for plumbing and equipment specified and as indicated on the drawings.

D. Acceptable Manufacturers:
1. Collegedale Casework, Inc.
2. Kewaunee Scientific Corp.
3. Laboratory Tops, Inc.
4. Hamilton Scientific, Inc.
5. Campbell-rhea.
6. Durcon Incorporated.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Owner, anchoring all components firmly into position for long life under hard use.

C. Epoxy Resin Tops: Butt all joints and fill with epoxy cement closely matching color of tops.
1. Mount sinks with epoxy welded joints and support sinks with the manufacturer's standard steel sink supports.

END OF SECTION 12 3650

SECTION 21 0000 - FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

A. The General Mechanical Provisions, Section 23 0000, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE:

A. General: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The entire building shall be fire sprinklered. Note, all Science Classrooms shall be Ordinary Hazard, Group 2.

B. Design/Calculations: The sprinkler system has been designed and sized by hydraulic calculations in accordance with 2016 NFPA No. 13 and fire authority requirements. Calculations have been included in submittals. Provide current fire flow information from flow test at nearest fire hydrant. Fire flow test shall be done within 6 months of installation of sprinkler system.

C. Preparation of Drawings and Material Data Sheets: A complete fire sprinkler submittal (drawings, specifications, materials and hydraulic calculations) has been prepared. Hydraulic calculations shall conform to 2016 NFPA 13, paragraph 23.3.5 in all respects.

D. Coordination Drawings: Contractor shall submit coordination drawings with Contractor title block to Engineer for review, in addition to materials submittals. Deviations between bid documents and coordination drawings shall be specifically noted on drawings (highlighted, clouded, etc.). Any contractor requested design changes to these documents, including layout, materials, or calculations, may be considered a substitution and shall comply with paragraph 1.4 below.

1.3 WORK SPECIFIED ELSEWHERE:

A. Electrical wiring.

B. Fire alarm system.

C. Painting of exposed piping.

1.4 DESIGN CHANGES/SUBSTITUTIONS:

A. General: Design changes or substitutions of fire sprinkler system shall be submitted to Engineer for review.

B. Significant changes in design or substitution of materials may require a construction change document, requiring resubmission to DSA/FLS, as determined by the Engineer and/or DSA District Engineer. Contractor shall bear all expenses incurred due to preparation and processing of design substitutions, up to and including submission to, and obtaining approval from, DSA/FLS. Refer to Section 23 0000, 1.11, B, and DSA Policy PL 10-01 and Interpretation of Regulations IR A-6, available from http://www.dsa.dgs.ca.gov.

C. Any substitution of “Flexible” type piping in lieu of “Rigid” pipe or any changes to size, manufacturer or lengths of “Flexible” type piping will require resubmittal of piping plans, product data sheets and hydraulic calculations to DSA/FLS for review and approval.

D. Contractor shall submit design or field change(s) through proper channels. Engineer shall have a minimum of 5 working days after receipt of design or field change(s) to submit to DSA. Architect and Engineer shall not be liable for any delays due to DSA review time scheduling, or Contractor's failure to identify changed areas and/or substituted materials in shop drawings and submittals.

PART 2 - PRODUCTS

2.1 STANDARDS:

A. All materials shall be in accordance with 2016 NFPA No.13 "Standard for the Installation of Sprinkler Systems". Underground mains shall be in accordance with 2016 NFPA No. 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".

2.2 PIPING MATERIALS:

A. General: The pressure rating of all piping, valves, flanges and other piping accessories shall be in accordance with code and fire authority requirements. Pressure ratings shall exceed the highest possible working pressure.

B. Piping:
1. Underground: Polyvinyl chloride, AWWA C900, with rubber ring joints, ASTM D1869, FM Class 150 (DR18) upstream of FDC, FM Class 200 (DR 14) downstream of FDC. Cast or ductile iron fittings, AWWA C110 or C153, Class 250 or higher, with rubber ring joints, ASTM D1869.
2. Above Grade:
   a. 2" and Smaller: Threaded black steel pipe, ASTM A53, schedule 40. 175 psi WOG (min.) black cast iron threaded fittings, ANSI B16.4, UL listed. Unions shall be Class 150 malleable iron threaded, ANSI B16.3.
   b. 2-1/2" and Larger: Welded or grooved black steel pipe, ASTM A53, schedule 10. Standard weight carbon steel welding fittings, ANSI B16.9. Flanges shall be steel, ANSI B16.5. Roll grooved pipe couplings may be used for assembling welded sections, Victaulic, Grinnell, Gruvlok.

C. Gate Valve:
1. 2" and Smaller: All bronze, rising stem. UL listed.
2. 2-1/2" and Larger: Iron body, bronze mounted, outside screw and yoke. UL listed. (UL listed butterfly valves may be substituted for 4" and larger gate valves above grade.)

D. Check Valve:
1. 2" and Smaller: All bronze swing check. UL listed.
2. 2-1/2" and Larger: Iron body, bronze mounted swing check. UL listed.

E. Drain Valve: All bronze angle globe valve. UL listed.

F. Anchors and Hangers: Shall comply with 2016 NFPA No. 13.

2.3 SPRINKLER HEAD:

A. Automatic sprinkler head, concealed type in areas with finished ceilings and recessed or suspended lighting, semi-recessed in areas with finished ceilings and surface lighting, upright or pendent heads elsewhere (as allowed by NFPA 13). Heads in finished areas shall be Victaulic FireLock V38 quick response concealed, Tyco RFII quick response concealed, or Globe Fire Sprinkler Corp., Quick Response GL Series Concealed Pendent, with chrome-finish metal cover plate. Heads elsewhere shall be quick response, Victaulic FireLock V27, Tyco, Model TY-FRB or Globe Fire Sprinkler Corp., Model GL Quick Response, with

standard finish. UL listed. Temperature ratings shall be in accordance with NFPA No. 13. Provide extra heads (of each type installed) in accordance with code requirements. Exposed heads installed with deflector lower than 7'-6" above floor shall have wire guards.

2.4 ALARM VALVE ASSEMBLY:

A. Standard wet type alarm valve assembly complete with trim as required by the authority having jurisdiction. Provide flow switch and Electric Bell for connection to alarm system. Provide tamper switch. UL listed. Coordinate Electric Bell with Divisions 26 and 28.

2.5 FIRE HYDRANT:

A. Fire hydrant shall be in accordance with fire authority.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION:

A. General: Piping shall be concealed in walls, above the ceilings or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location shall be approved by the Architect. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. Depth of cover in traffic areas shall be 36 inches (minimum).
1. Installer Certification: Installation shall be performed by certified fire sprinkler fitter(s) as required by CCR, Title 19, Divisions 1, Chapter 5.5. See CAL FIRE – Office of the State Fire Marshall Information Bulletin 17-002 for more information. The Bulletin can be downloaded from the following: http://osfm.fire.ca.gov/informationbulletin/pdf/2017/IB_AESCert_final_05_25_17.pdf

B. Standards: All piping shall be installed in accordance with NFPA No. 13 "Standard for the Installation of Sprinkler Systems". Underground mains shall be installed in accordance with NFPA No. 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".

C. Miscellaneous:
1. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings or floors in finished areas.
2. Pattern: Sprinklers shall be installed in a symmetrical pattern with lighting fixtures and with ceiling pattern. Heads located in lay-in ceilings shall be centered in panel, unless shown otherwise on drawings.
3. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller and 2" annular clearance for piping 4" and larger.
4. Access: Provide access doors as required for all valves, devices, etc.
5. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe, or pipe insulation sealed with fire rated materials in accordance with the requirements of 2019 CBC Section 714.
6. Concrete Thrust Blocks: Shall be constructed at all valves, tees, elbows, bends, crosses, reducers and dead ends in loose-joint pipe. Blocks shall cure a minimum of 7 days before pressure is applied. Concrete shall be 3000 psi mix.
7. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards, except where specifically allowed by CEC.

3.2 IDENTIFICATION:

A. All controls, piping, valves and equipment shall be labeled for function and service in accordance with NFPA No. 13 and No. 24.

3.3 TESTS AND ADJUSTMENTS:

A. Unless otherwise directed, tests shall be witnessed by a representative of the Architect and an inspector of the authority having jurisdiction. Contractor shall notify fire authority at least 48 hours prior to testing. At various stages and upon completion, the system must be tested in the presence of the enforcing agency. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and the entire work retested. Test all systems in accordance with fire authority requirements and NFPA No. 13 and No. 24.

3.4 CERTIFICATION:

A. At completion of the project, a Contractor's Material and Test Certificate, indicating installation and testing in accordance with referenced standards, shall be completed. Copies shall be prepared by Contractor for the approving authorities, Owner and Contractor. Deliver certificates to Owner through Architect.

END OF SECTION 21 0000

SECTION 22 0000 - PLUMBING

PART 1: - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

A. The General Mechanical Provisions, Section 23 0000, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE:

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:
1. Sanitary sewer system.
2. Domestic water system.
3. Fuel gas system.
4. Drain system (including condensate drain).
5. All equipment as shown or noted on the drawings or as specified.
6. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, braces, housekeeping pads, supports and related items no longer required.
7. Lead Free: All equipment, fixtures, valves and fixture stops providing water for human consumption installed after January 1, 2010, must meet the “Lead Free” requirements for the State of California.

B. Work Specified Elsewhere:
1. Line voltage power wiring, disconnect switches and installation of all starters are included in the Electrical Section unless otherwise noted.
2. Concrete and reinforcing steel unless specifically called for on the drawings or specifications.
3. Painting unless specifically called for in the drawings or specifications.
4. Carpentry.

PART 2: - PRODUCTS

2.1 PIPING MATERIALS:

A. Sanitary Sewer:
1. Soil, Waste and Vent Piping (Non-Pressurized):
a. Inside Building Above Grade: Standard weight coated cast iron pipe and fittings. Plain end, CISPI 301, ASTM A888, or hub end with rubber gaskets, ASTM A74, ASTM C564. ABI, Tyler, Charlotte. Couplings shall be heavy-duty shielded couplings, Type 304 stainless steel, with neoprene gasket, ASTM C-1540. Husky HD 2000, Clamp-All 80, Mission HeavyWeight. MG Couplings are also acceptable. Size 2" and smaller above grade may be standard weight galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12. 2" and smaller exposed to view shall be galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12.
Below grade cast iron pipe and fittings shall have 8 mil (minimum) Polyethylene Encasement (Poly Wrap), Per ANSI/AWWA C105/A21.5.
b. Inside Building: Solid wall Schedule 40 PVC, ASTM D1785, D2665, with solvent weld DWV fittings, ASTM D2665, D3311. Piping with less than 24" of cover outside building walls shall be cast iron as specified above.
c. Outside Building: Polyvinyl chloride (PVC), SDR-35, ASTM D3034 with PVC fittings with rubber ring joints. Piping within 10 feet of water piping shall be solid wall Schedule 40 PVC,

ASTM D1785, D2665, with solvent weld DWV fittings, ASTM D2665, D3311. Piping with less than 24" of cover outside building walls shall be cast iron as specified above.

2. Soil and Waste Piping (Pressurized):
   a. Above Grade: Standard weight galvanized steel, ASTM A53, with coated cast iron recessed drainage fittings, ANSI B16.12.
   b. Under Ground:
      (1) Hard drawn Type L copper pipe with brazed joints and DWV fittings.

-OR-

      (2) Solid wall Schedule 80 PVC, ASTM D1785, D2665, with Schedule 80 solvent weld pressure fittings, ASTM D2467.
   c. Valves: Same as specified for water piping, except 3" and smaller gate valves in copper piping system may be same as specified for 2" and smaller water.
   d. Cleanout Warning: Provide a permanent warning sticker on cleanout plugs that state "WARNING: PRESSURIZED SEWER. DISCONNECT PUMP POWER PRIOR TO OPENING".
3. Cleanouts: Comparable models of Josam, Wade, Mifab or Zurn are acceptable. Grease plug prior to installation. Floor Cleanouts: Smith 4023 with nickel bronze top in finished areas; Smith 4223 in utility areas. Wall Cleanouts: Smith 4532 with stainless steel cover and screw. Pipe Cleanouts: Iron body with threaded brass plug. Site cleanouts more than 5' outside building may be PVC with PVC plug.
4. Cleanout Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.

B. Acid Waste: CPVC pipe and fittings, Type IV, ASTM Cell Classification 23447, ASTM F 2618 and certified by NSF International for use in corrosive waste drainage systems with the NSF-cw mark. All pipe and fittings shall be listed to ASTM E 84/UL 723 for flame spread of less than 25 and smoke development of less than 50 as designated on the pipe marking or fitting package labeling. All pipe markings shall be accompanied by a yellow stripe for identification of CPVC chemical waste system. All fittings shall be CPVC drainage patterns meeting the requirements of ASTM D 3311 or the manufacturer's specifications, as applicable. Floor drains and floor cleanouts shall have stainless steel grates and/or tops. Joining method for pipe and fittings shall be solvent cement welding. Solvent cement shall be a "one-step" primerless type CPVC cement specially formulated for resistance to corrosive chemicals and manufactured in accordance with ASTM F 2618 or F 493. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. All pipe, fittings, and cement shall be supplied together as a system. 220□F maximum working temperature, not intended for pressure applications. Floor drains and floor cleanouts shall have stainless steel tops. Lifetime Warranty. Spears LabWaste.

C. Water and Gas:
1. Hot and Cold Water Piping: Materials used in the water system, except valves and similar devices, shall be of like material, except where otherwise approved by Engineer and Authority Having Jurisdiction, prior to start of work.
   a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:
      (1) Hard temper seamless copper, ASTM B88. Wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100F, min.). 1-1/2" and smaller above grade may be soldered, lead-free silver solder. All nipples shall be lead-free red brass (85% copper). Above grade fittings may be copper (1/2" to 2") or bronze (2-1/2" to 4") press fittings, ASME B16.18 or ASME B16.22. EPDM O-rings. Installation shall be in accordance with the manufacturer's installation instructions. ProPress.
   b. Outside Building - Below Grade:
      (1) Same as Inside Building. Galvanized steel shall have protective coating.

-or-

      (2) 3" and Smaller: Schedule 80 Polyvinyl chloride (PVC), ASTM D1785, with Schedule 80 PVC solvent weld fittings, ASTM D2466 where approved by administrative authority.
2. Gas Piping:
   a. Inside Building and All Above Grade: 2" and Smaller: Schedule 40 galvanized steel pipe, ASTM A53. 150 psi galvanized malleable iron screwed fittings, ANSI B16.3, ANSI B31.8. 2-1/2" through 4": May be screwed pipe as above or welded pipe as below. Welded:

Schedule 40 black steel pipe, ASTM A53. Standard weight carbon steel welding fittings, long radius ells, ANSI B16.9.

b. Inside Building Below Grade to Five Feet Outside Building: Same as Inside Building and All Above Grade. Provide sleeves and vents acceptable to administrative authority.

3. Valves and Specialties:

a. Valves:

(1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Kitz, Milwaukee, Nibco, Stockham, Walworth or Watts are acceptable. All valves of a particular type or for a particular service shall be by the same manufacturer.

(2) Gate Valve: 2" and Smaller: All bronze. Non-rising stem. Threaded bonnet. Wedge disk. Malleable iron handwheel. 200 psi CWP. Nibco T-113-LF.

(3) Ball Valve: Full port. Lead free brass body, cap, stem, disk and ball. Screwed connection. Lever handle. PTFE seat and stem packing. Min. 400 psi CWP. CSA-US and UL listed. Nibco T-FP-600A-LF.

(4) Plug Valve: Valves in gas piping systems must be UL or CSA listed for gas distribution. 4" and Smaller: Eccentric bronze or nickel plated semi-steel plug. Semi-steel body. Bronze bushings. Buna-N-rings. 175 psi WOG. KeyPort Valve Series 400. 2" and smaller above grade may be listed full port ball valves, except in publicly accessible locations. Apollo, Jomar, Nibco.

(5) Check Valve: Lead-free bronze swing check, regrinding. 200 psi CWP. Nibco T-413-Y-LF. For vertical applications use lead-free bronze, spring-loaded, lift-type. Nibco T-480-Y-LF.

(7) Valve Box: Precast reinforced concrete. Cast iron lid marked for service. Christy F8 in foot traffic areas; G5 in roadways. Provide with PVC pipe extension down to top of pipe.

b. Miscellaneous Specialties:

(1) Temperature and Pressure Relief Valve: ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing element immersed within upper 6" of tank. Watts.

(2) Union: 2" and Smaller: AAR malleable iron, bronze to iron ground seat. 300 psi. Unions for copper piping shall be copper or lead free cast bronze. Anvil. Size 2-1/2" and Larger: Grooved pipe, synthetic gasket, malleable iron housing. EPDM gasket, NSF 61 rated. Victaulic Style 77, Gruvlok.

(3) Dielectric Coupling: Insulating union or flange rated for 250 psig. Wilkins DUXL Series.

D. Drain Piping (including Condensate): Same as inside building cold water piping.

1. Condensate Drain Piping for Condensing Gas Fired Equipment: Solid wall schedule 40 CPVC piping with solvent weld fittings from equipment to neutralizing kit. Schedule 40 galvanized steel, ASTM A53 downstream of neutralizing kit. If no neutralizing kit, piping shall be CPVC to point of discharge.

E. Flue and Intake Piping (Condensing Gas Fired Equipment): Schedule 40 CPVC piping with Schedule 40 CPVC solvent weld fittings. Install per equipment manufacturer’s instructions.

F. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Anvil, Unistrut.

b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.

c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Anvil, Unistrut.

2. Flashing: Vent flashing shall be 4 lb/ft2 lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof jacks with 16" sq. flange. Provide clamp-on storm collar and seal water tight with mastic. For cold process built-up roof, material shall be 4 lb/ft^2 lead instead of galvanized steel. For single-ply roofing, use the roofing manufacturer's recommended flashing material.

2.2 PIPING INSULATION MATERIALS:

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Pre-Molded Fiberglass: Heavy density sectional pre-molded fiberglass with vapor barrier laminated all service jacket and pressure sealing vapor barrier lap. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. Perm rating 0.02, ASTM E96. Puncture rating 50 Beach units, ASTM D781. Provide 3" (min.) wide tape of same material as lap for butt joints. For hot water piping to 140°F, thickness shall be 1" for pipe sizes less than 1"; 1-1/2" thickness for pipe sizes 1" and 1-1/2"; 2" thickness for 2" and larger. See Title 24, Part 6 "California Energy Code" for temperatures above 140°F. Knauf, Johns-Manville, Owens-Corning.

C. Fiberglass Blanket: Unfaced. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft2-F at a mean temperature of 50F. 1-1/2" thickness. Knauf, Johns-Manville, Owens-Corning.

D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.

E. Vapor Barrier Coating: Childers CP-34, Foster 30-65. Permeance shall be 0.08 perms or less at 45 mils dry as tested by ASTM F1249.

F. Aluminum Jacketing: Aluminum pipe and fitting jacketing. 0.016" thickness for straight pipe. 0.024" thickness for fittings. Stucco-embossed finish. Integral moisture barrier. Provide pre-fabricated aluminum strapping and seals by same manufacturer. Childers.

G. Outdoor Weather Barrier Mastic: Childers CP-10/11, Foster 46-50.

H. Metal Jacketing Sealant: Childers CP-76, Foster 95-44.

I. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft2-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

J. Molded Closed Cell Vinyl (Piping Insulation Under Lavatories and Sinks): Fully molded closed cell vinyl, 1/8" thick, minimum. Thermal conductivity shall not exceed 1.17 BTU-in/hr-ft^2-ºF at an average temperature of 73ºF. Weep hole in cleanout nut enclosure. Hinged cap over valve to allow access for servicing. Out of sight nylon fastening system and internal ribs on drain insulation to provide air gap (Lav-Guard Only). Truebro Lav-guard, McGuire Pro Wrap, Plumberex.

2.3 FIXTURES:

A. General: Provide rough-in for and install all plumbing fixtures shown on drawings. Except in equipment rooms, all trim, valves and piping not concealed in wall structure, above ceiling or below floors, shall be brass

with polished chrome plate finish, unless noted otherwise. All enameled fixtures shall be acid resisting. Standard color is white unless otherwise noted.

B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent models of American Standard, Eljer, Elkay, Haws, Just, Kohler, Moen, T&S Brass, Willoughby or Zurn are acceptable. For drainage fixtures, equivalent models of Josam, Mifab, Smith, Wade or Zurn are acceptable.

C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.
1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). ¼ turn ball stops do not require stuffing box. Dahl, McGuire, Speedway.
2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.

D. Caulking: Caulk fixtures with white G.E. "Sanitary SCS1700", mildew resistant silicone sealant with EPA listed anti-microbial.

2.4 EQUIPMENT:

A. General Requirements:
1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
3. Ratings - Electrical: Electrical equipment shall be in accordance with NEMA standards and UL or ETL listed where applicable standards have been established.
4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
5. Electrical:
a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, and shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.
c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip-proof, NEMA B design on pumps, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction, unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors from 1 horsepower to 5 horsepower shall be the standard high efficiency

type, Magnetek E-Plus. Motors 7-1/2 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Motors exposed to weather shall be TEFC. Vertical motors with exposed fans shall have rain caps.

d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

B. Water Heater: Gas-fired, tankless, condensing, wall-mounted water heater, direct vent, certified by CSA Group to the latest edition of ANSI standard Z21.10.3/CSA 4.3. Unit shall be designed to burn natural gas. Water heater shall be vented with 2" or 3" CPVC vent pipe per manufacturer's installation instructions. Water heater shall be rated for 150 PSI working water pressure and 300 PSI test pressure. Gas supply pressure shall be 3.5" to 10.5'' WC for natural gas. Unit shall have a steel case, dual stainless steel heat exchangers, eco premixed burner, negative pressure gas valve, dual venturi, 3/4" inlet gas connection, 3/4" brass inlet/outlet water connections, and a condensate collector. Unit shall include features such as an adjustment for installations at high elevation, temperature lockout, and temperature options from 98-120°F in 1 °F intervals and 125-140°F in 5°F intervals. The unit shall include additional temperature options of 150-180°F in 10°F intervals, and 182°F for high temperature commercial applications. All NPE "A" models shall include an internal circulation pump and 0.5 gallon buffer tank. The water heater shall be controlled by an internal circuit board that monitors the inlet and outlet temperatures with installed thermistors, sensing and controlling flow rate to set point temperature with air-fuel ratio controls in order to maintain thermal combustion efficiency. Unit shall include safety features such as flame sensor system, high limit sensors, overheat prevention device, freeze protection mode, and fan motor rotation detector. Multi-system (cascade) applications that require 2 to 16 units shall be installed by connecting the units using cable-only connections (Ready-Link). The water heater shall exceed the energy efficiency requirements of ASHRAE 90.1-2013 and shall be listed by SCAQMD rule 1146.2 (Type 1) for Low NOx that complies with 20 ppm NOx requirements @ 3% 02. Water heater shall have a minimum 8-year limited Heat Exchanger warranty and 3-year limited Parts warranty for Commercial use. Navien, Inc. NPE Series.

C. Lift Station: See Equipment and Fixture Schedule on drawings sheet P12.

PART 3: - EXECUTION

3.1 PIPING INSTALLATION:

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Architect. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise noted.

2. Joints:

a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.

b. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.

c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3. Fittings and Valves:

a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.

b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.

c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.

d. Valves: All valves shall be full line size. Provide shut-off valve for each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.

e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling.

4. Pipe Support:

a. General: Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Nibco 707-3-5, to a Holdrite Model #SB1 bracket; nipple through surface shall be threaded brass.

(1) Pressure Pipe:

Pipe Size (Inches)	Maximum Spacing* Between Supports (ft.)	
	Copper	Sch. 40 steel
1/2	6	6
3/4	6	8
1	6	8
1-1/4	6	10
1-1/2	6	10
2	10	10
2-1/2	10	10
3	10	10
4	10	10
6	10	10

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

(2) Gravity Drain Pipe: Piping shall be supported at each length of pipe or fitting, but in no case at greater spacing than indicated above for pressure pipe.

b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.
c. Trapeze: Trapeze hangers of construction channel and pipe clamps may be used. Submit design to Engineer for review.

5. Miscellaneous:
a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.
b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance.
c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of 2019 CBC Section 714.
d. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.
e. Thermometer Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2". Mount on side of pipe.

B. Sanitary Sewer Piping:
1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed at 1/8" per foot pitch where structural or other limitations prevent installation at a greater pitch. Bell and spigot piping shall be installed with barrel on sand bed; excavate hole for bell.
2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 45 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.
3. Vents: Vents shall terminate not less than 6" above the roof nor less than 12" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.

C. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in battery. Minimum pipe size shall be 1/2", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Shock absorbers shall be installed in a vertical position as indicated on drawings. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.

D. Gas Piping: Installation shall comply with CPC and NFPA 54 (National Fuel Gas Code). Shall be pitched to drain to drip legs at low points where other than dry gas conditions exist. No unions shall be installed except at connections to equipment. Provide shutoff and dirt leg (sediment trap) at each equipment connection. Only equipment mounted on vibration isolators shall be connected with flexible connectors. Under floor piping shall be sleeved and vented.
Odor Fade Warning – The odorant in propane (LP) and natural gas is colorless and the intensity of its odor can fade under some circumstances. Contact the utility company for more information.

E. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be

connected with flexible connection. Piping not concealed in wall structure, above ceilings or below floors shall be chrome plated brass, except in equipment rooms, piping shall be galvanized steel. P&T relief and water heater drain piping shall be galvanized steel. Provide secondary drain piping where required.

F. Plastic Piping: Shall be cut square and assembled prior to solvent weld. Apply primer per manufacturer's recommendations. Coat male joint fully with solvent, make joint before solvent dries and wipe exterior clean.

G. Acid Waste Piping: Shall be installed in accordance with manufacturer's recommendations.

H. Flue and Intake Piping: Flue and intake piping shall be installed in accordance with its UL listing and the manufacturer's instructions.

3.2 PIPING INSULATION INSTALLATION:

A. Domestic Hot Water:
1. General: All domestic hot water piping, fittings and accessories shall be insulated.
2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.
3. Fittings and Valves:
   a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Solvent weld. Seal all joints with factory supplied pressure sealing vapor barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140F or the piping is exposed to weather.
   b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.
4. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.

B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather or other areas subject to freezing (i.e. ventilated attics, uninsulated exterior soffits, etc.) shall be insulated same as hot water piping. Cover with aluminum jacketing where exposed to weather. Short lengths of pipe and valves may be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish where exposed to weather.

C. Piping Insulation Under Lavatories and Sinks: Exposed water piping, water stops and drain piping under accessible lavatories and sinks shall be insulated with 1/8" thick molded closed cell vinyl. Installation shall be in accordance with manufacturer's instructions.

3.3 FIXTURE INSTALLATION:

A. Fixture Height: Shall be as indicated on Architectural drawings.

B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all foreign matter out of drain line.

C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white

G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

D. Floor Mounted Fixtures: Shall be provided with proper support plates. Caulk floor mounted fixtures with white G.E. "Sanitary SCS1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION:

A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.

B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 TESTS AND ADJUSTMENTS:

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.

B. Gravity Systems:
1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but no less than 2 hours.
2. Drains (Including Condensate): Similar to Sanitary Sewer.
3. Storm Drain: Similar to Sanitary Sewer.
4. Acid Waste: Similar to Sanitary Sewer.

C. Pressure Systems:

1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.
2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.
3. Gas Piping: Maintain 100 psig air pressure for 4 hours.

D. Fixtures: Provide torque testing of water closet carrier anchor bolts in presence of Inspector. If Inspector is not available, a testing agency shall handle the inspection.

3.6 DISINFECTION:

A. Disinfect all domestic water piping systems in accordance with 2019 CPC Section 609.9, and in accordance with administrative authority. Disinfection process shall be performed in cooperation with health department having jurisdiction and as required by applicable codes in presence of Inspector of Record (IOR). During procedure signs shall be posted at each water outlet stating, "Chlorination Do Not Drink". Contractor shall notify the IOR 48 hours prior to the need for testing so the IOR can make arrangements for the testing laboratory to collect samples and test the water. Samples shall be taken at the furthest point of

each building. Contractor shall obtain a copy of the test results from the Testing laboratory and shall provide copies to the Architect, IOR and Owner before project completion. If the water fails the bacteriological test, Contractor shall disinfect the piping again and pay for any retesting required, at no additional cost to owner. Contractor shall include copy of Bacteriological Test Results at closeout with operation and maintenance manuals.

END OF SECTION 22 0000

SECTION 23 0000 - GENERAL MECHANICAL PROVISIONS

PART 1: - GENERAL

1.1 GENERAL CONDITIONS:

A. The preceding General and Special Conditions and Divisions 00 and 01 requirements shall form a part of this Section with the same force and effect as though repeated here. The provisions of this Section shall apply to all of the Sections of Divisions 21, 22 and 23 of these Specifications and shall be considered a part of these sections.

1.2 CODES AND REGULATIONS:

A. All work and materials shall be in full accordance with current rules and regulations of all applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern. Applicable codes and regulations include, but are not necessarily limited to, the following:

1. California Code of Regulations (CCR):
    a. Title 8, Industrial Relations
    b. Title 24, Part 1, Administrative Regulations
    c. Title 24, Part 6, California Energy Code, 2019 Edition
    d. Title 24, Part 11, California Green Building Code, 2019 Edition
2. California Building Code - CBC - 2019
3. California Mechanical Code - CMC - 2019
4. California Plumbing Code - CPC - 2019
5. California Fire Code - CFC - 2019
6. California Electrical Code - CEC - 2019
7. Air Diffusion Council - ADC
8. American Gas Association - AGA
9. Air Movement and Control Association - AMCA
10. American National Standards Institute - ANSI
11. Air Conditioning and Refrigeration Institute - ARI
12. American Society of Heating, Refrigerating, and Air Conditioning Engineers - ASHRAE
13. American Society of Mechanical Engineers - ASME
14. American Society for Testing and Materials - ASTM
15. American Water Works Association - AWWA
16. Cast Iron Soil Pipe Institute - CISPI
17. National Electrical Manufacturers Association - NEMA
18. National Fire Protection Association - NFPA
19. National Sanitation Foundation - NSF
20. Occupational Safety and Health Act - OSHA
21. Plumbing and Drainage Institute - PDI
22. Sheet Metal and Air Conditioning Contractors National Association - SMACNA
23. Underwriters' Laboratory - UL

1.3 PERMITS AND FEES:

A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required by Section 01 1100. All charges shall be included in the work.

1.4 COORDINATION OF WORK:

A. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements. Verify the proper voltage and phase of all equipment with the electrical plans. If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Architect and the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination.

B. Mandatory Coordination and Shop Drawings:

1. Prepare or have prepared high level detailed Shop Drawings in plan view, with cross-sections as necessary, indicating the proposed installation plan for all HVAC, mechanical, fire sprinkler, and plumbing installations for the project. These Drawings should depict actual elevations and linear dimensions, as well as all routing changes, transitions, major offsets, deck and structural attachments deemed necessary to accomplish the installation. Individual Shop Drawings may be prepared for each trade working within the designated space or area; however, the coordination of the consolidated installation shall remain the responsibility of the Contractor. These Shop Drawings shall be provided to each Subcontractor having Work in each area for coordination. Any fittings, offsets or other changes due to coordination shall be at no additional cost to Owner.
2. Whereas the Drawings are diagrammatic, showing only the general arrangement of the systems, Contractor shall have responsibility for the fitting of materials and equipment to other parts of the equipment and structure, and to make adjustments as necessary or required to resolve space problems, preserve service room, and avoid architectural and structural elements and the Work of other trades. Contractor may be required to identify certain areas to relocate installations within the spaces depicted on the Drawings, e.g., ductwork and/or piping may be shifted within the space shown to accommodate other systems. Such functional relocations shall not be deemed a change to the requirements of the Contract. In the event a major re-routing of a system appears necessary, Contractor shall prepare and submit for approval, Shop Drawings of the proposed rearrangement.
3. Because of the diagrammatic nature and small scale of the Drawings, all necessary offsets, adjustments, and transitions required for the complete installation are not shown. Contractor shall carefully investigate the conditions affecting all the Work and shall arrange such Work accordingly, furnishing such fittings, equipment, valves, accessories, offsets, etc., as may be required, regardless of size or cost, to meet such conditions, at no additional cost to the Owner.
4. Coordination changes are not design changes and shall be provided at no additional cost to Owner. Any guidance, drawing or clarification issued by the Architect or Engineer to assist the Contractor or their sub-contractors in their coordination during construction are not design changes and shall be provided at no additional cost to Owner.
5. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of work between sections. The Contractor's decisions, if consistent with the Contract Documents, shall be final. The Architect and their Consultants are not required to coordinate work between sections and will not do so. Any changes required that affect the design intent shall be presented to and approved by the Architect and Engineer of Record.
6. The coordinated Shop Drawings must be signed off by HVAC, Plumbing, Fire Sprinkler, Electrical, Framing, Ceiling Installation, and Data and Low Voltage Subcontractors.
7. The signed off Shop Drawings shall be submitted to the Owner's Representative for review and approval prior to commencement of installation.
8. Provide reviewed Shop Drawings to each Subcontractor having Work in each area.

1.5 GUARANTEE:

A. Guarantee shall be in accordance with the General Conditions. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of

guarantee shall be furnished to the Owner through the Architect. Equipment that is started and operated prior to acceptance shall have the guarantee extended to cover that period. Owner guarantee shall start at acceptance.

1.6 QUIETNESS:

A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.7 DAMAGES BY LEAKS:

A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.8 EXAMINATION OF SITE:

A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.9 COMPATIBILITY WITH EXISTING SYSTEMS:

A. Any work which is done as an addition, expansion or remodel of an existing system shall be compatible with that system.

1.10 MATERIALS AND EQUIPMENT:

A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance.

1.11 SUBMITTALS:

A. Shop Drawings: Within 30 days of contract award, the Contractor shall submit six copies of shop drawings for all materials, equipment, etc. proposed for use on this project (this includes deferred approval items). Material or equipment shall not be ordered or installed until written review is processed by the Engineer. Any item omitted from the submittal shall be provided as specified without substitution.
All shop drawings must comply with the following:
1. Shop drawings are required for all material and equipment items and shall include manufacturer's name and catalog numbers, dimensions, capacities, performance curves, and all other characteristics and accessories as listed in the specifications or on the drawings. Descriptive literature shall be current factory brochures and submittal sheets. Capacities shall be certified by the factory. FAX submittals are not acceptable.
2. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents, and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.
3. All capacities, characteristics, and accessories called for in the specifications or on the drawings shall be high-lighted, circled or underlined on the shop drawings. Calculations and other detailed

data indicating how the item was selected shall be included for items that are not scheduled. Data must be complete enough to permit detailed comparison of every significant characteristic which is specified, scheduled or detailed.

4. Electronic Submittals: Where allowed by Division 01, electronic submittals are acceptable providing the following requirements are met. Electronic submittals which do not comply with these requirements will be rejected.
   a. Submittal shall be a single file in PDF format, with bookmarks for table of contents and each tab, and sub-bookmarks for each item.
   b. All text shall be searchable (except text that is part of a graphic).
   c. Submittal shall include all items noted in 1 through 3 above, except a binder is not required.
   d. Electronic submittals shall be processed through normal channels. Do not submit directly to the Engineer unless the Engineer is the prime consultant for the project.
   e. Contractor shall provide Owner and Owner's Representative with hard copies of the final submittal. Coordinate exact number required with Owner through Architect/Engineer.

B. Substitutions: Manufacturers and model numbers listed in the specifications or on the drawings represent the standard of quality and features desired (where equipment is scheduled on the drawings, any equipment submitted other than scheduled equipment is considered a substitution). Unless otherwise noted, alternate manufacturers may be submitted for review by the Engineer. Calculations and other detailed data indicating how the item was selected shall be included. The Contractor shall assume full responsibility that substituted items or procedures will meet the specifications and job requirements and shall be responsible for the cost of redesign and modifications to the work caused by these items. At the Engineer's request, furnish locations where equipment similar to the substituted equipment is installed and operating along with the user's phone numbers and contact person. Satisfactory operation and service history will be considered in the acceptance or rejection of the proposed substitution.

C. Review: Submittals will be reviewed for general conformance with the design concept, but this review does not guarantee quantity shown, nor does it supersede the responsibility of the Contractor to provide all materials, equipment and installation in accordance with the drawings and specifications. The Contractor shall agree that shop drawing submittals processed by the Engineer are not Change Orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall agree that if deviations, discrepancies or conflicts between shop drawings and design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed. If a resubmittal is required, submit a complete copy of the Engineer's review letter requiring such with the resubmittal.

1.12 MANUFACTURER'S RECOMMENDATIONS:

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

1.13 SCHEDULING OF WORK:

A. All work shall be scheduled subject to the review of the Architect, Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner.

1.14 OPENINGS, CUTTING AND PATCHING:

A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Architect.

1.15 EXCAVATION AND BACKFILL:

A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.

B. Excavation: Width of trenches at top of pipe shall be minimum of 16", plus the outside diameter of the pipe. Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

C. Backfill:
1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator. Native soil may be used where allowed by Geotechnical (Soils) Report. Where native soil is used, trenching for gravity drain pipe shall be done using a laser-level and trencher.
2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.16 PROTECTIVE COATING FOR UNDERGROUND PIPING:

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. Johns-Manville. Protective coating shall be extended 6" above surrounding grade.

1.17 ACCESS DOORS:

A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Key and cylinder lock (except quick-opening type for Emergency Gas Shutoff Valve). Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2"	12" x 12"
1 valve up to 3"	16" x 16"
Fire/smoke damper	20" x 24"

1.18 CONCRETE ANCHORS:

A. Steel bolt with expansion anchor requiring a drilled hole - powder driven anchors, adhesive anchors and concrete screws are not acceptable. Re-use of screw anchor holes shall not be permitted. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete. Post-installed anchors in concrete used for component anchorage shall be pre-qualified for seismic application in accordance with ACI 355.2 and ICC-ES AC193. Post-installed anchors in masonry used for component anchorage shall be pre-qualified for seismic applications in accordance with ICC-ES AC01. Maximum allowable loads for tension and shear shall be as determined by Calculation in compliance with ACI 318-14, Chapter 17, and the anchor's ICC or IAPMO evaluation report. Hilti, Powers, Red Head.

1.19 EQUIPMENT ANCHORING:

A. All equipment shall be securely anchored in accordance with ASCE 07-16, Chapter 13, as amended by CBC Section 1617A.1. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point. All air handlers shall be mounted on spring isolators. Secure base plate as indicated above.

1.20 SEISMIC SUPPORT AND RESTRAINT DESIGN SERVICE:

A. All mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with the "Seismic Restraint Components for Suspended Utilities", 2020 Edition, as published by Mason West Inc., OPM-0043-13, or other HCAI pre-approved system, and in accordance with ASCE 07-16, Chapter 13, as amended by CBC Section 1617A.1. Brace spacing shall be reduced by 50% for cast iron, plastic, no-hub, or other non-ductile piping. A copy of this manual shall be kept on site at all times during construction.

B. Contractor shall obtain the services of a Seismic Design service to provide engineered seismic supports and restraints for the project. Mason Industries, or pre-approved equal. **Note: Use of the "12 inch rule" does not exempt Contractor from this requirement.**

1. All seismic designs, including designs using HCAI pre-approvals, shall be submitted as project specific engineered designs sealed and signed by a licensed California structural engineer. All seismic designs shall include project / application specific seismic design demand calculations. Said seismic design demand calculations shall account for seismic forces in all applicable direction including axial, lateral, vertical tension, vertical compression, etc. Designs shall account for prying, eccentricity, uneven loading, weak axis bending, etc.
2. Seismic restraint layouts for piping, ductwork and electrical raceways shall be furnished on shop drawings or added to the contractor's shop drawings and shall include:
   a. The number, size and location of seismic braces.
   b. Maximum support loads and seismic loads at the seismic brace locations.
   c. Reference to specific details or pages from the HCAI pre-approved system (OPM).
   d. **If use of the "12 inch rule" is intended by Contractor, design service shall verify locations where it is intended to be used is feasible and specifically identify these locations on the shop drawings, along with appropriate hanger details.**
3. Installations not addressed by the OPM approval must be designed, detailed and submitted along with the shop drawings.
4 Submit seismic restraint layout drawings and special details for approval of the project structural engineer per the requirements listed in the HCAI pre-approval (OPM).

5. Seismic restraint layout drawings shall bear the stamp and signature of the registered professional structural engineer licensed in the state of California who designed the layout of the braces.

1.21 ASBESTOS CONTAINING MATERIALS AND ASBESTOS REMOVAL:

A. No materials or material coatings containing asbestos shall be allowed on this project.

B. All asbestos removal shall be by Owner. Asbestos is to be removed before the work is started. If the Contractor discovers asbestos which has not been removed, the Contractor shall immediately cease work in that area and promptly notify the Owner. Where the removal of asbestos shingles is necessary, the Contractor shall advise the Owner regarding the location and quantity of shingles to be removed.

1.22 SYSTEM IDENTIFICATION:

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6" to 8" below finished grade.

C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4) and identifies the area or space served by the equipment. Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

1.23 CLEANING:

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

B. At the end of each work day, the Contractor shall cover all open ends of piping and ductwork with protective plastic.

1.24 ACCEPTANCE TESTING:

A. All acceptance testing as required by California Code of Regulations, Title 24, and as noted on the Certificate of Compliance form, (where applicable), shall be performed and documented by an Acceptance Test Technician (ATT). These documents must be provided to the building inspector during construction and must be completed through an Acceptance Test Technician Certification Provider (ATTCP). The Contractor shall submit a copy of the documentation to the Engineer for review (hardcopy or electronic), prior to submitting to Administrative Authority.

1.25 OPERATION AND MAINTENANCE INSTRUCTIONS:

A. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

B. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.

1.26 RECORD DRAWINGS:

A. The Contractor shall obtain one set of blue line prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, underfloor duct, etc. within the building shall be recorded by offset distances from building walls. As part of the Contractor’s overhead expense, request a full set of reproducible drawings to transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review.

PART 2: - PRODUCTS (not used)

PART 3: - EXECUTION (not used)

END OF SECTION 23 0000

SECTION 23 0001 - HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS:

A. The General Mechanical Provisions, Section 23 0000, shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE:

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:
1. Air distribution system.
2. All equipment as shown or noted on the drawings or as specified. Furnish motor starters except where motor control centers are used. Coordinate with Division 26.
3. System energy balance.
4. Temperature control system.
5. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, ductwork, braces, supports, housekeeping pads, temperature controls and related items no longer required.

B. Work Specified Elsewhere:
1. Line voltage power wiring, disconnect switches and installation of all starters are included in the Electrical Section, unless otherwise noted.
2. Connection of condensate drains to equipment.
3. Concrete and reinforcing steel unless specifically called for in the drawings or specifications.
4. Painting unless specifically called for in the drawings or specifications.
5. Carpentry.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS:

A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50. Shall comply with 2019 CMC.

B. Metal Ductwork: Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A-653, with gage and construction to match SMACNA Standard for pressure required (26 gage minimum).
1. Fume Hood Exhaust Ductwork: Exhaust ducts from fume hoods shall be constructed in accordance with Chapter 5 of the California Mechanical Code with 18 gage stainless steel. All joints shall be made with a continuous weld.

C. Flexible Ductwork: Insulated flexible ductwork. One pound per cubic foot glass fiber insulation, 1-1/2" thick (R-6), 2” thick (R-8) where ductwork is outside the building thermal insulation envelope. Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. Seamless metalized reinforced polyester vapor barrier jacket. Continuous internal liner bonded to galvanized steel wire helix. Duct shall be capable of continuous operation at 1-1/2" of positive water static pressure and 4,000 ft/min air velocity. Duct shall comply with NFPA 90A. JP Lamborn.

D. Duct Sealants: All Joints Exposed to Weather: Sealant shall be water based, Foster 32-19/32-17, Childers CP-146/148, United Duct Sealer WB or G.E. “SilPruf” SCS2000 silicone sealant. Joints Not Exposed to Weather:

Fiber reinforced. White in color. Foster 32-17, Childers CP-148, Design Polymerics DP1030, Hardcast Versa-Grip 181, Hardcast CCWI-181.

2.2 AIR TERMINALS AND DUCT FITTINGS:

A. Grilles: (Grilles, Registers, Diffusers and Louvers)

1. Information on Drawings: Refer to Grille Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description Titus. Equivalent models of Anemostat or Krueger are acceptable. Refer to the floor plans for neck size, CFM, air diffusion pattern and fire damper, if required.
2. Performance: Submit complete performance data (throw, pressure drop, noise level, etc.) for all grilles proposed, other than those scheduled. Testing shall be in accordance with ANSI/ASHRAE 70-1991. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, pressure drop, throw and noise level.
3. Frame and Accessories: Supply, return, and exhaust grilles shall not have an opposed blade volume control damper unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawings. Key or screwdriver operated, no slide bars.
4. Finish: All ceiling and wall grilles and all louvers shall have a paintable white finish unless otherwise noted. Interior components (everything behind the face plate) shall be flat black. Floor grilles shall have an anodized aluminum finish unless otherwise noted.

B. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" diameter pin shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Regulator for horizontal ducts overhead shall be mounted on sides or bottom of ducts. Secure a 12" length of brightly colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, slit insulation to allow handle to protrude. Ventlok 641 (with 607 end bearing for round ducts).

C. Turning Vanes: Double wall, hollow metal, air foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne HEP.

D. Flexible Connection: UL listed neoprene coated 30 ounce fiberglass cloth. 3" metal, 3" fabric, 3" metal. Ventglas.

E. Combination Fire/Smoke Damper: California State Fire Marshal approved. UL listed and labeled indicating fire rating. Hour rating as required by the rating of the wall, ceiling, floor, etc. in which it is installed. Combination fire/smoke dampers shall have normally-closed, non-stall factory electric actuator rated for 250ºF (min.) and shall be Leakage Class II.

F. Duct Access Door:

1. Rectangular: Insulated double wall door. Full piano hinge. Cam latch. Pressure rating to match application. Air Balance, Ductmate.
2. Round: Three layers of stamped steel. Inside panel shall consist of two layers of metal which are spotwelded together along the rim, encapsulating high density fiberglass insulation (25/50 rated). Closed cell neoprene gasket bonded to the inside of the door. Zinc plated conical springs installed between the inner and outer door. Polypropylene molded knobs with threaded metal inserts. Knobs shall be easily turned by hand and shall be UL94HB listed. Zinc plated carriage bolts, clinched and sealed to the inner door. Provide self adhesive template for the exact size of duct opening. Pressure rating to match application. Ductmate.

2.3 DUCTWORK INSULATION MATERIALS:

A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Fiberglass Blanket: **Installed** thermal resistance at a mean temperature of 75ºF shall meet or exceed indicated value. 3/4 lb/ft^3 or 1 lb/ft^3, **R-6** where ductwork is within the building thermal insulation envelope. 3/4 lb/ft^3 **R-8** where ductwork is outside the building thermal insulation envelope and/or above the roof. Faced with glass reinforced foil laminated to Kraft paper. Certainteed, Knauf, Johns-Manville, Owens-Corning.

C. Acoustic Lining: Glass fiber duct liner, ASTM C1071 and C1104. Installed thermal resistance at a mean temperature of 75ºF shall meet or exceed indicated value. One side coated to prevent fiber erosion up to 6000 ft/min. Average noise reduction coefficient of 0.80. 1.5 lb/ft^3 density. 1" thick (**R-4.2**) where ductwork is within the building thermal insulation envelope. 2" thick (**R-8**) where ductwork is outside the building thermal insulation envelope and/or above the roof. Certainteed, Knauf, Johns-Manville, Owens-Corning.

D. Bonding Adhesive: Design Polymerics DP2501, Foster 85-60.

2.4 EQUIPMENT:

A. General Requirements:
1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.
2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.
3. Ratings:
   a. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be CSA (US) certified, except that boilers shall be CSA (US) certified or UL listed.
   b. Electrical: Electrical equipment shall be in accordance with NEMA Standards and UL or ETL listed where applicable standards have been established.
4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.
5. Electrical:
   a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.
   b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors 1 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Motors exposed to weather shall be TEFC. Motors in a fan air stream shall be TEFC or TEAO. Vertical motors outdoors shall be ODP or TEFC and shall have rain caps.

d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

6. Fan Selection:

a. Fan Curves: Performance curves shall be submitted for all units of 3000 CFM or greater. Operating point for forward curved fans shall be from point of maximum efficiency toward increased CFM limited by horsepower scheduled. Operating point for backward inclined fans shall be selected near point of maximum efficiency. Curves shall plot CFM verses static pressure with constant brake horsepower, RPM and efficiency lines.

b. Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted, pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.

7. Filters:

a. General: Tested and rated in accordance with ASHRAE Standard 52.2 and Title 24, C.C.R. Furnish and install one complete change of all filters after air balance is completed and prior to acceptance.

b. Filter Media: 22" media. MERV-13. Clean filter resistance 0.41" water at 500 fpm. Throw away frame. Class 2. Camfil AP-Thirteen.

8. Screens: All duct or louver openings to the outside shall be covered with 1/2", 16-gage, galvanized wire mesh screen.

9. Mixing Dampers: Opposed blade, 16-gage. Six-inch maximum blade width, 48" maximum length. Nylon or oil impregnated bronze bearings. One-half inch diameter pin shaft. 16-gage channel frame. One percent maximum leakage at 4" WC in accordance with AMCA 500 for outside air dampers. Actuating rod out of air stream. Arrow.

10. Sound Ratings: Shall be in accordance with ASHRAE 36 - 72. Sound ratings shall not exceed scheduled values.

11. Drives: Unless noted as direct connected, drives shall be V-belt, rated at 150% of motor horsepower. Multiple drive belts shall be matched set. Drive sheaves shall be dynamically balanced, adjustable, range +/- 10%, selected at mid range. Adjustable relative movement shall be lockable to shaft. Belts shall be aligned within 1-1/2 degrees at all times. Open drives shall be provided with OSHA approved open mesh belt guards. Belt guards exposed to weather shall be weatherproof enclosure with louvered face for adequate ventilation. Driving motor shall be mounted on adjustable rails. T.B. Woods, Browning. Submit RPM range of driven machine with drive selection.

12. Vibration Isolation:

a. General: The vibration isolation manufacturer shall be responsible for the proper selection of all isolators, support rails, and bases. Isolator selection shall be based on deflection as indicated. Lowest disturbing frequency shall be the basis for design. Isolator shall be selected for uniform deflection according to weight distribution. Shop drawings shall include a plan of equipment showing point loads, design data for each isolator including spring outside diameter, free, operating and solid heights, and ratio of horizontal to vertical stiffness, efficiency and design of support rails and bases. Consolidated Kinetics, Mason Industries, M.W. Sausse. All isolators shall be the product of a single manufacturer.

b. Springs: Laterally stable steel springs. Horizontal stiffness equal to or greater than 1.3 times vertical stiffness. Outside spring diameter shall be a minimum of 0.8 times operating height. Springs shall be selected to provide operating static deflection plus a 50% overload capacity before reaching solid height. Spring shall be housed in a welded steel assembly designed and engineered to limit movement of supported equipment without degrading the vibration isolation during normal operating conditions. Base plate shall have a 1/4" thick ribbed neoprene pad. Assembly shall have a drilled and tapped load plate and leveling bolt. Static deflection shall be 2" unless otherwise noted. Isolator shall be designed in accordance with C.C.R. Title 24, Section 1613A. Submit calculations to indicate compliance.

B. Air Conditioning Unit:

1. General: Self-contained heating/cooling unit designed for outdoor installation. Factory assembled and tested. Refer to Paragraph 2.4A for general requirements. Provide all starters and relays required for operation. 24-volt control circuit from integral transformer. Weatherproof cabinet, galvanized steel with enamel finish. Outside air inlet. Drain pan. Multivane centrifugal supply fan. ARI certified. Gas equipment AGA certified. Carrier.
2. Refrigeration: Sealed hermetic compressor with internal vibration isolating mount. Crankcase heater, high/low pressure switch, recycling timer. Air-cooled condenser with propeller fan. Non-ferrous finned coil. Low ambient control to 45°F. Single phase units shall have compressor start assist kit. 5-year extended warranty on compressor(s).
3. Heat: Natural gas fired. Low NOx. Aluminized or ceramic coated welded steel heat exchanger. Electric ignition. Automatic gas valve. Fan and limit controls.

C. Exhaust Fans:

1. General: All exhaust fans shall be tested according to AMCA Standard 210 in an AMCA registered laboratory. Fans exposed to weather shall have ventilated weatherproof housing over motor and drive assembly. Refer to Paragraph 2.6A for general requirements. All direct drive fans shall be provided with unit mounted speed controllers, unless otherwise noted. All motors 1 horsepower and larger shall be the premium efficiency type.
2. Fume Exhaust Fan (FJI):
   a. General: Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values. Each fan shall be direct drive in AMCA arrangement 4 according to drawings. Fans are to be equipped with lifting lugs. After fabrication, all carbon steel components shall be cleaned and chemically treated by a phosphatizing process to insure proper removal of grease, oil, scale, etc. Fan shall then be coated with a minimum of 2-4 mils of Permatector (Polyester Urethane), electrostatically applied and baked. Finish color shall be RAL-7023, concrete grey. Coating must exceed 1,000-hour salt spray under ASTM B117 test method. When properly anchored to the roof structure, the standard fan / stack assembly shall withstand wind loads of up to the equivalent load of 115 mph (185 km/hr) windspeed, without the need for guy wires or additional structural support.
   b. Fan Housing and Integral Stack: Fan housing is to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence. Fan shall be of airtight PermaLockTM construction with the scroll panel material formed and embedded into the side panels. All interior and exterior surface steel shall be coated with a minimum of 2-4 mils of Permatector (Polyester Urethane), electrostatically applied and baked. Finish color shall

be RAL-7023, concrete grey. No uncoated metal fan parts will be allowed. Housing and bearing support shall be constructed of welded structural steel members to prevent vibration and rigidly support the shaft and bearings. Housing shall include discharge stack of same material as fan housing to increase the overall discharge height of the unit. Minimum overall unit height with stack to be 7 feet from the roof deck. Stack material to be a minimum of 18 gauge. Stack to match outlet dimensions of the fan and shall not add additional static pressure drop to the exhaust fan. No discharge rain caps or flapper caps are permitted as to interfere with exhaust airflow. Threaded drain connection with plug shall be located at lowest part of scroll housing to prevent moisture build-up in the interior of fan.

c. Fan Wheel: The fan wheel shall be of the non-overloading single width backward inclined centrifugal type. Wheels shall be statically and dynamically balanced to balance grade G6.3 per ANSI S2.19. Fan wheel shall be manufactured with continuously welded steel blades and coated with a minimum of 2-4 mils of Permatector (Polyester Urethane), electrostatically applied and baked. Finish color shall be RAL-7023, concrete grey. The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.

d. Fan Motors and Drive: Motors shall meet or exceed EISA (Energy Independence and Security Act) efficiencies. Motors to be NEMA T-frame, 1800 or 3600 RPM, Open Drip Proof (ODP) with a 1.15 service factor.

PART 3 - EXECUTION

3.1 DUCTWORK INSTALLATION:

A. General:

1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA Standards. Ductwork shall be built to a pressure classification equal to or greater than the maximum operating pressure at that point in the ductwork. A copy of these standards shall be maintained at the job site at all times. Duct work and accessories shall be installed in a manner to prevent vibration and rattling.
2. Access: Provide duct access doors as required to adjust equipment and dampers. Provide wall or ceiling access panels, or remote actuators as required where equipment and dampers are not otherwise accessible. See detail on drawings for remote regulator.
3. Flexible Connections: Connection of ductwork to any vibrating equipment shall be with 3" (min.) flexible connection. Install with ample slack and uniform gap. There shall be no metal-to-metal contact across flexible connection. Flexible connections exposed to weather shall have a protective sheet metal cover.
4. Flanges and Escutcheon: Where ductwork penetrates walls, ceilings, or floors, furnish and install flange or escutcheon of same material as duct.

B. Low Velocity-Low Pressure (up to 2,000 ft/min and up to 2.0 in water):

1. Sheet Metal Ductwork:
   a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.
   b. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.
   c. Duct Joints and Seams: All joints and seams which are not exposed to weather shall be sealed airtight with duct sealant. All joints and seams exposed to weather shall be sealed air and water tight with silicone sealant. (See Part 2 of this Specification). All joints on spiral wound metal ductwork not exposed to weather shall be sealed air tight with grey duct sealant.
   d. Dampers: Install volume control damper and damper regulator in all branch ducts.

2. Flexible Glass Fiber Ductwork: The use of flexible duct is limited to the last 5 feet of each branch duct (i.e. one 5 foot section of flexible duct may be used to connect the grille to the sheet metal branch duct). No joints are permitted in this 5' length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. Joints shall be installed with stainless steel or nylon draw bands, Duro Dyne Dyn-O-Tie. Minimum turn radius of duct centerline not less than 1.5 times the duct diameter. Ducts shall not be compressed.
3. Fume Hood Exhaust Ductwork: Horizontal portions of the duct shall slope down towards the hood at 1/4" per foot (min.) unless the total horizontal length exceeds 75 feet, then the slope shall be 1" per foot (min.).

3.2 AIR TERMINALS AND DUCT FITTINGS INSTALLATION:

A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA Standards. Terminals and fittings shall be installed in a manner to prevent vibration and rattling. Metal surfaces exposed to view behind grilles and registers shall be painted flat black.

B. Combination Fire/Smoke Damper: Shall be installed in accordance with the manufacturer's recommendations. Provide access doors as required, label per CBC. Manufacturer's instructions shall be available to the inspecting authorities. Shall be tested according to State Fire Marshal requirements.

3.3 DUCTWORK INSULATION INSTALLATION:

A. General: Insulate all sheet metal supply, return and outside air intake ductwork except as noted below. Insulation shall be continuous through walls and floors except at fire dampers.

B. Where Insulation Is Not Required: Do not insulate factory-insulated ducts or casings, acoustic lined ducts, fibrous glass ducts, underground ductwork, supply or return ductwork exposed to view in the space that it serves, or exhaust ductwork.

C. Concealed Ductwork: Wrap concealed ductwork including outside air intakes with fiberglass blanket lapped 2" minimum. Secure with staples 4" on centers maximum on straight runs and 3" maximum at elbows and fittings. Insulation on bottom of ducts wider than 36" shall also be secured with mechanical fasteners at 24" on center.

D. Acoustic Lining: Unless otherwise indicated, all supply and return ductwork in equipment rooms, all ductwork exposed to weather and other ducts as indicated on drawings, shall have acoustic lining. Do not acoustic line outside air intakes. Where acoustic lining is installed, increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Seal exposed edges of lining with bonding adhesive.

3.4 EQUIPMENT INSTALLATION:

A. General: It shall be the responsibility of the equipment installer to ensure that no work done under other specification sections shall in any way block or otherwise hinder the equipment. All equipment shall be securely anchored in place. All equipment shall be installed level.

B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

3.5 TESTS AND ADJUSTMENTS:

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Architect. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested.

3.6 SYSTEM ENERGY BALANCE:

A. Scope: Provide the services of an independent test and balance agency to test, adjust and balance, retest and record performance of the system to obtain design quantities as specified. The agency must prove that they have no affiliation with any equipment manufacturer, design engineer, installing contractor, or any other party which might lead to a conflict of interest, in order to provide an unbiased, third party system balance and report.

B. Qualifications: Prior to commencing work, the agency shall be reviewed by the Engineer and shall be certified by the Associated Air Balance Council, National Environmental Balancing Bureau or Testing, Adjusting and Balancing Bureau. The agency shall provide documentation of having successfully completed at least five projects of similar size and scope.

C. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC, NEBB or TABB standards.

D. Submittals: Include in shop drawings copies of forms to be used for testing and balancing showing all data which is to be recorded. Seven copies of completed balance report shall be submitted to and reviewed by the Mechanical Engineer prior to the final mechanical construction review.

E. Procedure - General: Procedure shall be in accordance with Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, or equivalent NEBB or TABB standards. System shall be in full, continuous operation during test. Balanced quantities shall be plus 10%, minus 0% of design quantities. All nameplate data, manufacturer, model and serial numbers shall be recorded for each item tested.

F. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Engineer in making any tests he may require during this period of time.

G. Air Balance Procedure (For Each Air Handling System):
1. All air filters shall be clean when air balance is performed.
2. Provide a sketch of the equipment showing exactly where all pressure readings were taken.
3. Adjust blower RPM to design requirements.
4. Record motor full load amperes.
5. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.
6. Record system static pressures, inlet and discharge.
7. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.
8. Adjust system for design CFM recirculated air.
9. Adjust system for design CFM outside air.
10. Record entering air temperatures. (DB heating, DB and WB cooling.)
11. Record leaving air temperatures. (DB heating, DB and WB cooling.)
12. Adjust all main supply and return air ducts to design CFM.
13. Adjust all zones to design CFM, supply and return.
14. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.
15. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.
16. Each grille, diffuser and register shall be identified as to location.

17. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees upward deflection unless otherwise noted. Make a notation of any that are not set properly.
18. Size, type and manufacturer of diffusers, grilles, registers and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.
19. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.
20. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
21. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.
22. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by air balance agency, at no additional cost to Owner.
23. Set, test and adjust packaged heating/cooling unit economizer operation in cooperation with controls contractor. Record minimum and maximum outside and exhaust airflows.

3.6 TEMPERATURE CONTROL SYSTEM:

A. Scope: The control system includes control panels, control devices, line and low voltage control and interlock wiring, conduit and related equipment as required for proper operation of all controlled systems. Control and interlock wiring includes wiring to controllers, switches, timers, relays, etc. Power wiring and disconnect switches are included in the Electrical Specifications except that power wiring required for control devices such as thermostats, etc., is included in the control system.

B. Type of system: The control system shall be electric.

C. Contractor Qualifications: All controls shall be furnished and installed by a Contractor who is licensed, certified or contracted by the controls manufacturers for design, installation, start-up and service of their product. The Contractor must have factory supplied training and support. The Contractor must have sufficient personnel to respond to a trouble call at the site within two hours. The Contractor's local manager shall have a minimum of five years experience in the design, installation, start-up and service of similar systems. The Contractor shall submit a list of at least five projects which are similar in size, scope and contract value to this project. This list shall include the Owner's contact person, phone number and controls contract value.

D. Submittals: Submittals shall include the following:
1. Contractor qualifications. Manufacturer licenses, contracts or certifications for the installer shall be submitted on manufacturer's letterhead.
2. Manufacturer's data for all devices.
3. Diagrams showing control schematics. Diagrams shall include all sensors, terminal strips, panels and control devices. Locations of all devices shall be indicated.
4. Sequence of operation.

E. System Components:
1. Thermostats: Provide a 7-day programmable electronic thermostat with remote temperature sensor, dual setpoints, function selectors, night setback function, occupant override, keypad lockout, non-volatile memory and LCD display. **Venstar Commercial Model T8850 Explorer (District Preferred).**
2. Wall Switches: Plates for all wall switches and timers shall match those specified in Division 16.
3. Labels: All labels, signs, etc. shall be engraved, laminated plastic, white on black background, 1/8" high lettering, minimum.

F. System Shall Function as Follows:
1. Heating/Cooling Units: Provide specified programmable thermostat. Thermostat shall control the unit to maintain 75°F (cooling) or 72°F (heating), both adjustable.
2. Exhaust Fans: See Schedule for control.

G. Installation: All electrical work shall be in accordance with the California Electrical Code, the Electrical Specification Sections and the Manufacturer's recommendations. All electric/electronic systems shall be hardwired in conduit. Wiring shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed wiring shall run parallel to room surfaces; location shall be approved by the Architect. No structural member shall be weakened by cutting, notching, boring or otherwise. Provide a 120 volt circuit for each device requiring external power. Dedicated circuits shall be provided where required. Any devices or wiring exposed to the weather shall be protected in weatherproof enclosures such as NEMA 3R and weatherproof conduit. Set, test and adjust the system for proper operation.

H. Programming: The Contractor shall be responsible for programming the system and shall coordinate the scheduling (on/off times) with the Owner.

END OF SECTION 23 0001

SECTION 26 0573 - SHORT CIRCUIT & PROTECTIVE DEVICES COORDINATION STUDY

PART 1 - GENERAL

1.1 **RELATED DOCUMENTS**

Drawings and general provisions of Contract, including General and Supplementary Conditions, Divisions 0 and 1 and Sections 26 6000 and 26 7000 Specifications apply to work of this section.

1.2 DESCRIPTION

A. Provide a short-circuit and protective device coordination study for the ***new*** portion of the existing electrical distribution system only. The intent of these studies is to verify that the specified and supplied equipment are properly rated, correctly applied, and within industry and manufacturer's tolerances.

B. The short circuit study shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the distribution system down to the smallest protective device. The short circuit study shall consider operation during normal conditions, alternate operations, emergency power conditions, and any other operations which could result in maximum fault conditions.

C. The coordination study will determine the correct settings for the protective devices which will minimize the damage caused by an electrical fault and allow for selective coordination between the devices. The coordination study shall include the closest upstream utility protective device down to the panelboard main, branch, or feeder circuit breakers. The coordination study shall consider operation during normal conditions, alternate operation, and during emergency power conditions.

1.3 DATA COLLECTION FOR THE STUDIES

A. The contractor shall provide the required data for preparation of the study. This includes obtaining all required short circuit, X/R and impedance data from the serving utility company. The Engineer performing the system studies shall furnish the contractor with a listing of the required data immediately after the award of the contract.

B. The contractor shall ***expedite*** the collection of the abovementioned data to assure completion of the studies. This Study, along with the Arc Flash Hazard Study, needs to be reviewed and approved prior to the final approval of the Power Equipment Submittals and/or shop drawings to release of the power equipment for manufacturing.

1.4 QUALIFICATIONS

A. The Contractor shall have the coordination study prepared by qualified consultant. The consultant shall be a Registered Professional Electrical Engineer (licensed in California) who has at least ten (10) years of experience in performing power system studies.

B. The short circuit and coordination study shall be performed using the EasyPower or ETAP for Windows computer software package.

1.5 SUBMITTALS

A. The contractor shall submit the system studies within 30 days after the electrical equipment submittals have been received for review by the engineer. The electrical submittals will be reviewed but will not be approved until the Power System studies have been received and reviewed.

B. Submit six (6) bond copies of the Power System studies.

PART 2 - EXECUTION

2.1 IMPEDANCE ONE LINE DIAGRAM

A. Create an impedance One Line Diagram. All electrical equipment and wiring to be protected by the overcurrent devices installed under this project and each location where the fault current will be calculated shall be shown. Clearly show, on the one-line, the schematic wiring of the electrical distribution system.

B. Show reference nodes on the One Line Diagram referring to a formal report which shall include the following specific information:

1. X/R ratios, utility contribution, and short circuit values (asymmetrical and symmetrical) at the bus of the main service, and all downstream equipment containing overcurrent devices.

2. Transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.

3. Voltage at each bus.

4. Identifications of each bus.

5. Conduit material, feeder sizes, and length.

2.2 SHORT CIRCUIT STUDY

A. Pertinent data, rationale employed, and assumptions in developing the calculations shall be incorporated in the introductory remarks of the study.

B. The study shall be in accordance with applicable ANSI and IEEE Standards.

C. Determine the available 3 phase short circuit and ground fault currents at each bus. Incorporate the motor contribution in determining the momentary and interrupting ratings of the protective devices.

D. Present the data determined by the short circuit study in a table format which shall include:

1. Node & Device identification.

2. Operating voltage.

3. Type of Protective device. (i.e. fuse, molded case circuit breaker...)

4. Device short circuit rating.

5. Calculated maximum short circuit current, 3 phase or ground fault, asymmetrical and symmetrical, and X/R ratio.

6. De-rate the devices where the tested X/R ratio is less than the calculated X/R ratio. (maximum fault current multiplied by MF.)

7. Comments section indicating any equipment found to be underrated.

2.3 PROTECTIVE DEVICE COORDINATION STUDY

E. All requirements of the current California Electrical Code shall be adhered to.

F. The coordination study shall include the closest upstream utility protective device down to the panelboard main, branch, or feeder circuit breakers. Prepare the coordination curves to determine the required settings of protective devices to assure selective coordination.

G. The phase and ground overcurrent protection shall be included, as well as settings for all other adjustable protective devices.

H. Graphically illustrate on log-log paper that adequate time separation exists between devices. Sufficient curves shall be used to clearly indicate the coordination achieved between devices. Reasonable coordination intervals and separation of characteristic curves shall be maintained. Plot the specific time-current characteristics of each protective device in such a manner that the upstream devices will be clearly depicted on the sheet.

I. The plots shall include complete titles, representative One Line Diagram and legends, associated power company's relays or fuse characteristics, and complete parameters of transformers. There shall be a maximum of eight protective devices per sheet.

J. The following specific information shall also be shown on the coordination curves:

1. Device identifications.

2. Time and current ratio for curves.

3. Fuse, circuit breaker, and relay curves, showing complete operating bands of low-voltage circuit breaker trip curves.

4. Cable damage curves.

5. ANSI transformer magnetizing inrush and withstand curves per ANSI C37.91 and transformer damage curves.

6. Motor starting curves

7. Significant maximum symmetrical or asymmetrical short circuit cutoff point.

8. Electric utility's relays and/or fuses including manufacturer's minimum melt, total clearing, tolerance.

9. Medium voltage equipment relays.

10. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

11. Low voltage equipment circuit breaker trip devices, including manufacturers tolerance bands.

12. Pertinent transformer full-load currents at 100 and 600 percent.

13. Ground fault protective device settings.

14. Other system load protective devices for largest branch circuit and feeder circuit breaker in each motor control center and panelboard.

K. Develop a table to summarize the settings selected for the protective devices. Include in the table the following:

1. Device identification.

2. Current transformer ratio, relay tap, time delay, and instantaneous pickup.

3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.

4. Fuse rating and type.

5. Ground fault pickup and time delay

PART 3 - ANALYSIS

Analyze the short circuit calculations and highlight any equipment that is determined to be underrated as specified or not coordinated. Propose approaches to effectively protect any equipment found to be underrated

After developing the coordination curves, highlight areas lacking coordination. For each sheet, present a technical evaluation with a discussion of any recommended compromises for best coordination.

PART 4 - REPORT

The results of the power system study shall be summarized in a final report. The report shall include the following sections:

A. Introduction, executive summary and recommendations, assumptions, impedance One Line Diagram, and copies of the project One Line Diagrams.

B. Tabulations of equipment ratings versus calculated short circuit values and X/R ratios, and commentary regarding same.

C. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

D. Copies of the manufacturers time current curves for the devices studied and plotted on the time current curves.

E. CD with system model/data base files from the software used in the study.

PART 5 - FIELD SETTINGS

A. This contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The setting shall be in accordance with the approved Short Circuit and Protective Device Coordination Study.

B. Necessary field setting of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved Short Circuit and Protective Device Coordination Study shall be carried out by the contractor at no additional cost to the owner.

END OF SECTION 26 0573

SECTION 26 0574 - ARC FLASH HAZARD STUDY

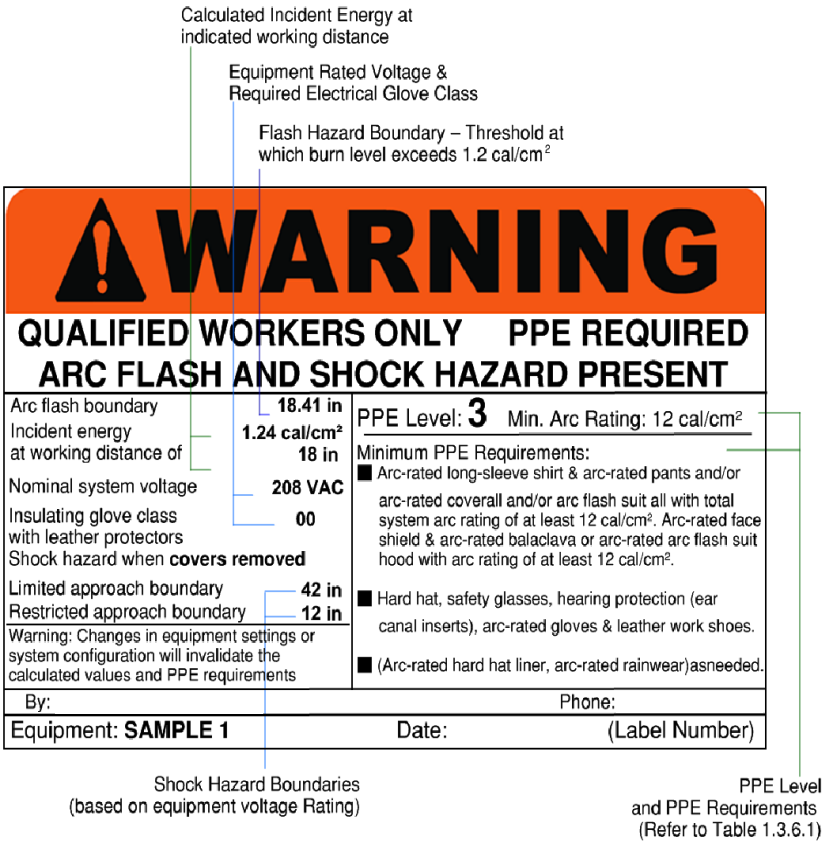
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions, Divisions 0 and 1 and Sections 26 6000 and 26 7000 Specifications apply to work of this section.

1.2 DESCRIPTION

A. Provide an Arc Flash Hazard Study for the ***new*** portion of electrical distribution system only, as shown on the One Line Diagram. The intent of the Arc Flash Hazard Study is to determine hazards that exist at each major piece of electrical equipment shown on the One Line Diagram. This includes switchgear, switchboards, panelboards, motor control centers, PDUs, UPS, ATSs, and transformers. The study shall include creation of Arc Flash Hazard Warning Labels. The labels shall be printed on self-adhesive color nylon or vinyl die cut stock. The electrical contractor shall provide and install the labels.



Example of Arc Flash Warning Label

B. The Arc Flash Hazard Study shall include the electrical distribution system equipment shown on the One Line Diagram. Use the data from the Fault/Coordination Study from Specification

Section 26 0573 to perform the Arc Flash Hazard Study. The Arc Flash Hazard Study shall consider operation during normal conditions alternate operations, emergency power conditions, and any other operations, which could result in maximum arc flash hazard.

1.3 QUALIFICATIONS

A. The Contractor shall have the study prepared by a Registered Professional Electrical Engineer (licensed in the State of California) who has at least ten (10) years of experience in performing power system studies.

B. The arc flash hazard study shall be performed using EasyPower or ETAP for Windows computer software packages.

1.4 SUBMITTALS

A. The contractor shall submit the Arc Flash Hazard Study and arc flash warning labels at least 30 days prior to energizing the electrical equipment.

B. Submit three (3) copies of the power systems study and (1) set of warning labels.

PART 2 - EXECUTION

2.1 SHORT CIRCUIT STUDY

A. Perform a Short Circuit Study as specified in Section 26 0573.

2.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Perform a Protective Device Coordination Study as specified in Section 26 0573.

2.3 ARC FLASH HAZARD STUDY

A. Perform an Arc Flash Hazard Study using data from the completed Short Circuit and Protective Device Coordination Studies.

B. Pertinent data, rationale employed, and assumptions in developing the calculations shall be incorporated in the introductory remarks of the study.

C. The study shall be in accordance with applicable NFPA 70E, OSHA 29-CFR, Part 1910 Sub part S and IEEE 1584 Standards.

D. Determine the following

1. Flash Hazard Protection Boundary

2. Limited Approach Boundary

3. Restricted Boundary

4. Prohibited Boundary

5. Incident Energy Level

6. Required Personal Protective Equipment Class

7. Type of Fire Rated Clothing

E. Produce an Arc Flash Warning label listing items 1 – 7 above. Also, include the bus name and voltage. The labels shall be printed on self-adhesive color nylon or vinyl die cut stock.

F. Produce Arc Flash Evaluation Summary Sheet listing the following additional items:

1. Bus Name

2. Upstream Protective Device Name, Type, and Settings

3. Bus Line to Line Voltage

4. Bus Bolted Fault

5. Protective Device Bolted Fault Current

6. Arcing Fault Current

7. Protective Device Trip / Delay Time

8. Breaker Opening Time

9. Solidly Grounded Column

10. Equipment Type

11. Gap

12. Arc Flash Boundary

13. Working Distance

14. Incident Energy

15. Required Protective Fire Rated Clothing Type and Class

PART 3 - ANALYSIS

Analyze the Short Circuit and Protective Device Coordination, and Arc Flash Hazard calculations and highlight any equipment, which is determined to be underrated or causes an abnormally high incident energy calculation. Propose approaches to reduce the energy levels. The proposed major corrective modifications shall be taken, under the advisement of the Engineer and the Contractor will be given further instructions.

PART 4 - REPORT

The results of the power system study shall be summarized in a final report. The report shall include the following sections:

A. Introduction, executive summary and recommendations, assumptions and a reduced copy of the One Line Diagram.

B. Arc Flash Evaluations Summary Spreadsheet.

C. Bus Detail Sheets.

D. Arc Flash Hazard Warning Labels printed on self-adhesive color nylon or vinyl die cut stock.

E. CD with system model and database file from the software used in the study.

END OF SECTION 26 0574

SECTION 26 6000 - GENERAL CONDITIONS FOR ELECTRICAL WORK

PART 1 - ORDINANCES, REGULATIONS AND CODES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1, specifications apply to work of this section.

1.2 All work must conform to the requirements which fall within the scope of the regulations in the Codes or under the jurisdiction of any of the governing bodies listed.

A. The California Code of Regulations, Titles 19 thru 24.

B. The California Electrical Code as applicable under current state and local regulations (latest edition and supplements).

C. State Board of Health.

D. CAL-OSHA Regulations.

E. Nothing in these Specifications or shown on the plans, shall relieve the Contractor from full compliance with applicable portions of any of the above regulations pertaining to work which he is installing under this Contract.

1.3 PERMITS AND FEES

Pay for and obtain all permits, inspection fees, etc., as required for the completion of all work included in this Contract. Any inspection Certificates required shall be obtained and delivered to the Owner.

1.4 EXAMINATION OF DRAWINGS AND SITE

Before submitting his bid, the Contractor shall carefully examine the Architectural, Structural, Mechanical and Plumbing Drawings for this work, along with the Specifications for same in addition to the drawings and specifications governing the work of this trade. He shall also visit the site of the proposed construction and familiarize himself with all the site conditions. No subsequent allowances will be made to the Contractor because of his negligence in complying with the above or his alleged inability to understand the requirements.

1.5 CONDUCT OF THE WORK

The Contractor shall maintain on the job a competent foreman or a superintendent at all times to superintend the work.

1.6 CONTRACTOR'S RESPONSIBILITY

The Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner. He shall erect and maintain suitable barriers, protective devices, lights and warning signs where required for the protection of the public and employees about the buildings. He shall be fully responsible for any loss or injury to persons or property resulting from his neglect or the carelessness and neglect of his employees.

1.7 SUBMITTALS

A. Shop drawings of power and signal service and distribution equipment and lighting fixture catalog cuts shall be submitted for approval in seven (7) bound copies.

B. All shop drawings shall be submitted at one time in a neat and orderly fashion in a suitable binder with title sheet including Project, Engineer and Contractor, table of contents and indexed tabs dividing each group of materials or item of equipment. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identical by the mark number as indicated on drawings.

C. Equipment or material furnished or incorporated in construction without prior approval of the Architect may be rejected and if rejected shall be removed from the structure and replaced with approved equipment or material at the Contractor's expense.

1.8 RECORD DRAWINGS

See General Conditions.

1.9 CATALOG DATA AND OPERATING INSTRUCTIONS

Upon completion of the work in this Contract, the Architect shall be furnished with a complete set of catalog data which describes each piece of equipment installed under this Contract. The catalog shall be bound in a set and shall be clearly labeled as to each item of equipment used.

PART 2 - LOCATIONS

2.1 The work as laid out is to some extent diagrammatic, and the location thereon indicated may be approximate only. The Contractor, therefore, shall install all the equipment, apparatus, conduit runs and the like as follows:

A. Adhere to the location indicated as far as possible.

B. Maintain ample head room in all rooms and passageways, clearance around all apparatus and equipment and under pipe lines for unrestricted passage and for easy servicing of all apparatus, equipment, devices and the like.

C. Verify the exact locations of all fixtures and other apparatus or devices as indicted on the drawings. In the event these drawings do not sufficiently indicate the locations for all such fixtures, apparatus or devices, the Contractor shall obtain the exact locations from the Architect.

2.2 VERIFICATION OF DIMENSIONS

A. The Contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and he shall assume full responsibility for the proper locations and grading of each portion thereof.

B. Where the work requires connections to be made to equipment that is furnished and set in place by others, the Contractor shall obtain exact locations and rough-in dimensions from the manufacturer of such equipment and he shall install the connections in a neat and workmanlike manner.

2.3 CUTTING AND PATCHING

This Contractor shall do all cutting and patching of the work for the installation of the equipment and materials as approved by the Architect and/or Engineer. All patching shall accurately match the adjoining work.

2.4 BORING

A. Provide mechanical boring equipment to bore under existing asphalt, concrete, or other surfaces or objects as noted on the drawings. All borings shall be a minimum of 24" under the substrate material unless otherwise authorized by the Architect.

B. Holes shall be bored not to exceed 1" larger diameter than the largest component remaining in the excavation.

C. Water or air pressure jetting are not permitted, unless they comply with the following requirements:

1) All surfaces of the hole can be visually inspected with 6' maximum length.

2) All objects shall be supported continuously to prevent sagging.

3) The hole shall be filled with compacted damp sand and inspected by the Project Inspector or Materials Testing Lab technician.

2.5 FOUNDATIONS AND SUPPORTS

This Contractor shall provide all foundations, supports and hangers, etc., as required to install the equipment as specified or shown on the drawings. All equipment shall be supported, braced and cross-braced in such manner as to prevent sway and/or lateral movement.

2.6 EXCAVATION AND BACKFILLING

A. Excavating required for the installation of the work shall be done by this Contractor. Underground lines outside the buildings shall be installed with a minimum cover of 24" except depth of utility services shall comply with respective utility company requirements.

B. The conduit shall be laid on material described below to afford bearing for the full length of the conduit. Any part of the trench excavated below grade shall be corrected with thoroughly compacted material approved by the Architect.

C. When the bottom uncovered at subgrade is soft and, in the opinion of the Architect, cannot support the conduit, a further depth shall be excavated and refilled to conduit foundation grade as required by the Architect.

D. Backfill:

1) 6" Below, Around, and to 6" Above Conduit: Material shall be sand. Place carefully around and on top of conduit, taking care not to disturb conduit. Consolidate with vibrator.
2) 6" Above Conduit to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to

required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

E. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Architect.

F. A red or yellow tracer tape stating "CAUTION ELECTRIC LINE BURIED BELOW" shall be installed 12" above conduit, full length of trench.

G. Electrical conduit shall not be run in excavations provided for plumbing or heating pipes, unless separated by a minimum of 12 inches.

H. Verify location of all underground lines with Owner and utility companies before starting excavation. If any utility company facilities are identified and located within the perimeter of the building, the Contractor shall stop work, promptly notify the Architect and secure his instructions.

I. Ten (10) days before doing any excavation or trenching, contact "Underground Service Alert," 1-800-642-2444, advise them of work schedule and comply with their recommendations.

2.7 CLEANING UP

A. The Contractor shall keep the premises free from accumulations of his waste material or rubbish. At the completion of the work, he shall remove all his rubbish, tools, scaffolding and surplus materials from and about the buildings, leaving the premises in a clean condition.

B. All exterior surfaces of exposed equipment and material shall be thoroughly cleaned of all dirt, cement, plaster and other debris, including the exterior surfaces of all conduit, conduit fittings, conduit hangers, insulation and the like.

C. All surfaces to be painted shall be carefully wiped or otherwise cleaned; cracks and corners scraped out clean, grease and oil spots removed so that surfaces may receive paint without further preparation.

D. All fixtures and plated materials shall be thoroughly cleaned and polished.

2.8 DAMAGE BY BREAKS

The Contractor shall be responsible for all damage to any part of the premises caused by breaks in conduit or fixtures furnished and/or installed by him under this specification for a period of one (1) year from date of acceptance of the project by the Owner.

2.9 SITE CONDITIONS

A. Where existing utilities are shown on the plans, extreme care shall be exercised in excavating near these utilities to avoid any damage thereto, and the Contractor shall be held responsible for any such damage caused by this operation.

B. The general location and arrangement of conduit, equipment apparatus, etc., as shown in the drawings or herein specified and all installations shall be made in accordance therewith. Information on the drawings relative to existing services is approximate only. Minor deviations required to conform to actual locations shall be made without additional cost to Owner.

C. Should existing utilities, not shown on the plans, be found during excavations, or identified, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage there arising from his operations after discovery of such utilities not shown on the plans. These utilities shall be removed or relocated as directed by the Architect. An equitable adjustment in the Contract will be made for the additional work involved.

D. The Contractor shall use special precautions where excavations are made in the areas near electrical ducts since they may be high voltage ducts. All such ducts shall be exposed by careful hand excavation so as not to damage the ducts or cause injury to personnel and shall be suitable marked with warning signs, barricades, etc. as required.

2.10 STANDARD PRACTICE

All work not shown in complete details shall be installed in conformance with the best standard practice for the trade.

2.11 INTENT

It is the intention to provide systems that are complete in every respect without further cost to the Owner. Anything not shown in drawings, or indicated in the specifications, but required for complete operating systems shall be included as part of this Contract. This shall include all connections to existing services.

2.12 SPECIAL NOTE

Attention of Contractor is hereby called to all work covered by notes on the drawings. Work covered by notes must be furnished and installed whether it is specifically mentioned in these specifications or not.

2.13 GUARANTEE

Except as otherwise specified, all materials, apparatus equipment furnished and installed under the Electrical Section of this specification shall be new and free from all defects. Should any trouble develop within a period of one (1) year from date of acceptance of the work, due to inferior or faulty material and/or workmanship, the trouble shall be corrected and material and equipment replaced by the Contractor without expense to the Owner.

2.14 SERVICES

The location of any existing utility services shown on the drawings is approximate and shall be checked by this Contractor for exact location. Refer to “EXCAVATION AND BACKFILLING” for additional requirements.

2.15 LIST OF MATERIALS

Within thirty (30) calendar days after the award of the Contract, the Contractor shall submit seven (7) copies of a complete list of materials to be installed under this Contract, giving, in the case of each item of material to be used, the name of the article. All substitutes must be approved by the Architect as stipulated in Section 01620.

2.16 ACCESS OPENINGS

It shall be the responsibility of the Contractor to provide sufficient and convenient access openings, panels, etc., in the building construction where required for the maintenance of, installation and/or removal of all equipment, or other items of the various systems and equipment.

2.17 PURCHASE ORDERS AND ACCEPTANCE

A. The Contractor shall file with the Architect two (2) certified copies of all purchase orders, for materials, equipment, appliances and rentals thereof within two (2) weeks from date of Notice to Proceed with the Contract if requested by the Architect.

B. The Contractor shall file with the Architect two (2) certified copies of acceptance of purchase orders for materials, equipment, and appliances by the manufacturer, distributor or wholesale house within six (6) weeks from the date of Notice to Proceed with the Contract if requested by the Architect.

C. Failure to provide same within the stipulated time shall be deemed sufficient cause for the Architect to withhold certificates of payment for work completed or materials and equipment provided by the Contractor or his subcontractors toward the completion of their Contracts.

END OF SECTION 26 6000

SECTION 26 7000 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1 and Section 26 6000 Specifications apply to work of this section.

1.2 SCOPE OF WORK

This portion of the work includes the furnishing of all labor and materials necessary for the complete wiring system to outlets and all equipment shown on the drawings or covered by this Section of the Specifications and other Division 26 and Division 28 sections of the Specifications. In general, the work includes the following:

A. Complete system of branch circuit wiring, conduit and distribution equipment for lights, receptacles, and power.

B. Furnish and install lighting panelboards, lighting fixtures, wall switches, convenience outlets, etc. as shown on drawings.

C. All hangers, anchors, sleeves, chases and supports for fixtures, all electrical equipment and materials.

D. Furnish, install and connect wire, conduit and switches, etc. required for other equipment covered by other sections of these Specifications.

E. All excavating and backfill as required for electrical work.

F. The patching and repair of all work modified or damaged by the installation of work under this Contract.

G. Demolition work.

H. Terminal cabinets and backboards.

I. The Contractor shall furnish and install all work necessary to make complete systems, whether or not such details are mentioned in these Specifications or shown on the drawings, but which are necessary in order to make complete working systems, excepting only those portions that are specifically mentioned therein or plainly marked on the accompanying drawings as being installed by other Contractors.

J. Electrical Contractor must coordinate his work with the work of other trades so as to provide raceways, conductors and outlets in the correct location for the equipment served, including all built-in appliances, mechanical, and signal equipment and connect same. Electrical Contractor must provide power of the correct voltage and phase to each item of equipment.

K. Before construction starts, the Electrical Contractor shall arrange a coordination meeting with the General Contractor and all other subcontractors supplying equipment that requires electrical connections. All electrical requirements shall be verified and any problems shall be immediately reported to the Architect. Equipment items to verify shall include, but not be limited to: Voltage, amps, phase, location, orientation, space requirements, type of connection, starter and disconnect location and provision, control system operation and requirements, etc.

L. The above list is given for the convenience of the Contractor and is not considered all-inclusive.

1.3 TEMPORARY CONSTRUCTION POWER

A. Provide a temporary construction power system that is adequate for this project. Coordinate requirements and details with the General Contractor. All 120V, 15A and 20A receptacles shall have ground fault circuit interrupter protection.

PART 2 - WORK NOT INCLUDED

2.1 The furnishing and installation of motors.

2.2 Access panels.

PART 3 - MATERIALS

3.1 All materials, appliances and equipment except that furnished by the Owner shall be new, bear U.L. Label and of the make, brand or quality specified or as accepted by the Architect as herein provided. This shall also apply to all parts of the work whether or not this particular paragraph is referred to by number.

3.2 All apparatus, conduit systems, etc., shall be installed and interconnected so as to form complete systems as herein specified and/or shown on all the accompanying drawings. This Contractor shall furnish and install all work necessary to make complete working systems, excepting only those portions that are specifically mentioned herein or plainly marked on accompanying drawings as being furnished by other contractors.

3.3 PANELBOARDS

A. The panelboards shall be constructed in accordance with the standard set up by the Underwriters' Laboratories, Inc., and as manufactured by Square "D", General Electric, Eaton, Siemens or approved equal, and each shall contain the number and type of circuit breakers as indicated on the drawings. All circuit breakers, rated 100 amps and larger, shall be sub-feed type and equipped with adjustable instantaneous trip settings.

B. The panelboards shall be equipped with a hinged lockable door, piano hinged trim and typewritten circuit directory. All finish in offices, corridors or areas subject to public view shall be prime coat for finish coat by painter. In storage rooms, equipment rooms, etc., finish shall be standard factory gray Hammertone. Provide a flush lock on all panelboards.

C. Provide an engraved Bakelite nameplate, fastened with screws or rivets to the face of each panelboard, which will identify it.

D. Seven copies of detailed construction drawings for the panelboards and terminal cabinets shall be submitted to the Architect for Approval before their construction is started.

3.4 TERMINAL CABINETS

A. Terminal cabinets shall be flush or surface mounted as indicated with hinged doors and lock. The exterior finish to be same as for panelboards. Provide ¾" plywood backing inside of cabinet. Provide proper number of terminals in cabinets as required.

B. Provide a Bakelite nameplate fastened with screws or rivets to the face of each terminal cabinet, which will identify it.

C. Provide circuit directory and holder on inside of door with one line for each conductor entering and each conductor leaving cabinet.

3.5 RACEWAYS AND FITTINGS

A. Shall be as manufactured by Allied Tube and Conduit Corporation, AFC Cable Systems, Inc., Carlon, Cantex, PW Pipe or approved equal.

B. Galvanized rigid steel conduits (RSC) may be used in all locations.

C. For underground runs in direct contact with earth, conduit shall be wrapped with PVC tape or shall have factory applied PVC coating.

D. Galvanized intermediate metallic conduit (IMC) may be used in indoor locations not in direct contact with earth.

E. Galvanized electrical metallic tubing (EMT) may be used in indoor dry locations in which it is:

1) Not subject to physical damage.
2) Not in direct contact with earth.
3) Not in concrete slabs.
4) Not in hazardous areas.
5) On roof or walk cover when specifically shown on drawings.
6) In masonry walls, not in same cells as rebars.

F. Non-metallic rigid conduit shall be PVC Schedule 40 and may be used:

1) Underground.
2) Below concrete slab on grade.
3) In concrete slab on floors above grade.
4) In masonry walls, not in same cells as rebars.

G. Flexible steel conduit may be used in dry locations for final connections to:

1) Motors, transformers and other mechanical equipment, not to exceed 18 inches.
2) Lighting fixtures, not to exceed 72 inches.
3) Facilitate wiring in tight locations, when approved by Engineer.

H. Flexible aluminum conduit may be used in walls or in attics to facilitate wiring in tight locations, when approved by the Engineer.

I. Liquidtight flexible steel conduit shall be used in outdoor or wet locations for final connection to motors or other mechanical equipment, not to exceed 18 inches.

J. Fittings:

1) For rigid and intermediate steel conduits, fittings shall be:

- Galvanized rigid steel threaded type.
- Provide insulated grounding bushings at switchboard enclosures and panel enclosures for feeders.

2) For electrical metallic tubing (EMT), fittings shall be:

- Zinc plated steel set screw type in dry locations.
- Zinc plated steel compression type for conduits larger than 1”, in wet locations and in masonry walls.
- All connectors shall have an insulated throat.

3) For non-metallic conduits, fittings shall be PVC Schedule 40 type. Use PVC schedule 40 adapters at all boxes and panelboards

4) Brush or dauber apply PVC cement.

5) For flexible metallic conduits, fittings shall be zinc plated steel/malleable iron squeeze type.

6) For liquidtight flexible metallic conduits, fittings shall be zinc plated steel/malleable iron compression type.

7) Use of the following is prohibited:

- Crimp-on, tap-on or indenter type fittings.
- Spray (aerosol) PVC cement.

3.6 PULL BOXES

A. Pull Boxes shall meet all code requirements as to size for conduits terminating therein and to thickness of material used in fabrication.

B. Fabricated sheet steel pull boxes shall be installed only in dry, protected locations and shall be furnished with knockouts and removable screw cover. Box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surrounding surface.

C. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with two coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.

D. Approved manufacturers for metal boxes are Cooper B-Line, Milbank, Hoffman or approved equal.

E. Weatherproof concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products, Utility Vault or approved equal. All pull boxes shall be H/20 rated and be equipped with H/20 rated ***galvanized*** steel checker plate cover with the inscription "Electric, Lighting, Fire Alarm or Signal".

3.7 OUTLET BOXES

A. All outlet boxes shall be standard one or two piece galvanized knockout outlet boxes. Raco, Appleton, Thomas and Betts or approved equal.

B. All outlet box covers, rings or other fittings shall be standard galvanized. Raco, Appleton, Thomas and Betts or approved equal.

C. No outlet box shall be smaller than four inches (4") square and 1 ½" in depth, except in concrete block construction where Thomas and Betts concrete masonry boxes are approved.

D. Floor outlets on grade shall be fully adjustable type floor boxes, suitable for use in concrete floors. Wiremold #RFB6E-OG with a Wiremold #8CTC2NKTR Evolution cover assembly. Where floor box is installed in a bare concrete floor, provide a Bare Concrete and Terrazzo ring, Wiremold #RFB6E-CTR with a Wiremold #8CT2NKTR Evolution cover assembly. Cover shall be die-cast aluminum with nickel finish, unless otherwise noted on drawings. For 120V power, provide an industrial specification grade 20A 125V duplex receptacle with internal duplex receptacle bracket #RFB6DP, quantity as shown on drawings. For data/telephone, provide a decorator style receptacle bracket #RFB6GFI for mounting frame to accept the modular telephone/data jacks, unless otherwise noted on drawings. Any unused device compartments shall be covered with internal blank bracket #RFB6B.

E. All special outlets shall be as hereinafter specified or as shown on drawings.

F. Thru boxes are not permitted.

G. Any unused boxes shall be equipped with a blank cover plate.

3.8 RECEPTACLES

A. Furnish and install an industrial specification grade 20A, 125 volt, 3 wire grounding type duplex receptacle with one piece brass mounting strap at all receptacle outlets as indicated on drawings. Leviton #5362-W or equal as manufactured by Hubbell, Pass and Seymour, Cooper or other approved manufacturers.

B. Device color shall be white.

C. Isolated ground duplex receptacles shall also provide TVSS (Transient Voltage Surge Suppression) as follows: Surge protection 320 Joules hot-neutral, ground-neutral, hot-ground, RFI and EMI noise filtration of 7:1 reduction. A LED shall indicate surge protection unit is in operation. Receptacle shall be 20A, 125V NEMA 5-20R, Leviton #8380-IG-O or approved equal.

D. G.F.C.I. duplex receptacles shall be provided for 15 and 20 amp 125 volt circuits where required by the C.E.C. #210.8 and #590.6. At indoor locations, provide a Leviton #G5362-00W or equal. At exterior locations, provide weather-resistant type G.F.C.I. duplex receptacles, Leviton #G5362-WTW or equal. At damp locations, provide a diecast weatherproof lockable cover, RACO # 5028-0 or equal. At wet locations, provide a diecast weatherproof "while-in-use" lockable cover, Red Dot #CKSUV or equal.

3.9 LOCAL SWITCHES

A. Furnish and install industrial specification grade, quiet type toggle switches, 20 AMP rated 120/277V AC only, controlling wall and ceiling outlets as indicated on the drawings. Leviton #1221-2W or equal as manufactured by Hubbell, Pass and Seymour, Cooper or other approved manufacturers.

B. Where two or more switches are in proximity they shall be ganged in the same box and they will be set under one plate. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.

C. Special receptacles or switches shall be as noted on drawings.

D. Where key switches are noted on the drawings, provide Leviton #1221-2KL.

E. Device color shall be white.

F. When a switch is used as a disconnecting means, it shall be mounted in a readily accessible location.

3.10 WALL PLATES

A. All wall plates for electrical outlets and devices shall be smooth stainless steel, non-magnetic type 302S.

B. All telephone outlet plates shall be blanked plates, same as device plates.

3.11 CONDUCTORS (Wire)

A. All wire installed in this contract shall be of a standard manufacturer as approved by the National Board of Fire Underwriters and be of the size as indicated on the drawings. All wire shall bear the Underwriters' label and shall be brought to the job in unbroken packages and approved by the Job Inspector before it is installed.

B. All power conductors #10 AWG and smaller shall be type THWN copper, unless otherwise noted. All conductors #8 AWG and larger shall be type THWN-2 copper, unless otherwise noted.

C. All underground conductors in a 480V or 480/277 volt power system shall be type XHHW-2 copper, unless otherwise noted.

D. Number 12 AWG wire shall be the smallest gauge wire used, except for signal

circuits, which shall be as shown on plans or as specified under other sections of these specifications.

E. All wire #8 AWG gauge or larger shall be stranded.

F. The neutral conductor of all lighting feeders shall be of the same size as the phase conductors.

G. Splices on all wire less than #8 gauge shall be with insulated spring connectors Ideal "Wing Nuts", 3M "Scotchlok", or equal.

H. Splices in wires #8 gauge and larger shall be made with crimp on solderless connector, 3M Scotch, Burndy or equal. Connectors to switches or bus bar shall be made with one piece lugs for all wires, sized for conductors as shown on plans.

I. Each branch circuit shall be marked with the circuit number at the panel and at the first outlet nearest the panel. E-Z Code Markers (Thomas and Betts) or equal shall be used to label the circuits.

3.12 LIGHTING FIXTURES

A. This Contractor shall submit for approval seven (7) portfolios with full description and manufacturer data sheets of all fixtures (including ballasts and lamps), that he proposes to use.

B. This Contractor shall furnish and install all lighting fixtures and lamps as indicated on the Electrical Drawings and in accordance with these specifications.

C. This Contractor shall be held responsible for the complete equipment of all fixture outlets with fixtures of the proper design as shown.

D. All fixtures shall be securely anchored to prevent any possible chance of their falling.

E. Continuous runs of fixtures shall be installed straight and true.

F. Recessed fixtures shall be complete with plaster frames, supporting brackets and hanger wires.

G. Electrical Contractor shall coordinate outlets with Acoustic Tile Contractor and other trades and locate outlets in center or at intersections of acoustical tile in all acoustical tile ceilings.

H. Recessed fixtures in t-bar ceilings shall be attached to t-bar ceiling with integral t-bar clips, two on each side and near the end of fixture.

I. When the light fixture is equipped with an integral emergency battery pack, the light fixture shall be connected so that it is controlled via the room light switch and is automatically energized when power has fails.

3.13 MOTOR DISCONNECTS

A. Disconnects shall be fused safety switches with dual element fuses. Heavy Duty rated with quick-make, quick-break operating mechanism. Fuse rating shall comply with motor manufacturer's recommendations. Switch shall be UL listed. Disconnects shall have an external operating handle, lockable in the open or closed position.

B. Disconnect switches shall be located so as not to obscure any part of the HVAC unit's nameplate data.

C. Each disconnect switch shall have an engraved Bakelite nameplate identifying the panel and circuit number that feeds the motor. Nameplates shall comply with specifications for "Identification of Switches and Apparatus".

3.14 DRY TYPE TRANSFORMERS

A. Transformer shall be Class H insulation with temperature rise not exceeding 115 degrees C., in a maximum ambient of 40 degrees C., with rated nameplate load connected to the secondary side, at rated voltage. Unless otherwise noted, the transformer shall comply with the Energy Efficiency levels mandated by the Department of Energy.

B. Transformer shall be built in accordance with the latest revised IEEE, ANSI and NEMA standards.

C. Case temperature shall not exceed 35 degrees C., above ambient.

D. Designs shall incorporate built-in vibration dampening systems.

E. Terminal compartment shall be located to insure termination of cable leads in temperature levels not to exceed 60 degrees C., and to provide for side or bottom entrance of conduit. Enclosures shall be weatherproof and rodent proof. Ventilation openings shall be louvered type. Screening will not be acceptable.

F. Transformer shall be furnished with 2 taps above and below rated voltage, each 2 ½%.

G. Transformer shall be suitable for non-linear loads and have a U.L. rating of K-4, when indicated on the drawings.

H. Acceptable manufacturers shall be Square "D", General Electric, Eaton, Siemens or approved equal.

PART 4 - EXECUTION AND INSTALLATION

4.1 CONDUIT SYSTEMS

A. A concealed conduit system shall be installed for all interior wiring including controls. Conduit shall be run continuous between outlets, etc., and with the minimum number of bends.

B. PVC 40, galvanized rigid steel wrapped with PVC tape or galvanized rigid steel with factory applied PVC coating shall be used for underground runs.

C. Where underground conduit cannot be run below building footings and the Contractor shall provide PVC-80 sleeves through the footings (Contractor shall obtain approval for all sleeve sizes and locations with the Structural Engineer before installation).

D. All conduit shall be delivered to the site of construction in their original bundles. Each length of conduit shall bear the label of the National Board of Fire Underwriters. All conduit subjected to rough usage while on the job before installation and not acceptable to the Architect shall be removed from the premises upon notice.

E. Conduit installed in masonry walls shall be rigid steel galvanized conduit, PVC or EMT, not in same cell as re-bars.

F. The joints in all conduits installed under concrete slabs on the ground, or underground, or exposed to the weather, shall be made liquid and gas-tight. All underground conduit outside of the buildings shall be buried to a depth of not less than 24" below finish grade. Two or more conduit runs installed in a common trench shall be separated horizontally by at least four inches (4"). Electrical conduit runs installed in a common trench with other utility lines shall be separated horizontally from such lines by at least twelve inches (12"). Provide a detectable warning tape, 12" above the top of the conduit and the full length of trench.

G. Changes in direction shall be made with conduit elbows or long radius bends made on the job. Where two or more conduits are grouped in exposed locations, the sweeps shall be struck from the same center forming concentric arcs.

H. All joints in conduit shall be made with standard coupling. In making joints, conduits must be truly and accurately cut and threaded (where applicable) with straight thread, smoothly reamed and squarely butted. All conduit shall be kept corded and dry during construction, using plastic caps or conduit pennies held in place with conduit bushings. Should dirt or moisture collect in any conduit, the Contractor shall swab them out to the satisfaction of the Architect.

I. Conduits ending at the motors shall be carried as close as possible to the terminal blocks making allowance for the movement of the motors when they are equipped with slide rails. The connection between the conduit terminals on the motor and the conduit shall be made with liquid-tight flexible conduit using the proper fittings.

J. All conduits where they enter panel enclosures, pull boxes, or outlet boxes shall be secured in place by galvanized locknut inside of box.

K. Where conduits are run exposed, they shall be installed straight and true with reference to the adjacent construction.

L. Any conduit installed under building shall be under the slab. The top of any conduit below floor slab shall be a minimum of 4" below the bottom of the concrete slab.

M. All boxes for bracket outlets shall be equipped with a 3/8" "No-Bolt" fixture stud. These boxes shall be so set that when in place the fixture shall be at right angles to the ceiling or walls.

N. All empty conduit shall be equipped with a nylon pull string continuous from outlet-to-outlet or end-to-end.

O. Flexible conduit will be permitted for connecting lighting fixtures to junction boxes.

P. Flexible connections in outdoor and damp locations shall be flexible liquid-tight metal conduit or non-corrosive seamless metallic tubing with watertight connections.

Q. Install roof jacks for this construction in accordance with other sections of this Specification.

R. The maximum allowed length of flex conduit at equipment connections is 18".

S. Expansion joints for conduit shall be provided where required to compensate for thermal expansion and contraction.

T. At all sub-panels and terminal cabinets, stub two 1"C and two ¾"C into the accessible attic space. If the attic space is not accessible, stub conduits to a location as directed by Architect or Engineer. Provide additional conduit stubs when indicated on the drawings.

U. Any conduit entering underground pull boxes shall be sealed to prohibit water from entering the conduit. Conduits with conductors shall be sealed with a sealing compound after all conductors have been installed. All spare (empty) conduits shall be identified with either the "origination" or "destination" (example: to pull box 150' to the south, from Main Switchboard, etc.). The contractor shall use a scrap piece of the respective PVC conduit, approximately 3" in length and tie the nylon pull string thru it. Write the description on the conduit using an indelible/permanent marker.

4.2 OUTLETS

A. In general, the locations of electrical outlets shall be as shown on the drawings; however, the Contractor shall make any changes necessary to suit conditions on the job or rearrangement of built-in fixtures and equipment as directed by the Architect or his representative.

B. The Contractor shall study the general building plans with relation to spaces surrounding each outlet in order that his work may fit the work of others and that when fixtures or other equipment are installed they will be symmetrically located according to room layout. Refer all conflicts and discrepancies promptly to the Architect.

4.3 OUTLET BOXES

A. Outlets for concealed wiring shall be flush with the finished wall or ceiling surfaces. Pull boxes, junction boxes and all others to which no fixture or device is to be attached, shall be fitted with blank cover plates and painted to match surroundings. In order to reduce noise transmission between rooms, outlet boxes shall not be installed back to back. Where outlets are side by side and faced into opposite rooms, the boxes shall be at least 6" apart, except in fire rated walls space boxes at least 24" apart. If the boxes are connected together, the connection shall be flexible and shall have openings packed with fiberglass.

B. The Electrical Contractor shall inform himself of wall thickness throughout the building and shall provide outlet boxes of suitable depth that can be flush mounted and yet will be deep enough to contain the particular apparatus involved. Location of exposed pull or junction boxes will be subject to the Architect's approval.

C. Outlets from which lights are suspended shall have approved 3/8" fixture studs fastened through from back of box. All outlet boxes and particularly those supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. All lighting fixture outlets shall be coordinated with mechanical, architectural, or other equipment to eliminate conflicts and provide a workable, neat installation.

D. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate; provide box partitions as required by the C.E.C. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.

E. Outlet box extensions shall be UL listed and shall be attached to box with threaded metal screws. "Flash guards" are not permitted to be used as box extensions.

4.4 LOCATIONS OF OUTLETS

A. The Architect reserves the right to make reasonable changes in the indicated locations before work is roughed in without additional charge to the Owner.

B. Where wainscot occurs at the 4'-6" level, the switch shall be mounted lower in the wainscot as near the 4'-0" level as possible, but in no case, shall the switch be partially in the wainscot and partially in the wall. It shall be the Electrical Contractor's responsibility to verify all door swings. Switches, unless specifically noted, shall be on the strike side of the door. If switch is indicated on hinged side of door, verify location with Architect.

4.5 CONDUCTOR IDENTIFICATION AND INSTALLATION

A. The drawings indicate the arrangement of outlets on each branch circuit and the circuit tags show the number of the circuit, and the board to which it will be connected.

B. Circuits indicated with the same numbers shall be connected to the same breaker on the panelboard.

C. All feeders and branch circuits shall be tagged in all pull boxes and in the gutters of all panels to which they connect.

D. All wiring shall be done in identified neutrals.

E. No wire shall be installed until all work of other contractors that might cause injury to the said wire has been completed. Care shall be used to pull wires to insure that no damage occurs to the insulation. A wire lubricant shall be used for pulling in wires.

F. In making the connection of all branch circuits to the terminals of switches, base plugs, etc., the wires shall be looped around the binding screws or be fitted with connecting lugs. At the ceiling outlets, this Contractor shall leave not less than 6" of free ends on each wire for connections to the fixtures.

G. No splices shall be permitted except in outlet boxes, and in panelboard gutters.

H. Switches and receptacles shall be securely fastened to the outlet box. Where the outlet box covers are back of the finished walls the switch or receptacle shall be built out from the same with washers so that it is rigidly held in place to the box. The floating of any switch or receptacle will not be permitted.

I. All signal and communications conductors shall be identified in terminal cabinets as to type of system e.g.: clock, bell, fire alarm, etc. and location of other end of conductor by room number or name as directed by Owner. Identification shall be by numbers at terminal strips and a numbered directory in cardholder inside terminal cabinet.

J. Fire alarm system cabling and wiring shall be color-coded as follows:

Initiating Devices:	-	Addressable cable, red jacket.
Signaling Devices:	-	Black and Red wires for horns, strobes or horn strobes.
	-	Speaker cable, blue jacket for speakers.

K. All power wiring size #6 AWG and smaller, shall be factory color-coded. For larger than #6, mark conductors on each end and at all junction and/or pull boxes with a 1" bank of colored pressure-sensitive plastic tape. For isolated ground wires, mark with a 1" band of green tape, followed by a 1" band of yellow tape, followed by a 1" band of green tape. Colors for each phase and the neutral shall be consistent throughout the system. Color code shall be as follows:

WIRE	120/208V	480/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Equip. Ground	Green	Green

The white or gray conductor shall be the neutral at each outlet. All switches shall be installed in "hot" leg. On all lighting circuits the switch leg shall be purple from switch to fixture. All travelers from switch to switch on 3 and 4-way switches shall be pink. This color code shall be followed by Contractor for all fixture whips except for factory-manufactured whips. When factory manufactured whips are used, color code shall apply to all wiring except the factory whip.

L. Conductors having white, gray or green covering shall not be used to indicate other than neutral or grounding. This limitation applies to all power, lighting, and control circuits.

M. Installation of conductors shall be made in a neat and workmanlike manner to meet Code requirements and shall be run continuous without weld, splice or joint between boxes. Do not install wires in conduit unless the entire system of conduit and outlet boxes is permanently in place. All conductors shall be pulled using a UL approved wire lubricant.

N. Make all terminations at motors using 3M Series 5300 Motor Lead/Cable Splicing Kits. Make connections per 3M written installation procedures.

O. On all bolted electrical connections, the Contractor shall use Belleville washers.

P. All wiring to be neatly bundled and tied with nylon cord or plastic straps.

Q. When approved by the Electrical Engineer, splices in underground pull boxes shall be made with crimp on compression connectors and insulated with heat shrink sleeves or with splice kits listed by the manufacturer for wet locations. Wire nuts are not permitted. Cables and/or conductors for fire alarm and signals systems shall not be spliced.

4.6 GROUNDING

A. The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded, accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.

B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc.: where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge conductor with ground clamps.

C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.

D. At each building, the interior hot and cold-water piping and the interior aboveground gas piping shall be bonded to the building service equipment per C.E.C. #250.104.

E. Do not use underground gas piping as a grounding electrode.

F. Pull a green equipment ground conductor in all power conduits, both metallic and non-metallic.

G. Each disconnect switch shall have a ground connector (lay in wire type) which shall be used for grounding the disconnect enclosure. The ground wire shall continue and be connected to the enclosure of the equipment served.

H. Where there is more than one building supplied from a common service, provide a grounding electrode at each building per C.E.C. #250.32.

4.7 MOUNTING HEIGHTS OF EQUIPMENT

Unless otherwise specified elsewhere or shown on the plans, the following mounting shall apply:

A.	Panelboards:	6’-0” top of box
B.	Disconnect Switches:	4’-0” to center line
C.	Contactors:	4’-0” to center line

4.8 IDENTIFICATION OF SWITCHES AND APPARATUS

All switchboard circuits, externally operated switches and apparatus used for the operation of or control of circuits, appliances, or equipment shall be properly identified with an engraved Bakelite nameplates, 1” x 3”, black letters on white background. All such nameplates shall be of the self-adhesive type and attached onto the apparatus by screws or rivets. Card holders in any form are not acceptable.

4.9 EARTHQUAKE PROOFING OF LIGHT FIXTURES

A. Fixtures weighing more than 50 pounds shall be supported independently of the outlet box.

B. Pendant type fixtures shall be designed so that they may swing horizontally in any direction a minimum of 45 degrees from the vertical. Pendant shall have ball aligner at top, and swivel connection at fixture. If there is an obstruction within the 45 swing of the fixture the Contractor shall provide a State approved restraint to keep fixture from swinging into the obstruction.

C. All fixtures mounted in or on suspended ceilings shall be fastened to the ceiling-framing members in accordance with C.E.C. #410.36(B). Recessed fixtures in t-bar ceilings shall be provided with integral t-bar clips, one near each corner to attach it to the t-bar ceiling frame.

D. Recessed fixtures in T-bar ceilings shall be attached to the building structure above with #12 Ga. slack safety wire at two diagonal corners of each fixture (two wires per fixture).

4.10 FIRE RATED AREAS

A. Where light fixtures, conduit, cabinets, or boxes penetrate fire rated ceilings, walls or floors provide a fire rated enclosure or fire stop. Rating of enclosure or fire stop shall match or exceed rating of area penetrated. Verify location of fire rated areas with architectural drawings and with General Contractor.

B. Where outlet boxes are recessed on opposite sides of a fire rated wall, boxes shall be separated by a horizontal distance of at least 24 inches. Where the wall opening for a steel electrical outlet box exceeds 16 sq. inches in area, or an aggregate of more than 100 sq. inches for any 100 sq. feet of wall or partition area, fire stopping is required.

C. Penetrations in walls, floors or ceilings requiring protected openings shall be fire-stopped.

D. Fire-stopped shall be of an approved material, securely installed and be in conformance with the 2019 C.B.C., Section 714.3.1 and 714.3.2.

E. All required fire-stopping and joint sealants as a result of the work in Divisions 26, 27 and 28 is the responsibility of each individual trade. Refer to Sections 07 8400 and 07 9210, respectively.

PART 5 - COORDINATION

5.1 HEATING, AIR CONDITIONING, PLUMBING AND OTHER MECHANICAL WORK

A. The Mechanical Contractor shall furnish equipment such as motors, starters, thermostats, wiring diagrams, etc. However, the Electrical Contractor shall be responsible for furnishing and installing of all fused disconnect switches, conduits, wire, fittings, etc. for power connections.

B. Install all electrical equipment where it is not already installed as a part of a unit furnished by the Equipment Contractor. (See drawings of respective contractors).

C. The Electrical Contractor shall furnish fused disconnect switches for pumps, motors and air conditioning and handling units, if they are not furnished by others. Fuses shall be dual element, rating per equipment manufacturer's recommendations. Disconnects shall comply with requirements for "Motor Disconnects" as specified earlier in this section.

D. All disconnect switches (whether provided with unit or by Contractor) shall have a circuit identification engraved nameplate as specified under "Motor Disconnects".

E. Thermal overload protection shall be furnished for all motors where such protection is not included as a part of another contract.

F. All motor outlets, disconnect switch locations and control outlets shown on the plans are approximate only. Verify exact location of same with Equipment Contractor.

G. All line and low voltage controls, including conduits, outlets, wiring and connections shall be furnished and installed by the Mechanical Contractor. (Division 23).

H. Furnish and install a weather-resistant duplex receptacle with ground fault circuit interrupter protection within 25 ft. of all rooftop H.V.A.C. units. Provide a diecast weatherproof "while-in-use" lockable cover, Red Dot #CKSUV or equal.

I. Coordinate with General Contractors, Mechanical Contractors and equipment suppliers before bid is submitted and again before rough-in is started to verify that all systems are complete and all components are provided including starters, disconnects, relays, solenoids, control conduit and wire, etc.

PART 6 - MISCELLANEOUS

6.1 MISCELLANEOUS EQUIPMENT

A. Contractor shall be responsible for electrical hook up and connections to all electrical equipment whether furnished by this Contractor or others, including wiring, conduit, disconnects, circuit breakers etc., even if not shown on drawings. Verify all locations and requirements with equipment supplier before rough-in.

B. When there are fire sprinklers, the Electrical Contractor shall connect bell, flow and tamper switches and other electrical devices as required by Sprinkler Contractor and local and state fire marshal. Verify requirements with General Contractor before bid.

6.2 INTERRUPTION OF SERVICE

A. Interruption of service in existing buildings shall not be made at a time which will inconvenience the Owner. Before making any final connections to the existing buildings or doing any other work that will interrupt the service, the Contractor shall consult with the Owner and schedule the work at Owner's convenience even if it is necessary to make such connections after regular working hours.

B. This Contractor shall do all rerouting and reconnecting of existing electrical facilities made necessary by this construction. Care shall be taken not to disrupt existing facilities. If any facilities are disrupted, this Contractor shall replace or repair them at his expense and to the satisfaction of the Architect.

6.3 CHANGES

A. Electrical Contractor shall consider the number of outlets for electric equipment shown on plans as final, but the Architect reserves the right to shift same, within reason, to a location and position which will meet more completely final requirements.

6.4 GUARANTEE AND TESTS

A. All electrical equipment testing, and related costs shall be included in the Contractor's bid.

B. Contractor shall obtain approval from the Architect of proposed independent testing agencies before any testing is started.

C. Equipment of all kinds installed by this Contractor shall be tested to determine whether it fulfills the requirements of these specifications. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the tests. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.

D. Should any piece of apparatus or any material or work fail in any of these tests, it shall be immediately removed and be replaced with new material by this Contractor at his expense and the portion of the work replaced be again tested by the Contractor.

E. All circuit breakers, 100 amps or more, shall be tested by an independent testing agency in accordance with NETA specifications and a report submitted to the Architect. Any circuit breaker that does not pass the test shall be replaced.

F. The entire installation shall be free from short circuits and improper grounds. Panels and circuits shall be tested for grounds and shorts. Each individual circuit shall be tested at the panel with the equipment connected for proper operation. Ground tests shall meet the requirements of the California Electrical Code. Upon completion of the work, a final inspection by the Architect and other interested authorities shall be conducted.

This Contractor shall guarantee to repair or replace at his expense any material or equipment that develops defects or is determined not to be in conformance with the plans and specifications, during a period of one year after work is accepted by the Owner.

G. The grounding electrode system at the main electrical service equipment shall be tested by an independent testing agency in accordance with the three point fall of potential method as specified in IEEE Standard 81-1983. Maximum ground resistance shall be 25 OHMS. A copy of the test report shall be submitted to the Architect and Engineer of record.

H. All feeder cables #2 and larger shall be tested for insulation resistance. Test report must include number of cable per phase & type of cable insulation.

I. Three copies of test report shall be submitted to Electrical Engineer prior to the final job walk.

J. The independent testing agency performing the abovementioned tests shall be NETA or NICET certified or approved by the electrical engineer.

6.5 DEMOLITION

A. Remove and/or relocate electrical facilities as required to clear areas for new construction.

6.6 UTILITY COMPANY SERVICE CHARGES

All service charges shall be paid by the Owner.

END OF SECTION 26 7000

27 0200 General Requirements (Structured Cabling Systems and Pathways and Spaces systems for all Voice and Data systems)

27 02 01 Summary

A. The Scope of Work covered by this document is to furnish and install the Structured Cabling Systems and Pathways and Spaces systems. This work will provide for the structured cabling system (SCS) for all Voice and Data systems.

B. Telecommunications system shall include the following systems:

1. Structured Cabling System (SCS) For Telecommunications Systems
2. Pathways for Telecommunications Systems
3. Grounding and Bonding System (GBS) For Telecommunications Systems
4. Fire stopping for Telecommunications Systems

27 02 05 Additional Requirements

A. **Coordination of work:** Contractor shall be responsible for coordination of work among project specification divisions and contractor/subcontractors involved in this project. This coordination of Work Includes following instructions provided the Construction Manager or General Contractor if project is managed by such.

B. **General compliance requirements:** Provide a complete and operable system in compliance with project drawings, specifications, referenced standards, applicable building codes, and Authority Having Jurisdiction (AHJ) requirements. Scope of this contract includes materials, equipment, labor, configuration, programming, testing, startup and commissioning services, and documentation costs for complete and operable system that meets all requirements indicated on drawings or contained in specifications. Comply with all contract documents, specifications, drawings, manufacturer's instructions, and Owner and AHJ requirements. In case of conflict among applicable documents or standards, contractor shall notify owner's representative in writing of apparent conflict, and then comply with most stringent requirements unless otherwise directed in writing from owner's representative. Work includes all items required for complete system whether or not identified in specification or drawings.

C. Information about general construction and architectural features and finishes shall be derived from structural and architectural drawings and specifications only.

D. Work related to telecommunications system shall be installed by an SCS manufacturers authorized or certified trained installer. Owner reserves the right to review and approves any personnel assigned to this project in a supervisory or managerial role.

E. SCS contractor shall have had at least 3 years of comparable experience with telecommunications projects. Comparable projects shall equal or exceed size and complexity of work on drawings.

F. **Complete and usable work:** Refer to and comply with requirements in section 27 02 67 outlined below.

27 02 10 Related Documents and Drawings

A. **General:** The project drawings and general conditions of Contract shall apply to this section.

B. **Coordination:** Coordinate with work specified in other sections and divisions of specifications.

C. **Reference:** Codes and standards as referenced in Section 27 02 20 may define additional specifications or requirements not specifically called out within this division. However, contractor shall adhere to most stringent requirements as defined herein, or as defined by reference within section 27 02 20.

D. Architectural and Engineering specifications may have additional conditions or requirements that affect the work defined by this division of specifications. Contractor shall be responsible for the coordination of all conditions and other trade requirements that may impact schedule, scope of work, work progress, or other factors that may affect the overall ability for contractor to execute the requirements of this division of specifications.

27 02 20 Codes and Standards

A. General: All work, including but not limited to: cabling, pathways, support structures, wiring, equipment, installation and workmanship shall comply with the latest editions of the requirements of the Authority Having Jurisdiction (AHJ), California Electrical Code, National Electrical Safety Code, all applicable local rules and regulations, equipment manufacturer's instructions, and the National Electrical Contractor's Association (NECA) Standard of Installation. In case of discrepancy or disagreement between the documents noted above, the Contractor shall satisfy the most stringent requirements.

B. Other sections of this document contain References to Codes and Standards that are applicable to the section.

27 02 20.20 Codes

C. California Electric Code (CEC)

D. National Fire Protection Association (NFPA)

NFPA 70

NFPA 72, National Fire Alarm Code

NFPA 75, Standard for the Protection of Electronic Computer/Data Processing Equipment

NFPA 76, Recommended Practice for the Fire Protection of Telecommunications Facilities

NFPA 101, Life Safety Code

27 02 20.40 Reference Standards

A. Telecommunications Industry Association (TIA)

TIA-526-7, Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7

T-526-14-A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant – SFSTP-14

TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises

TIA-568-C.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements

TIA-568-C.2, Commercial Building Telecommunications Cabling Standard—Part 2: Balanced Twisted Pair Cabling Components

TIA-568-C.3, Optical Fiber Cabling Components Standard

TIA-569-B, Commercial Building Standards for Telecommunications Pathways and Spaces

TIA-606, Administration Standard for Commercial Telecommunications Infrastructures

ANSI J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications

B. Other Reference Materials

BICSI Telecommunications Distribution Methods Manual (TDMM)

BICSI Wireless Design Reference Manual (WDRM)

Institute of Electrical and Electronic Engineers (IEEE)

National Electrical Manufacturers Association (NEMA)

Underwriters Laboratories (UL) Cable Certification and Follow Up Program

27 02 25.40 Definitions

Access Floor - A floor system that has removable floor panels.

Building Backbone Cabling – Cabling used to connect Floor Distributors (FD) or other local collection points to the Building Distributor (BD). Building backbone cabling

typically carries aggregate traffic and, as such, impacts multiple network devices and users. Building backbone cabling may include either fiber optic or copper cabling or both.

Building Distributor (BD) – Termination point from which all building backbone cabling emanates and interconnection point for the network backbone. Commonly referred to as BDF and Intermediate Cross-connect (IC). There is one BD for each building and it feeds all FD's in the same building. The BD should be located so that all FD's served are within 300 cable meters (984 cable feet). All BD's are linked to the

Campus Backbone Cabling – Cabling used to connect Building Distributors (BD) or other key network segments to the Campus Distributor (CD). With rare exceptions, campus backbone cabling carries aggregate traffic and typically impacts entire buildings worth of network devices and users and, as such, link redundancy with diverse routing is highly recommended. Campus backbone cabling almost exclusively consists of fiber optic cabling. Copper cabling may be used in short-distance (< 90m) applications. In such cases, lightning protection will usually be required by code.

Campus Distributor (CD) – Termination point from which all campus backbone cabling emanates and highest-level interconnection point for the network backbone. Commonly referred to as NOC and Main Cross-connect (MC). On smaller campuses, there is one CD for the campus. On larger campuses there might be several CD's with each CD serving several buildings. Besides linking to each of the BD's it serves, the CD is also the network interconnection point for data center links and links to service providers.

Category 3 (Cat 3) – A category of transmission performance, defined in EIA standards, that specifies electrical properties up to 10 MHz. Cat 3 is the minimum performance grade permissible and is used typically for analog voice distribution.

Category 5e (Cat 5e) / Class D – A category/class of transmission performance that specifies electrical properties up to 155.5 MHz. Capable of supporting copper-based, four-pair Gigabit Ethernet (IEEE 802.3ab 1000BASE-T) applications. Category 5e is defined in TIA/EIA 568B.2 standard. Class D is defined in the ISO 11801 standard.

Category 6 (Cat 6) / Class E – A category/class of transmission performance that specifies electrical properties up to 250 MHz. Refer to the TIA/EIA 568B family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class E requirements. Also refer to CENELEC EN50173.

Category 6A (Cat 6) / Class E_A– A category/class of transmission performance that specifies electrical properties up to 500 MHz and capable of supporting data applications operating at 10Gbps. Refer to the TIA/EIA 568B family of standards for more information on Category 6 and ISO/IEC 11801 for more information on Class EA requirements.

Certification – The testing and documentation of the transmission performance (e.g., Category 5e / Class D) of a permanent link or channel, based on sweep frequency (where applicable) testing of numerous parameters with results compared to a range of acceptable values. This project requires 100% certification (with documentation) of all permanent link cabling at the time of installation. Channel certification is optional and is the responsibility of the group using the channel.

Channel – The entire physical pathway between active equipment ports, inclusive of all patch cords, patch panels, jacks and cabling segments.

Conduit - A raceway of circular cross-section.

Entrance Facility (EF) – Termination point of service provider cables that have entered the building and location of service demarcation point (MPOE) and interconnection point to the network. Commonly referred to as Telco Room and Entrance Facility (EF). The EF is linked to the CD, where present, or to the BD.

Floor Distributor (FD) – Termination point for horizontal cabling and interconnection point for network access. Commonly referred to as IDF and Horizontal Cross-connect (HC) - FD quantities and locations are determined by building size and geometry so that all points served are within 90 cable meters (295 cable feet) of an FD. The FD feeds all Telecommunications Outlets (TO's) in its service zone. All FD's in a building are linked to the building's Building Distributor (BD) via backbone cabling.

Horizontal Cabling – Cabling used to connect individual work area outlets to local Floor Distributors (FD) or other collection points. Unlike backbone cabling, horizontal cabling does not typically carry aggregate traffic and, as such, impacts only single network devices or users. In buildings, horizontal cabling almost exclusively consists of copper cabling. Fiber optic cabling may be used where situations dictate but, unlike horizontal copper cabling, horizontal fiber optic cabling is not installed in advance as default building facilities. At this writing, horizontal copper cabling in many networks is capable of supporting Gigabit (1Gb/s) Ethernet applications as well as other applications of similar bandwidth.

Permanent Link – A stationary cabling segment, consisting of the permanently installed cable and the permanently affixed jack at both ends (typically at the outlet faceplate and closet patch panel, or on a patch panel on both ends). The concept is based on the assumption that, while patch cords might be disconnected or moved over time, the permanent cable and jacks will not be disturbed and the electrical characteristics of the permanent link will remain unaltered.

Plenum -A space within the building designed for the movement of environmental air; i.e., a space above a suspended ceiling or below an access floor.

Raceway - Any channel designed for holding wires or cables; i.e. conduit, electrical metal tubing, busways, wireways, ventilated flexible cableway.

27 02 30 Project Drawings

A. **Building composite floor plans:** Provide building floor plans showing outlet locations and jack configuration, types of jacks, run distance for each jack cable, and cable routing/locations. Identify TO's that, according to location and available pathway systems, require cable length greater than allowed by standards. Recommend alternatives for Owners Representative's consideration.

B. **Telecommunications space plans/elevations:** Include enlarged floor plans of TRs indicating layout of equipment and devices, including receptacles and grounding provisions. Submit detailed plan views and elevations of telecommunications spaces showing racks, termination blocks, and cable paths.

C. **Logical Drawings:** Provide logical riser or schematic drawings for all systems. Include schematic symbol key.

27 02 50 Substitutions

A. **Substitution requests:** Substitution requests will be considered only if submitted to Owner's Representative not less than 7 working days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representatives sole discretion. No exceptions. Requests for substitutions shall be considered *not approved* unless approval is issued in writing by Owner's Representative.

B. **Rejection:** For equipment, cabling, wiring, materials, and all other products indicated or specified as *no substitutions* or *no alternates*, Owner does not expect nor desire requests for substitutions and alternate products other than those specified. Owner reserves right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.

27 02 65 Warranty

27 02 65.10 Contractors Warranty

A. **General requirements:** Comply with additional requirements in contract general requirements and extended warranties required in other specification sections. Refer to all other 27xxx sections for specific additional warranty requirements that exceed or are in addition to those of this section.

B. **Contractor warranty:** Provide all services, materials and equipment necessary for successful operation of entire telecommunications system and SCS system for a period of one year after system acceptance. Scope of warranty includes all equipment, devices, wiring, accessories, software, hardware, installation, programming, and configuration required to maintain a complete and operable system. Provide manufacturer's published recommended preventative maintenance procedures during warranty period. This shall apply to all items except

those specifically excluded, or items wherein a longer period of service and warranty is specified or indicated. All warranties shall be effective for one year, minimum, from date Certificate of Final Acceptance is issued. Use of systems provided under this section for temporary services and facilities shall not constitute final acceptance of work nor beneficial use by Owner and shall not institute warranty period. The warranty shall cover repair or replacement of defective materials, equipment, workmanship, and installation that may be incurred during this period. Warranty work is to be done promptly and to Owner's satisfaction. In addition, warranty shall cover correction of damage caused in making necessary repairs and replacements under warranty. Additional warranty responsibilities are:

1. Obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's designated name. Replace material and equipment that require excessive service during guarantee period as determined by Owner.
2. Provide 2-business day service beginning on date of Substantial Completion and lasting until termination of warranty period. Service shall be at no cost to Owner. Service can be provided by installing contractor or by a separate service organization. Choice of service organization shall be subject to Owner's approval. Submit name and a phone number that will be answered on a 24-hour basis each day of week, for duration of service.
3. Submit copies of equipment and material warranties to Owner before final acceptance.
4. At end of warranty period, transfer manufacturers' equipment and material warranties still in force to Owner.
5. If warranty work problems cannot be corrected immediately to Owner's satisfaction, advise Owner in writing, describing efforts to correct situation, and provide analysis of cause for problem. If necessary to resolve problem, provide at no cost services of manufacturer's engineering and technical staff at site in a timely manner to analyze warranty issues, and develop recommendations for correction, for review and approval by Owner.

C. **Pathways Material and Installation warranty:** Provide all services, materials and equipment necessary to warrant the installation and performance of all pathway materials for a period of one year after beneficial use. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

D. **Grounding and Bonding Material and Installation warranty:** Provide all services, materials and equipment necessary for successful operation of GBS for a period of one year after beneficial use. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

E. **Firestopping Material and Installation warranty:** Provide all services, materials and equipment necessary to warrant the performance of all Firestopping material for a period of one year after beneficial use, or longer if required by the local AHJ. Scope of warranty includes all equipment, devices, installation and other work required to maintain a complete and operable system. Provide manufacturers published recommended preventative maintenance procedures during warranty period.

27 02 65.20 SCS Manufacturers Extended Warranty

A. SCS Systems will be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified vendor. Manufacturer shall administer a follow on program through the Vendor to provide support and service to the purchaser. The first part is an assurance program, which provides that the certified system will support the applications for which it is designed, during the 20-year warranty of the certified system.

B. The second portion of the certification is a 20-year warranty provided by the manufacturer and the vendor on all products within the system (cords, telecommunications outlet/connectors, cables, cross-connects, patch panels, etc.).

C. In the event that the certified system ceases to support the certified application(s), whether at the time of cutover, during normal use or when upgrading, the manufacturer and vendor shall commit to promptly implement corrective action.

D. The cabling system must conform to the current issue of industry standard ANSI/TIA/EIA-568. All performance requirements of this document must be followed. As well, workmanship and installation methods used shall be equal to or better than that found in the BICSI (Building Industry Consulting Service International) ITSIM manual.

27 02 67 Completeness of Work

A. **Complete and usable work:** The contractor is responsible for providing complete and usable work according to contract documents. All materials and equipment shall be provided with all accessories and additional work required for field conditions, as well as additional work and accessories required for complete, usable, and fully functional construction and systems, even if not explicitly specified or indicated. Telecommunications system in this Contract shall be provided as complete and operable systems in full compliance with requirements on drawings and specification requirements. Drawings are diagrammatic and specifications are performance-based, and Contractor shall provide all work required to comply with drawings and specifications, even if not explicitly indicated or specified. Contractor shall be responsible for coordinating installation of electrical systems with all field conditions and work of other trades. Minimum clearances and work required for compliance with NFPA 70, and manufacturer’s instructions shall be provided. Comply with additional requirements indicated for access and clearances. Contractor shall verify all field conditions and dimensions that affect selection and

provision of materials and equipment, and shall provide any disassembly, reassembly, relocation, demolition, cutting and patching required to provide work specified or indicated, including relocation and reinstallation of existing wiring and equipment. Contractor shall protect from damage resulting from Contractor's operations existing facility, equipment, and wiring. Extra charges for completion and contract time extension will not be allowed because of field conditions or additional work required for complete and usable construction and systems. Comply with additional requirements indicated for access and clearances.

B. **Drawings and specifications form complementary requirements;** provide work specified and not shown, and work shown and not specified as though explicitly required by both. Except where explicitly modified by a specific notation to contrary, it shall be understood that indication or description of any item, in drawings or specifications or both, carries with it instruction to furnish and install item, provided complete.

C. **Terms:** As used in this specification, *provide* means *furnish* and *install*. *Furnish* means "to purchase and deliver to project site complete with every necessary appurtenance and support," and *install* means "to unload at delivery point at site and perform every operation necessary to establish secure mounting and correct operation at proper location in project."

D. **Supplementary items:** Provide supplementary or miscellaneous items, appurtenances, devices and materials necessary for a sound, secure and complete installation. Examine project drawings and other Sections of specifications for requirements that affect work of this section. Completely coordinate work of this section with work of other Sections and provide a complete and fully functional installation. Refer to all other drawings and other specifications sections that indicate types of construction in which work shall be installed and work of other sections with which work of this section must be coordinated

27 02 70 Project Conditions

A. **Field verification:** Carefully verify location, use and status of all material, equipment, and utilities that are specified, indicated, or deemed necessary for removal. Verify that all materials, equipment, and utilities to be removed are completely inactive and will not be required or in use after completion of project. Replace with equivalent any material, equipment and utilities that were removed by Contractor that are required to be left in place.

B. **Existing utilities:** As applicable, do not interrupt utilities serving facilities occupied by Owner or others unless permitted under following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify owner in writing at least 14 days in advance of proposed utility interruptions. Do not proceed with utility interruptions without Owner's written permission.
2. Equipment installation:

a. Determine suitable path for moving unit substation into place; consider Project conditions.
b. Verify clearance requirements and locate equipment to meet installation tolerances.
c. Revise locations and elevations from those indicated to those required to suit Project.

27 02 73 Delivery Storage and Handling

A. **General:** Contractor shall be responsible for the deliveries, storing and handling of all materials relative to the SCS systems, including materials supplied by others that are part of the SCS installation contract. Material shall be stored and protected according to manufacturer's instructions. Contractor shall be responsible for the security of all material during installation. For all material provided by contractor, or delivered to contractor on site, contractor assumes full responsibility and liability for any material shortages, damage or loss due to storage and handling methods.

27 02 77 Examination

A. **General:** Prior to submitting a proposal, Contractor shall examine site, review Project drawings and specifications, and determine exact extent of work required. Contractor shall include in their proposals all materials, labor, and equipment required to complete required work indicated. Work that is necessary to obtain complete and usable Project as specified herein shall be included in Contractor's proposal, even if not indicated or specified.

B. **Bidders' questions:** Should bidders have questions as to intent of drawings and specifications, quality of materials to be used, and work to be performed, questions shall be submitted in writing to Owner's Representative in manner dictated by Owner's Representative. All answers and clarifications to drawings and specifications will be issued in writing.

C. Extra payment will not be allowed for claims for due to unfamiliarity with work to be performed by other trades, existing conditions at job site, local or state laws and codes, and alterations due to field conditions.

27 02 79 Additional Costs

A. **General:** Project acceptance inspections, final completion inspections, substantial completion inspections, and acceptance testing/demonstrations shall be conducted after verification of system operation and completeness by Contractor.

B. **Inspections and testing:** For Project acceptance inspections, final completion inspections, substantial completion inspections, and/or testing/demonstrations that require more than one site visit by Owner's Representative or Architect/Engineer to verify Project compliance for same material or equipment, Owner reserves right to obtain compensation from Contractor to defray cost of additional site visits that

result from Project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions. Owner's Representative will notify Contractor of hourly rates and travel expenses for additional site visits, and will issue an invoice to Contractor for additional site visits. Payment of additional site visit costs by Contractor is required within 30 days of invoicing. Owner reserves right to deduct additional costs defined herein that are indicated on past due invoices from Project amount due Contractor.

C. **Exclusions:** Contractor shall not be eligible for extensions of Project schedule or additional charges resulting from additional site visits that result from Project construction or testing deficiencies/incompleteness, incorrect information, or non-compliance with Project provisions.

END of SECTION

27 0400 Execution

27 04 01 General Requirements

A. General: Sequence, coordinate, and integrate various elements of telecommunications system, materials, and equipment. Comply with following requirements as a minimum.

A. Coordinate systems, equipment, and materials installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for wiring, cabling, and equipment installations.

D. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of Work. Give particular attention to large equipment requiring positioning prior to closing in building.

F. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide maximum headroom and access for service and maintenance as possible.

G. Coordinate connection of materials, equipment, and systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

H. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by Contract Documents, recognizing that portions of Work are shown only in diagrammatic form. In case of conflict among individual system requirements, request direction in writing from Owner's Representative.

I. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed in both exposed and un-exposed spaces.

J. Install cabling, wiring, and equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

K. Provide access panel or doors where units are concealed behind finished surfaces.

L. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

M. Comply with all requirements and work indicated on drawings.

N. Avoid interference with structure and with work or other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of Owner and according to code requirements.

O. Install equipment and cabling/wiring so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel or roof curbs as appropriate.

P. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall and ceiling mounting of equipment as required.

Q. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other support hardware.

R. Obtain and analyze catalog data, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

S. Structural steel and hardware shall conform to ASTM standard specifications. Use of steel and hardware shall conform to requirements of AISC Code of Practice: Section Five.

T. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that would void warranty.

27 04 10 Equipment Installation

A. General: Install equipment according to manufacturer's written instructions. Install equipment level and plumb. Install wiring and cabling between equipment and all related devices.

B. Mounting: If neither the Owner's Instructions nor the individual section call out the required hardware mounting, use the following.

1. For equipment at walls, bolt units to wall or mount on structural steel channel strut bolted to wall.
2. For equipment not at walls, provide freestanding racks fabricated of structural steel members and slotted structural steel channel strut.
3. Use feet consisting of 0.25 inch thick steel plates, 6 square inch, bolted to floor.
4. Use feet for welded attachment of vertical posts not over 3 feet on center.
5. Connect posts with horizontal U channel steel strut and bolt control equipment to channels.

C. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

D. Connections: Tighten wiring connectors, terminals, bus joints, and mountings, to include lugs, screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. In absence of published connection or terminal torque values, comply with torque values specified in UL 486A and UL 486B.

27 04 30 Demolition, removal and Protection of work

A. Demolition and removal: Cut, remove, and legally dispose of selected equipment, components, and materials as indicated, including but not limited to removal of material, equipment, devices, and other items indicated to be removed and items made obsolete by new Work. Provide and maintain temporary partitions or dust barriers adequate to prevent spread of dust and dirt to adjacent areas.

B. Protection of work: Protect structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed. During cutting and patching operations, protect adjacent installations. Patch finished surfaces and building components using new materials specified for original installation and experienced Installers.

27 04 33 Penetrations and Sleeves

A. General: Coordinate work with other sections. SCS Installation Contractor shall be responsible for the provision of cabling sleeves and conduits unless specifically provided by the Electrical Contractor. SCS Installation Contractor shall coordinate with Electrical Contractor to determine exact requirements.

B. When required, set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured or otherwise constructed without sleeves and wall penetration is required. Do not penetrate structural members. Provide sleeves and packing materials at all penetrations of foundations, walls, slabs (except on-grade), partitions, and floors. Sleeves shall meet requirements of pertinent specifications. Lay out penetration and sleeve openings in advance, to permit provision in work. Set sleeves and conduit in forms before concrete is poured. Provide remedial work where sleeves and conduits are omitted or improperly placed.

C. Sleeve fill: Sleeves that penetrate outside walls, basement slabs, footings, and beams shall be waterproof.

1. Fill slots, sleeves and other openings in floors or walls if not used.
2. Fill spaces in openings after installation of conduit or cable.
3. Fill for floor penetrations shall prevent passage of water, smoke, fire, and fumes.

4. Fill shall be fire resistant in fire floors and walls, and shall prevent passage of air, smoke and fumes. See section 27 05 32 - Firestopping for Telecommunications Systems.
5. Sleeves through floors shall be watertight and shall extend 2 inches above floor surface.
6. Where raceways passing through openings are exposed in finished rooms, finishes of filling materials shall match and be flush with adjoining floor, ceiling, and wall finishes.

D. Conduit sleeves:

1. Annular space between conduit and sleeve shall be at least 1/4 inch.
2. Sleeves shall not be provided for slabs-on-grade unless specified or indicated otherwise.
3. For sleeves through rated fire walls and smoke partitions, comply with requirements for firestopping. See section 27 05 32 - Firestopping for Telecommunications Systems.

E. Supports: Do not support piping risers or conduit on sleeves.

F. Future use: Identify unused sleeves and slots for future installation.

27 04 39 Cleaning

A. Contractor is responsible for clean up of debris on a daily basis. Cost of clean up is the responsibility of the Contractor.

A. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition. Perform cleaning and washing required to provide acceptable appearance and operation of equipment to satisfaction of Owner's Representative.

B. After completion of Project, clean exterior surface of all equipment, including concrete residue, dirt, and paint residue. Final cleaning shall be performed prior to Project acceptance by Owner's Representative.

27 04 70 Special Responsibilities and Information

A. Coordination of information: Cooperate and coordinate with work of other sections in executing work of this section. Perform work such that progress of entire project, including work of other sections, shall not be interfered with or delayed. Provide information as requested on items furnished under this section, which shall be installed under other sections. Obtain detailed installation information from manufacturers of equipment provided under this section.

B. Information gathering: Obtain final rough-in dimensions or other information as needed for complete installation of items furnished under other sections or by Owner. Keep fully informed as to shape, size and position of openings required for

material or equipment to be provided under this and other sections. Give full information so that openings required by work of this section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide sufficient information in proper time, provide cutting and patching or have same done, at no expense to Owner.

C. Housekeeping pads: Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor mounted equipment

D. Maintenance of equipment and systems: Maintain equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown and during delays pending final test of systems and equipment because of seasonal conditions.

E. Use of premises: Use of premises shall be restricted as directed by Owner's Representative and as required below:

1. **Cleaning and rubbish removal:** Remove and dispose of dirt and debris, and keep premises clean. During progress of work, remove equipment and unused material. Put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Owner's Representative.

2. **Rubbish Removal:** Provide for the removal from the site of all spoils, debris, boxes, packaging, crates, and trash generated from the work.

3. **Storage:** Store materials maintaining an orderly, clean appearance. If stored on site in open or unprotected areas, all equipment and material shall be kept off ground by means of pallets or racks, and covered with tarpaulins.

F. Protection of fireproofing:

1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, if possible, prior to start of spray fire proofing work.

2. Conduits and other items that would interfere with proper application of fireproofing shall be installed after completion of spray fire proofing work.

3. Patching and repairing of fireproofing due to cutting or damaging to fireproofing during course of work specified under this section shall be performed by installer of fireproofing and paid for by section responsible for damage and shall not constitute grounds for an extra to Owner.

G. Temporary utilities: Refer to contract general requirements regarding requirements.

H. Movement of materials: Unload materials and equipment delivered to site. Pay costs for rigging, hoisting, lowering and moving equipment on and around site, in building or on roof.

27 04 80 Division of Work

A. General: Division of work responsibility matrix at the end of this section is for Contractor's reference to clarify roles of various manufacturers, installers, subcontractors, and trades involved in telecommunications system Project.

B. Contractor holding contract with Owner is responsible for coordinating work of all subcontractors to provide a complete and usable Project complying with contract provisions of Project documents.

C. Failure to coordinate work by subcontractors and suppliers will not be considered justification for additional compensation or extension of schedule.

END of SECTION

27 0500 Common Work Results for Communications

27 05 26 Grounding and Bonding for Communications Systems

1. GENERAL

1.1. Work Includes

Provide all labor, materials, and equipment for the complete installation of work called for in the Contract Documents.

1.2. Scope of Work

A. This section includes the minimum requirements for the equipment and cable installations in communications equipment rooms (Telecommunications Closets).

B. Included in this section are the minimum composition requirements and installation methods for the following:

1. Grounding Electrode System
1. Busbars
2. Bonding accessories

1.3. Quality Assurance

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

1.4. Submittals

A. Provide product data for the following:

1. Manufacturers cut sheets, specifications and installation instructions for all products.

2. PRODUCTS

2.1. Grounding Electrode System

A. Grounding Electrode System

1. When required the Grounding Electrode System shall meet the following

a. Active grounding system constantly replenishing moisture into the soil
b. Provide low resistance to ground
c. Provide season to season stability
d. Be maintenance-free for 30 years
e. Contain no hazardous materials or chemicals

2. Approved Manufacturers:
   a. Cooper BLine, Burndy, or approved equal

2.2. Wall-mount Busbars

A. Telecommunications Main Grounding Busbar (TMGB)

1. Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25” (6.4 mm) thick solid copper bar.
1. The busbar shall be 4” (100 mm) high and 20” (510 mm) long and shall have 30 attachment points (two rows of 15 each) for two-hole grounding lugs.
2. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 27 lugs with 5/8” (15.8 mm) hole centers and 3 lugs with 1” (25.4) mm) hole centers.
3. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4” (100 mm) standoff from the wall.
4. The busbar shall be UL Listed as grounding and bonding equipment.
5. Approved manufactures:
   a. Chatsworth (CPI), Erico Caddy, Cooper BLine, or approved equal

B. Telecommunications Grounding Busbar (TGB)

1. Telecommunications Grounding Busbar (TGB) shall be constructed of .25” (6.4 mm) thick solid copper bar.
2. The busbar shall be 2” (50 mm) high and 12” (300 mm) long and shall have 9 attachment points (one row) for two-hole grounding lugs.
3. The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 6 lugs with 5/8” (15.8 mm) hole centers and 3 lugs with 1” (25.4 mm) hole centers.
4. The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4” (100 mm) standoff from the wall.
5. The busbar shall be UL Listed as grounding and bonding equipment.
6. Approved manufactures:
   a. Chatsworth (CPI), Erico Caddy, Cooper BLine, or approved equal

2.3. Bonding Accessories

A. Two Mounting Hole Ground Terminal Block

1. Ground terminal block shall be made of electroplated tin aluminum extrusion.
2. Ground terminal block shall accept conductors ranging from #14 AWG through 2/0.

3. The conductors shall be held in place by two stainless steel set screws.
4. Ground terminal block shall have two 1/4" (6.4 mm) holes spaced on 5/8" (15.8 mm) centers to allow secure two-bolt attachment to the rack or cabinet.
5. Ground terminal block shall be UL Listed as a wire connector.

B. Compression Lugs

1. Compression lugs shall be manufactured from electroplated tinned copper.
2. Compression lugs shall have two holes spaced on 5/8" (15.8 mm) or 1" (25.4 mm) centers, as stated below, to allow secure two bolt connections to busbars.
3. Compression lugs shall be sized to fit a specific size conductor, sizes #6 to 4/0, as stated below.
4. Compression lugs shall be UL Listed as wire connectors.

C. Antioxidant Joint Compound

1. Oxide inhibiting joint compound for copper-to-copper, aluminum-to-aluminum or aluminum-to-copper connections.

D. C-Type, Compression Taps

1. Compression taps shall be manufactured from copper alloy.
1. Compression taps shall be C-shaped connectors that wrap around two conductors forming an irreversible splice around the conductors; installation requires a hydraulic crimping tool
2. Compression taps shall be sized to fit specific size conductors, sizes #2 AWG to 4/0, as stated below.
3. Compression taps shall be UL Listed.

E. Pedestal Clamp With Grounding Connector

1. Pedestal clamp shall be made from electroplated tinned copper or bronze. Installation hardware will be stainless steel.
1. Pedestal clamps shall be sized to fit a specific size conductor, size #6 and/or 2/0, as stated below.
2. Pedestal clamp installation hardware shall be sized to attach to round and/or square raised access floor pedestals that are 1-1/8" to 1-3/4" in diameter, as stated below.
3. Pedestal clamp shall provide straight (in-line) or cross (intersection) support for up to two conductors.
4. Pedestal clamp shall be UL Listed as grounding and bonding equipment.

F. Pipe Clamp With Grounding Connector

1. Pipe clamp shall be made from electroplated tinned bronze. Installation hardware will be stainless steel.
1. Pipe clamp shall be sized to fit up to two conductors ranging in size from #6 to 250 MCM; conductors must be the same size.

2. Pipe clamp installation hardware shall be sized to attach to pipes, sizes 1" to 6" (.75" to 6.63" in diameter), as stated below.
3. Pipe clamp shall be UL Listed as grounding and bonding equipment.

G. Equipment Ground Jumper Kit

1. Kit includes one 24"L insulated ground jumper with a straight two hole compression lug on one end and an L-shaped two hole compression lug on the other end, two plated installation screws, an abrasive pad and a .5 once tube of antioxidant joint compound.
1. Ground conductor is an insulated green/yellow stripe #6 AWG wire
2. Lugs are made from electroplated tinned copper and have two mounting holes spaces .5" to .625" apart that accept 1/4" screws.
3. Jumper will be made with UL Listed components

H. Approved Manufacturers:

1. Cooper BLine, Burndy, or approved equal

3. EXECUTION

2.1. Installation

A. Outdoor grounding and bonding connections.

1. All outdoor grounding and bonding (earthing) connections shall be accomplished using exothermic welding.

B. Wall-Mount Busbars

1. Attach busbars to the wall with appropriate hardware according to the manufacturer's installation instructions.
2. Conductor connections to the TMGB or TGB shall be made with two-hole bolt-on compression lugs sized to fit the busbar and the conductors.
3. Each lug shall be attached with stainless steel hardware after preparing the bond according to manufacturer recommendations and treating the bonding surface on the busbar with antioxidant to help prevent corrosion at the bond.
4. The wall-mount busbar shall be bonded to ground as part of the overall Telecommunications Bonding and Grounding System.

C. Rack-Mount Busbars and Ground Bars

1. When a rack or cabinet supports active equipment or any type of shielded cable or cable termination device requiring a ground connection, add a rack-mount horizontal or vertical busbar or ground bar to the rack or cabinet. The rack-mount busbar or ground bar provides multiple bonding points on the rack for rack and rack-mount equipment.
2. Attach rack-mount busbars and ground bars to racks or cabinets according to the manufacturer's installation instructions.

3. Bond the rack-mount busbar or ground bar to the room's TMGB or TGB with appropriately sized hardware and conductor.

D. Ground Terminal Block

1. Every rack and cabinet shall be bonded to the TMGB or TGB.
2. Minimum bonding connection to racks and cabinets shall be made with a rack-mount two-hole ground terminal block sized to fit the conductor and rack and installed according to manufacturer recommendations.
3. Remove paint between rack/cabinet and terminal block, clean surface and use antioxidant between the rack and the terminal block to help prevent corrosion at the bond.

E. Pedestal Clamp

1. At minimum, bond every sixth raised access floor pedestal with a minimum #6 AWG conductor to the TMGB or TGB using a pedestal clamp sized to fit the pedestal and the conductor and installed according to the manufacturer's recommendations.
2. If pedestal clamps are used to construct a signal reference grid, bond the signal reference grid to the TMGB or TGB and bond each rack and/or cabinet to the signal reference grid using a compression tap or similar non-reversible bonding component sized to fit both conductors.
3. Remove paint between the pedestal and pedestal clamp, clean surface and use antioxidant between the pedestal and the clamp to help prevent corrosion at the bond.
4. Remove insulation from conductors where wires attach to the pedestal clamp.

F. Pipe Clamp

1. Bond metal pipes located inside the data center computer room with a minimum #6 AWG conductor to the TMGB or TGB using a pipe clamp sized to fit the pipe and the conductor and installed according to the manufacturer's recommendations.
2. Remove paint between the pipe and pipe clamp, clean surface and use antioxidant between the pipe and the clamp to help prevent corrosion at the bond.
3. Remove insulation from conductors where wires attach to the pipe clamp.

G. Equipment Ground Jumper Kit

1. Bond equipment to a vertical rack-mount busbar or groundbar using ground jumper according to the manufacturer's recommendations.
2. Clean the surface and use antioxidant between the compression lugs on the jumper and the rack-mount busbar or groundbar to help prevent corrosion at the bond.

END of SECTION

27 05 28 Pathways for Communications Systems

1. GENERAL

1.1. Scope of Work

A. Install empty raceway system, including underfloor and overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable troughs, service poles, miscellaneous and positioning material to constitute complete system, as indicated for distribution of Telecommunications wiring which includes cables for Data, Voice, Video, Audio, Security and future signal requirements.

B. The location at which all new telecommunications wiring will terminate is called a Telecom Outlet (TO). There are several styles of outlets:

1. New construction
2. Existing construction typical
3. Existing construction variations
4. Telephone (Voice) only
5. Data only

C. Furnish and install split channel raceway and outlet boxes as specified in the Drawings and as specified herein.

D. Furnish and install conduit stubs in walls and floors for cable routes.

1.2. Quality Assurance:

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

B. Assure that the "as installed" system is correctly and completely documented including engineering drawings, manuals, and operational procedures in such a manner as to support maintenance and future expansion of the system.

1.3. Submittals

A. Product Data: For features, ratings, and performance of each component specified.

B. Submit manufacturer’s instructions for storage, handling, protection, examination, preparation, operation, and installation of products. Include application conditions

or limitations of use stipulated by any product testing agency. Submit for the following:

1. Wall Boxes
2. Raceway
3. Conduit
4. Conduit Bushings

C. Shop Drawings:

0 1. Component List: List manufacturer, part number, and quantity of each component.

1 2. Include dimensioned plan and elevation views of equipment rooms, labeling each individual component. Show raceway assemblies, method of field assembly, workspace requirements, and access for cable connections.

2. PRODUCTS

2.1. Telecom Outlets (TO)

A. Cat5e and Cat6 TO consists of one (1) 4-11/16" square by 2-1/8" deep flush mounted box. Each outlet box shall have a EMT conduit stubbed above the drop ceiling or extended into the hallway cabletray. Conduits size is as follows UON:

1. For Outlets with 3 or less cables, use a 1” EMT conduit
2. For Outlets with 3-6 cables, use a 1.25” EMT conduit
3. For all other sizes, calculate fill ratio at 40% for proper sized conduit

B. Cat6A TO consists of one (1) 5" square by 2-7/8" deep flush mounted box. Each outlet box shall have a EMT conduit stubbed above the drop ceiling or extended into the hallway cabletray. Conduits size is as follows UON:

4. For Outlets with 3 or less cables, use a 1.25” EMT conduit
5. For Outlets with 3-6 cables, use a two 1.25” EMT conduit
6. For all other sizes, calculate fill ratio at 40% for proper sized conduit

C. Existing surface-mounted construction TO typically consists of surface-mounted raceway including base, cover, end fitting, entrance end fitting, and (2) 1" EMT conduits stubbed out top of entrance end fitting to above ceiling or out to nearest hallway distribution system. Size of the raceway is site dependent based on number of conductors to be installed.

D. The intent of the installation of the TOs which consist of the raceway is as follows:

1. Where ceilings are accessible, the raceway and entrance end fitting shall extend above the ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.
2. Where ceilings are partially accessible, or if the Drawings and/or Specifications indicate installation of access panels, the raceway shall extend above the

ceiling and the conduits installed above the ceiling in the room to the nearest hallway distribution system.

3. Where ceilings are inaccessible or no ceilings exist, the raceway shall extend up as close to the ceiling as practical to allow installation of conduits as high as possible to the nearest hallway distribution system.

2.2. Horizontal Distribution Systems

A. Conduit System (Renovations only, where conduit exists)

1. Provide conduits secured to wall above corridor ceilings as shown on the Drawings or as specified herein for installation of telecommunications cables. Any exposed conduit
2. Corridor conduits shall be 4" EMT, furnished in 10 foot lengths wherever possible, with no sharp edges, reamed as necessary, evenly supported at two locations per 10 foot section spacing. Conduits shall be sized and quantified to account for handling cables in all TO conduits at 40% fill back to the TR and/or ER rooms. Verify size prior to installation. Bushings and/or connectors on ends of EMT are required.
3. All conduits shall be installed stacked and attached to walls unless conditions exist which prohibit this type of installation. When this condition exists, mount conduits side-by-side supported with 3/8” rod attached to building structure utilizing unistrut channel to form a trapeze. Double nut the top and bottom at the unistrut. Utilize conduit clamp to secure conduits to unistrut.
4. Provide measured pull line in each conduit rated at 1200 lbs. minimum. Increments must be in 12” steps.
5. Grounding of conduits is not required per CEC #250-33, Exception No. 2. shall be painted except conduit above suspended ceilings or in mechanical, electrical or telecommunication rooms. Color to match that of surface installed upon or as directed by Owner’s Representative. Coordinate with other trades prior to painting.
6. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire rated construction to be verified with AHJ. See Section 27 05 32 for more firestopping information.

B. Corridor Cable Tray System

1. Complete wall mounted or suspended aluminum cable tray system and necessary accessories shall be provided as shown on plans. Install entire cable tray system in accordance with manufacturer’s minimum installation practices and all local governing codes.
2. Coordinate installation of cable tray with other trades to allow a minimum of 12” above, 12” in front, and 12” below of clearance from piping, conduits, ductwork, etc. Allowance must be provided for access to the tray with reasonable room to work. Obstructions to the tray must be minimized and cannot block more than 6 feet of the tray at any point in the run.

3. Submittal drawings, in the form of 8 ½"x 11" catalog cut sheets, shall be provided for the following items: cable tray, fittings, accessories and load data.
4. Cable tray shall not be loaded beyond 60% of manufacturer's recommended load capacity.
5. Install wall mounted cable tray on both sides of hallway as shown on drawings and where applicable.
6. Where a new cable tray distribution system encounters a wall, install sufficient 4" EMT sleeves through the wall so cabling does not exceed 20% fill.
7. Where cable tray is exposed below ceiling, install the appropriate solid bottom inserts to conceal cables.
8. Install cable tray dropouts where large quantities of cables exit the distribution system.
9. Cable tray must be sized to facilitate sufficient growth capacity for migration cable plant to coexist in same tray as existing cable plant, wherever possible.
10. Manufacturer of cable tray in corridors and telecom rooms shall be:

C. Telecommunication Room Cable Tray System

1. TR cable tray shall completely wrap all walls within the room. Cable tray shall extend over all equipment frames.
2. Cable tray shall be a minimum width of 2" high x 12" wide. Cable tray may be sized upwards if fill ratio requirements need to be met based on cable quantities.
3. Manufacturer of tubular ladder type cable tray in telecommunication rooms shall be Cooper BLine, Chatsworth (CPI), CommScope or approved equal.
4. Cable tray shall be 12 inch cable runway.
5. Rectangular steel tubing cross members welded at 12-inch intervals. Finish in black enamel. CommScope, Part Number CR-SLR-10L-12W or equivalent.
    a. 12-inch Wall Angle Assembly Kit – CommScope Part Number CR6-12WRSK or equivalent.
    b. 3-inch Channel Rack–To-Runway Mounting Plate - CommScope Part Number CRR2RRMK or equivalent.
    c. End Closing Tube - CommScope Part Number CRPECK or equivalent.
    d. Corner Clamp - CommScope Part Number CRTJSK or equivalent (2 required per End Closing Tube to complete assembly).

D. All open pathway/trays shall be installed a minimum of six (6) inches away from any light fixture or other source of EMI (Electromagnetic Interference).

E. All pathways shall be grounded per CEC Article 250.

F. Provide external grounding strap at expansion joints, sleeves and crossover and at other locations where pathway/tray continuity is interrupted.

G. Support all pathways from building construction. Do not support pathways from ductwork, piping, or equipment hangers.

H. Install cable tray level and straight unless noted on the construction drawings

2.3. Station Conduits

Station conduit is defined as conduit that originates at the TO and rises within the walls or is exposed from a raceway and extends up into the drop ceiling or over to the hallway distribution system.

A. Provide station conduits from TOs to above the drop ceiling or extend over to the hallway distribution systems consisting of 1” EMT minimum or appropriate size as shown on the Drawings or as specified herein for installation of telecommunications cables.

B. Provide an insulating press fit bushing on all telecommunications conduits including interconnecting nipples and stub to distribution system. To prevent conflicts with other cables or conduits to cable tray, the conduit shall be stubbed not less than 6" above or below conduit/cable tray center line. Where space permits, every effort shall be made to bend station conduits down such that the flow of installed cables promotes the minimum length back to the TR and the least amount of bends in the cables. Bushings must be rated to be used in an environmental air handling space (Plenum).

C. Manufacturer of insulating bushing on all telecommunication conduits shall be:

1. Arlington, Erico Caddy or equivalent

D. Provide pull line in each empty conduit to hallway distribution system.

E. Indelibly mark station conduit at hallway distribution end with Room # that conduit serves.

F. The use of 90 degree electrical pulling elbows is prohibited.

G. Do not include more than two 90 degree bends between pulling points when installing station conduit runs. If the path of the station conduits requires more than 180 degrees of total bends, installation of an appropriate sized junction box is required. See section 2.4 for junction box requirements.

H. Place an appropriate sized junction box in each individual station conduit run that exceeds 100 feet in length.

I. The use of a third bend in a conduit is only acceptable if:

1. The total conduit run is reduced by 15%.
2. The conduit size is increased to the next trade size.
3. One of the bends is located within 12” of the cable feed end.

2.4. Junction Box Requirements for Station Conduits

A. If the station conduit route exceeds the 180 degree of total bends limitation, an appropriate sized junction box is required within a straight section of the conduit run.

B. Each station conduit run requires a separate junction box. The sharing of a junction box by multiple conduits is prohibited.

C. A junction box shall not be used in place of a bend. All junction boxes in station conduit paths shall be installed within a straight section of the conduit run.

2.5. Service Entrance Conduits

A. Entrance conduits shall be continuous into the building and to the ER. Securely fasten all entrance conduits to the building to withstand any cable placing operation. Do not include more than two 90 degree bends between pulling points when installing entrance conduits.

B. On exterior wall penetrations, seal both sides of the wall around outside of conduit with hydraulic cement to prevent water from entering the building. Seal the inside of the conduit on both sides with conduit plugs, water plugs, or duct sealer to prevent water, vapors, or gases from entering the building.

2.6. Pathway Requirements for Entrance Conduits

A. If the entrance conduits exceeds the 180 degree of total bends limitation, an appropriate sized junction box, manhole, or handhole is required.

B. As-built drawings of entrance conduit path required to be submitted to Owner's Representative before covered with soil.

2.7. Riser Conduits

Riser conduits shall only be used when noted on the Construction Documents for special applications only. Riser conduits are not required as a general rule for the riser system. However, when required:

A. Minimum of (2) 4" conduits shall be installed between the ER room and each TR room as shown on the Drawings.

B. Conduits entering ER and TR rooms shall be reamed or bushed and terminated not more than 4" from entrance wall and within 12" of room corners.

C. Conduits entering ER and TR rooms from below floor shall be terminated not more than 4" above finished floor.

D. Conduits for riser cables shall be continuous and separate from all other conduit or enclosed raceway systems. Do not include more than two 90 degree bends between pulling points when installing riser conduits. Where junction boxes are required, locate in accessible areas, such as above suspended ceilings in hallways.

E. Conduits shall not be less than 4" trade size and be equipped with a measured pull line at 12” increments rated at a minimum 1200 pound test.

F. Provide restorable fire stops inside and around conduits as recommended by UL1479 or ASTM E814 for all conduits penetrating fire-rated construction. Fire-rated construction to be verified with AHJ. See Section 27 05 32 for more firestopping information.

G. Provide an insulating press fit bushing on all telecommunications riser conduits. Bushings must be rated to be used in an environmental air handling space (Plenum).

1. Manufacturer of insulating bushing on all telecommunication conduits shall be Arlington or equal.

H. Riser conduits shall not be used for the distribution of horizontal cables.

2.8. Firestopping

A. In all buildings, floor/ceiling assemblies, stairs, and elevator penetrations must be sealed with a 2-hour fire stop assembly at a minimum, unless otherwise noted.

B. Contact Owner’s Representative to identify walls which are fire-rated construction. Walls must be sealed with a 2-hour fire stop assembly at a minimum.

C. Communication pathways requiring fire stopping shall utilize removable/re-usable fire stopping putties for ease of Moves, Adds, and Changes.

D. All fire stopping penetrations shall conform to the recommended practices listed in UL1479 or ASTM.

E. See Section 27 05 32 - Firestopping for Telecommunications Systems

3. EXECUTION

3.1. General Requirements

A. The intention of the telecommunications conduits is to provide a route between ER and TR rooms, routes from the TRs throughout building floors to hallways, and routes from hallway distribution systems into rooms to individual TOs for telecommunications cabling.

B. Installation of new pathways shall not interfere with existing pathways in such a way that installation of new cables within the existing pathway is made more difficult.

3.2. Examination

A. Examine areas to receive cable management system. Notify the Owner’s Representative of conditions that would adversely affect the installation or subsequent utilization of the system.

B. Do not proceed with installation until unsatisfactory conditions are corrected.

3.3. Installation

A. Install in accordance with recognized industry practices, to ensure that the equipment complies with requirements of the CEC, and applicable portions of NFPA 70B and NECA "Standards of Installation" pertaining to general electrical installation practice.

B. Coordinate installation with other trades.

C. Field verification is required before installation.

D. Install cable management system at locations indicated on the drawings and in accordance with manufacturer's instructions.

END OF SECTION

27 05 29 Hangers and Supports for Communications Systems

1. GENERAL

1.1. Work Includes

The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of non-continuous cable supports as described in this specification.

1.2. Scope of Work

This Section includes the minimum requirements for the support structures for the Communications Systems for the project as outlined in the Bid Document.

A. Non-continuous cable supports (2.3A)
B. Adjustable non-continuous cable support sling (2.3B)
C. Multi-tiered non-continuous cable support assemblies (2.3C)
D. Non-continuous cable support assemblies from tee bar (2.3D)
E. Non-continuous cable support assemblies from drop wire/ceiling (2.3E)
F. Non-continuous cable support assemblies from beam, flange (2.3F)
G. Non-continuous cable support assemblies from C & Z Purlin (2.3G)
H. Non-continuous cable support assemblies from wall, concrete, or joist (2.3H)
I. Non-continuous cable support assemblies from threaded rod (2.3I)
J. Raised floor non-continuous cable support assemblies (2.3J)
K. Cantilever-Mounted Option for non-continuous cable supports (2.3K)
L. Installation accessories for non-continuous cable supports (2.3L)

1.3. Submittals

A. Submit product data on non-continuous cable support devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.4. Quality Assurance

A. Non-continuous cable supports and cable support assemblies shall be listed by Underwriters Laboratories for both Canadian and US standards (cULus).
B. Non-continuous cable supports shall have the manufacturers name and part number stamped on the part for identification.

1.5. Coordination

A. Coordinate installation of hangers, supports and cables with other trades.

2. PRODUCTS

2.1. Acceptable Manufacturers

A. Subject to compliance with these specifications, non-continuous cable supports shall be as manufactured by:

2.2. Non-continuous Cable Support Systems

A. Non-continuous cable supports
   1. Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
   2. Non-continuous cable supports shall have flared edges to prevent damage while installing cables.
   3. Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.
   4. Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.
   5. Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.
   6. Non-continuous cable supports shall be as manufactured by:

B. Adjustable non-continuous cable support sling
   1. Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair UTP; rated for indoor use in non-corrosive environments. Rated to support Category 5e and higher cable, or optical fiber cable; cULus Listed.
   2. Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.
   3. Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces.
   4. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.
   5. Acceptable products:

C. Multi-tiered non-continuous cable support assemblies
   1. Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.

2. If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.
3. The multi-tiered support bracket shall consist of:

D. Non-continuous cable support assemblies from tee bar
1. Tee bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
2. Acceptable products:

E. Non-continuous cable support assemblies from drop wire/ceiling
1. Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
2. Acceptable products:

F. Non-continuous cable support assemblies from beam, flange
1. Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
2. Acceptable products:

G. Non-continuous cable support assemblies from C & Z Purlin
1. Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.
2. Acceptable products:

H. Non-continuous cable support assemblies from wall, concrete, or joist
1. Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.
2. Acceptable products:

I. Non-continuous cable support assemblies from threaded rod
1. Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.
2. The multi-tiered support bracket shall have a static load limit of 300 lbs.
3. U-hooks and Double J-hook shall attach directly to threaded rod using standard nuts.
4. Acceptable products:

J. Raised floor non-continuous cable support assemblies
1. Fastener to raised (access) floor pedestal with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments; cULus Listed.
2. Acceptable products:

K. Cantilever-Mounted cable supports
1. U-hook shall be able to be assembled to a wide variety of wall mount brackets.
2. Spacing of individual U-hooks as needed, max of 4’ to 5’ apart.

3. U-hooks may have the optional attachment of a cable roller for ease in pulling cables.
4. Acceptable products:

L. Installation accessories for non-continuous cable supports
1. Cable Pulley
   a. Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included. The pulley shall be made of plastic and be without sharp edges. The pin and bail assembly must be able to be secured to the J-Hook during cable installation. The pulley must remain secured while cables are being pulled.
   b. The pin and roller assembly must be removed after cables are installed.
   c. Acceptable products:
2. Cable Protector
   a. The protective steel tube shall fit over threaded rod and be at least 4" in length.
   b. The tube shall prevent damage to cables placed in or pulled through CAT-CMTM U-hooks. The tube shall not inhibit the pulling of cables.
   c. Acceptable products:

2.3. Finishes

A. ASTM B633 Standard Specification for Electro-deposited Coatings of Zinc on Iron and Steel
   ASTM B 695 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel
   ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
B. Non-continuous cable supports used where only mildly corrosive conditions apply shall be stainless steel, AISI type 304.

3. EXECUTION

3.1. Installation

A. Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (California Electrical Code), applicable local codes, and to the manufacturer's installation instructions.
B. Do not exceed load ratings specified by manufacturer.
C. Adjustable non-continuous support sling shall have a static load limit of 100 lbs.
D. Follow manufacturer's recommendations for allowable fill capacity for each size non-continuous cable support.
E. Locate pathways per Telecommunications Drawings.

END of SECTION

27 05 32 Firestopping for Telecommunications Systems

1. GENERAL

1.1. Scope

A. This SECTION describes the requirements for furnishing and installing firestopping for fire-rated construction. This includes all openings in fire-rated floors, walls and other rated elements of construction, both blank (empty) and those accommodating items such as cables, conduits, pipes, ducts, etc.

B. Fireblocking for Concrete Floor or Wall Sleeved Cables.

C. Fireblocking for Gypsum Wall Sleeved Cables.

D. Fireblocking for Concrete Block Wall Sleeved Cables.

1.2. Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 7 Specification Sections, apply to this Section.

1.3. Submittals

A. Submit manufacturer's product literature and installation procedures for each type of Firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance and limitation criteria and test data. Submit cured samples of firestop materials.

B. Product Data: Shall be clearly marked to indicate all technical information which specifies full compliance with requirements of this section and Contract Documents, including the following:

1. Copy of UL illustration of each proposed system indicating manufacturer's approved modifications.
2. Each condition requiring penetration seals in proposed UL systems materials, anchorage, methods of installation and actual adjacent construction.

1.4. Quality Assurance

A. Firestopping systems (materials and design) shall conform to both Flame (F) ratings and Time (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.

1.5. Coordination

A. Coordinate layout and installation of Firestopping System with other trades.

B. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

2. PRODUCTS

2.1. Acceptable Manufacturers:

A. Materials and products required for work of this section shall not contain asbestos or polychlorinated biphenyls (PCB).

B. Manufacturers: 3M, STI, & Hilti

C. Firestopping System must be approved by the local AHJ before purchase or installation.

2.2. General

Provide and install firestopping materials to meet applicable codes and installation requirements for each firestopping application. Products using caulking, putties, wrap strips, mortars, composite boards and/or mechanical devices shall be used as appropriate for the specific condition.

2.3. Caulking

When caulking is used, provide and install flexible caulking materials. Cured firestop materials 1/8 thick shall be able around a 1” mandrell without breaking.

2.4. Firestop

Do not use any firestop products which re-emulsify, leach active intumescent ingredients or dissolve when placed in water after curing. Product must withstand the passage of cold smoke, either as inherent property of the system or by the use of a separate product included as part of the UL system or device, and designed to perform this function.

2.5. Penetration Seals

A. General:

1. Penetration seals (firestopping material) shall be asbestos-free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ASTM E814 and UL 1479.
2. Materials shall meet and be acceptable for use by all three model building codes, Basic/Califonia Building Code, Building Code and Standard Building Code, per National Evaluation Service, Inc. report # NER-243.
3. Materials shall meet requirements of NFPA 101 and NFPA 70.

4. Materials shall be suitable for the firestopping of penetrations made by steel, glass, plastic and insulated pipe, conduit, bus duct, noninsulated pipe and ductwork.
5. On insulated pipe, fire-rating classification must not require removal of insulation.
6. The rating of penetration seals shall not be less than the rating of the time-rated floor or wall assembly.
7. Systems shown below are examples and other equal systems may be approved or required by the AHJ.

B. 2-hour Rated Concrete Floor:

1. Penetrants: Multiple pipes.
2. UL System: No. 93.

C. 2-hour Rated Concrete Floor:

1. Penetrants: Maximum 30" dia. Metal pipe/conduit.
2. UL System: No.319

D. 1-2 –Hour Rated Gypsum Board Wall:

1. Penetrant: Metal pipe/conduit.
2. UL System: No. 147

E. 2-Hour Rated Gypsum Board Wall:

1. Penetrant: Metal pipe/conduit.
2. UL System: No. 147.

F. 3-Hour Rated Concrete Wall:

1. Penetrant: Metal duct, maximum 2' square and maximum dimension of 30".
2. UL System: No. 105.

G. Walls Below Grade:

1. Penetrants: Pipe sleeves.
2. Seal: Thunderline "Link Seal" casing seal.

3. EXECUTION

3.1. Inspection

Examine the areas and condition where Firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the Architect.

3.2. Conditions Requiring Firestopping

A. General – Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designed as insulation, safing, or otherwise.

B. At any point where a fire rated wall is penetrated with cable or conduit.

C. Penetrations

1. Penetrations include conduit, cable wire, pipe, duct or other elements which pass through one or both outer surfaces of a fire rated floor, wall or partition.
2. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether of not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved firestop any annular space between the sleeve and wall opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction as specified herein.

3.3. 3.3 Installation

A. General

1. Installation of Firestops shall be performed by a applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
2. Apply Firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
3. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of Firestop.

B. Field Quality Control

1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
2. Follow safety procedures recommended in the Material Safety Data Sheets.
3. Finish surfaces of firestopping which is to remain exposed in the completed work to a uniform and level condition.
4. All areas of work must be accessible until inspection by the applicable Code Authorities.
5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification at no additional cost.

C. Calculate the maximum cable fill ratio for each FireStopping System and cable type. Do not exceed the maximum fill ratio.

D. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.

3.4. Warranty

A. A. Comply with General Conditions, and include but not be limited to:

1. Repairs and replacement of penetration seals which fail in joint adhesion, cohesion, abrasion, resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability, or appear to deteriorate in any other manner not clearly specified in submitted manufacturer's data as an inherent quality of the material for exposure indicated.

3.5. Cleaning

A. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

B. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

END OF SECTION

27 05 33 Conduits and Backboxes for Communications Systems

1. GENERAL

1.1. Outlets Cat5e and Cat6

A. Each data outlet in a wall or floor shall be served by two (2) 1 in. conduits and a double-gang deep device box with a single-gang mud ring.

B. Wall mounted telephones shall be served by one 0.75 in. conduit and a single-gang deep device box with a single-gang mud ring. The outlet box shall be mounted at a center height of 48 in. above the finished floor, unless otherwise specified on the drawing, and shall have a clearance of 12 in. of wall surface on all sides.

C. All outlet conduits shall be stubbed into accessible ceiling space.

D. All outlet conduits shall have burrs and any other abrasive elements removed and an insulating bushing shall be installed on both ends.

E. No section of conduit shall be longer than 30 m (100 ft.) between pull points.

F. No more than 180 degrees of conduit bends shall be permitted between pull points.

G. The minimum inside radius for any bend of an outlet conduit shall be six times the inside diameter of that conduit.

1.2. Outlets Cat6A

A. Each data outlet in a wall or floor shall be served by two (2) 1.25 in. conduits and a 5-Square double-gang deep device box with a single-gang mud ring.

1. Approved manufactures: Steel City, Rand-L, or approved equal

B. All outlet conduits shall be stubbed into accessible ceiling space.

C. All outlet conduits shall have burrs and any other abrasive elements removed and an insulating bushing shall be installed on both ends.

D. No section of conduit shall be longer than 30 m (100 ft.) between pull points.

E. No more than 180 degrees of conduit bends shall be permitted between pull points.

F. The minimum inside radius for any bend of an outlet conduit shall be six times the inside diameter of that conduit.

1.3. Conduits

A. Electric metallic tubing: Comply with UL 797. Tubing shall have hot dipped galvanized exterior, enamel-coated interior.

G. Flexible conduit shall not be used in lieu of conduit bends and offsets.

H. PVC conduit: Comply with UL 651, listed for use with 90 degrees C conductors operating at 90 degrees C.

1.4. Standards Compliance

A. General standards: Comply with current revision of TIA 569 as amended

1.5. Submittals

A. Provide product data for the following:

1. Manufacturers cut sheets, specifications and installation instructions for all products (submit with bid).

1.6. Coordination

A. Coordinate installation of labels with other trades.

I. Storage and Handling: Avoid breakage, denting and scoring finishes. Damaged products will not be installed. Store materials in original cartons and in a clean dry space; protect from weather and construction traffic. Wet materials will be unpacked and dried before storage.

2. PRODUCTS

2.1. Approved Products

A. Dry location device boxes: Manufacturer shall be:

1. Steel City, Rand-L, Hubbell, or Raco
Equivalent products by other manufacturers may be used where approved in writing by Owner's Representative.

J. Wet location boxes: Manufacturer shall be:

1. Steel City, Rand-L, Hubbell, or Raco
Equivalent products by other manufacturers may be used where approved in writing by Owner's Representative.

3. EXECUTION

3.1. Installation

A. Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (California Electrical Code), applicable local codes, and to the manufacturer’s installation instructions.

K. Install conduits using techniques, practices, and methods that are consistent with Category 6 or higher requirements and that supports Category 6 or higher performance of completed and linked signal paths, end to end.

L. Follow manufacturer's recommendations for allowable fill capacity for each size non-continuous cable support.

END of SECTION

27 05 36 Cable Trays for Communications Systems

1. GENERAL

1.1. Scope

A. Continuous, rigid, welded steel or stainless steel wire mesh cable management system.

B. Cable tray systems are defined to include, but are not limited to, straight sections, supports and accessories.

1.2. Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3. Quality Assurance

A. Source Limitations: Obtain cable tray components through one source from a single manufacturer.

B. Comply with NFPA 70, California Electrical Code, Article 392: Cable Trays; provide UL Classification and labels.

1.4. Coordination

A. Coordinate layout and installation of cable tray with other trades.

B. Revise locations and elevations from those indicated as required to suit field conditions and as approved by the Architect.

2. PRODUCTS

2.1. Manufacturers

A. Subject to compliance with requirements, provide products by the following:

2.2. Materials and Finishes:

A. Cable Tray Materials:

Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, bent, and surface treated after manufacture.

B. Cable Tray Finishes:

Finish for Carbon Steel Wire after welding and bending of mesh;

1. Electrodeposited Zinc Plating: ASTM B 633, Type III, SC-1.
2. Powder-Coated Trays – UL classified Black powder-coated surface treatment over Electrodeposited Zinc Plating (or plain steel) using ASA 61 black polyester coating.

C. Cable tray will consist of continuous, rigid, welded steel wire mesh cable management system, to allow continuous ventilation of cables and maximum dissipation of heat, with UL Classified splices where tray(including UL Classified painted tray) acts as Equipment Grounding Conductor (EGC). Wire mesh cable tray will have continuous Safe-T-Edge T-welded top side wire to protect cable insulation and installers.

D. Provide splices, supports, and other fittings necessary for a complete, continuously grounded system.

Mesh: 2 x 4 inches (50 x 100 mm).
Straight Section Lengths: 118 inches (3,000 mm).
Wire Diameter: Patented design includes varying wire sizes to meet application load requirements; to optimize tray Strength; and to allow tray to remain lightweight.
Safe-T-Edge: Patented Safe-T-Edge technology on side wire to protect cable insulation and installers' hands.
Fittings: Wire mesh cable tray fittings are field-fabricated from straight tray sections, in accordance with manufacturer's instructions and Item 2.3.

E. CF Series Cable Tray Size:

1. Depth: Cable tray depth will be 4 inches
2. Width: Cable tray width will be 6 ,12, 18, or 24 inches as shown on Telecommunications Drawings:
3. Length: Cable tray section length will be 118 inches (3000mm) unless otherwise shown on drawings.
4. Fill Ratio: Cable tray may be filled to total fill capacity per CEC. Minimum 20% spare capacity recommended to accommodate future cabling changes or additions.
5. Load Span Criteria:
6. Cable tray will be capable of carrying a uniformly distributed load of 50 pounds per foot on an 8 ft support span, according to load tests of standard shown in Item A above.

2.3. Cable Tray Supports & Accessories

A. Fittings/Supports: Wire mesh cable tray fittings are field-fabricated from straight tray sections, in accordance with manufacturer's instructions. Supports will include the FAS (Fast Assembly System) where possible so that screws, bolts, and additional tools are not required for cable tray mounting; installation time is reduced; and tray

path can adapt to installation obstacles without the need for additional parts. Place supports so that support span does not exceed that shown on the drawings.

1. FAS System support methods to mount from ceiling and wall structures with 1/4", 3/8" or 1/2" threaded rod, if applicable
2. Splices, including those approved for electrical continuity (bonding), as recommended by cable tray manufacturer. Select one of the following splicing methods, if applicable:
   a. UL Classified EDRN Fast Splice: No hardware required
   b. UL Classified SWK Splice Washer Kit: Swaged set for splicing, turns, bends, tees
   c. UL Classified ED Universal Splice Bar: Cut & bend to fit any configuration
   d. Preclick Splice: Bolted connection optional
   e. UL Classified EDT Splice Plate: Bolted connection
   f. UL Classified CE 25 & CE 30 Square Splice Washers: Use with EZ BN ¼" Nut & Bolt
   g. UL Classified CE 40 Square Splice Washer: Use with EZ BN ¼" to splice trays on bends, adjustable tees
   h. FASLock Splice: For sweeps and bends with tray 12" (300mm) and wider.
   i. UL Classified EZ T 90 kit: For Tees and 90s
   j. UL Classified RADT90 kit: For 5-1/2" radius Tees and 90s

A. Accessories: As required to protect, support, and install a cable tray system. Select from the following accessories, if applicable:

2.4. Equipment Grounding Conductor Function & Grounding

A. UL Classified cable trays (including painted tray) may act as Equipment Grounding Conductors.

B. Use UL Classified splicing methods to ensure cable tray is electrically continuous and bonded as recommended.

   Ground cable trays at end of continuous run.

C. Test cable tray system per NFPA70B, Chapter 18 to verify grounding less than 1 ohm.

D. Ground cable trays against fault current, noise, lightning, and electromagnetic interference by mounting grounding wire to each 10' cable tray section with grounding clamp.

3. EXECUTION

3.1. Examination:

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2. Installation

A. Install cable tray level and plumb according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Cutting: Field-fabricate changes in direction & elevation by cutting & bending cable tray.

1. Cut cable tray wires in accordance with manufacturer’s instructions.
2. Cable tray wires must be cut with side-action bolt cutters with offset head to ensure integrity of protective galvanic layer.
3. Remove burrs and sharp edges from cable trays.

END of SECTION

27 05 43 Underground Ducts and Raceways for Communications Systems

A. Outdoor telecommunications pathways connect building, pedestals, maintenance holes, handholds, and towers. These pathways consist of underground, direct-buried or aerial. Underground or direct-buried are generally preferred over aerial because of aesthetics and security. Generally, underground duct banks are preferred over direct-buried because of security, ease of future cable installation and maintenance.

C. Conduit Types

Examples of conduit types include:
— EB-20 – For encasement in concrete;
— EB-35 – For encasement in concrete;
— DB-60 – For direct burial or encasement in concrete;
— DB-100 – For direct burial or encasement in concrete;
— DB-120 – For direct burial or encasement in concrete;
— Rigid Nonmetallic Conduit Schedule 40 – For direct burial or encasement in concrete;
— Rigid Nonmetallic Conduit Schedule 80 – For direct burial or encasement in concrete;
— Multiple Plastic Duct (MPD) – For direct burial or installation in conduit;
— Rigid Metallic Conduit – For direct burial or encasement in concrete;
— Intermediate Metallic Conduit – For direct burial or encasement in concrete;
— Fiberglass Duct – For direct burial or encasement in concrete;
— Innerduct Polyethylene (PE) – For direct burial or installation in conduit;
— Innerduct Polyvinyl Chloride (PVC) – For direct burial or installation in conduit

D. Installation

1. The length of conduit between pulling points shall not exceed 600 ft (183m).
2. Manufactured bends should be used whenever possible. No section of conduit shall contain more that two 90-degree bends, or equivalent between pull points.
3. Conduits should be installed such that a slope exists to allow drainage and prevent the accumulation of water.
4. When conduits connect maintenance holes, a slope of .125 in per foot (10 mm per meter) should exits from the middle of the span to each maintenance hole.
5. Conduits must be buried at a minimum depth of 18 in. (45.7 cm).

END of SECTION

27 05 53 Identification for Communications Systems

1. GENERAL

1.1. Work Includes

A. Work covered by this Section shall consist of furnishing labor, equipment and materials necessary for the labeling of the telecommunications infrastructure as described on the Drawings and/or required by these specifications.

1.2. Scope of Work

A. This Section includes the minimum requirements for the Identification and labeling of the Communications Systems for the project as outlined in the Bid Document.

1.3. Summary

A. Administration of the telecommunications infrastructure includes documentation of cables, termination hardware, patching and cross-connection facilities, conduits, other cable pathways, Telecommunications Rooms, and other telecommunications spaces. All facilities shall apply and maintain a system for documenting and administering the telecommunications infrastructure.

B. Industry Labeling Standards and Conventions shall be used unless otherwise stated in the bid documents or by the Owner's Representative.

C. Telecommunications Infrastructure Records must be maintained in a computer spreadsheet, or in a computer database. Paper records are encouraged, but are optional. A cable record is prepared for each backbone cable. The record will show the cable name, and must describe the origin point and destination point of the cable. The cable record will record what services and/or connections are assigned to each cable pair or strand. An equipment record is prepared for services distributed from a certain piece of equipment, such as a router, or a system such as the telephone system PBX.

D. Installer shall maintain accurate, up-to-date Installation or Construction Drawings. At a minimum, the Installation Drawings shall show pathway locations and routing, configuration of telecommunications spaces including backboard and equipment rack configurations, and wiring details including identifier assignments.

E. Installer shall provide a complete and accurate set of as-built drawings. The as-built drawings shall record the identifiers for major infrastructure components including; the pathways, spaces, and wiring portions of the infrastructure which may each may have separate drawings if warranted by the complexity of the installation, or the scale of the drawings.

1.4. Quality Assurance

A. All labels shall be installed in a neat and workmanlike manner. All methods of labeling that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner or Owner Representative.

B. Labels shall be of the quality and manufacture indicated. The labels and labeling equipment specified are based upon the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.

C. Strictly adhere to all Building Industry Consulting Service International (BICSI), Electronic Industries Alliance (EIA) and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data labeling.

2. PRODUCTS

2.1. Labels

A. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

B. Where insert type labels are used provide clear plastic cover over label.

C. Outside plant labels shall be totally waterproof even when submerged.

3. EXECUTION

3.1. Identification & Labeling

A. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.

B. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.

C. All labels shall be printed or generated by a mechanical device.

3.2. Telecommunication Identifiers

A. Outside Plant cabling shall be clearly marked using permanent means. Outside plant shall use the following system of numbering and labeling:

1. Fiber Optic:
   a. Identify: far-end building name, building number, fiber-type and strand-count

b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200 foot intervals.
c. Label at termination panels at both ends.

2. Copper:
   a. Identify: far-end building name, building number and strand-count
   b. Label at entrance and exit points of tunnel system and at conduit entry points between 12 inches and 36 inches from the conduit or at closet point that is clearly visible and long cable length in tunnel at 200 foot intervals.

B. Riser cabling shall be clearly marked using permanent means. Riser cabling shall use the following system of numbering and labeling:

1. Fiber Optic:
   a. Identify: far-end EF / ER / TR, fiber-type and strand-count .
   b. When small facilities are fed from a primary location and treated as an ER, riser shall be labeled similar to Outside Plant Fiber Optic.
2. Copper:
   a. Identify: far-end EF / ER / TR and pair-count
   b. Termination points shall be labeled as to actual pair at every fifth (5th) pair-point.

3.3. Labeling Procedures

A. To be consistent with ANSI/TIA/EIA standards and industry practices, it is important that both labeling and color coding be applied to all telecommunications infrastructure components. Labeling with the unique identifier will identify a particular component. Proper color coding will quickly identify how that component is used in the overall telecommunications infrastructure of the facility.

B. Visibility and durability:

1. The size, color, and contrast of all labels should be selected to ensure that the identifiers are easily read. Labels should be visible during the installation of and normal maintenance of the infrastructure.
2. Labels should be resistant to the environmental conditions at the point of installation (such as moisture, heat, or ultraviolet light), and should have a design life equal to or greater than that of the labeled component.
3. Labels are generally of either the adhesive or insert type. All labels must be legible, resistant to defacement, and maintain adhesion to the application surface.
4. Outside plant labels shall be totally waterproof, even when submerged.
5. Labels applied directly to a cable shall have a clear vinyl wrapping applied over the label and around the cable to permanently affix the label.
6. Other types of labels, such as tie-on labels, may be used. However, the label must be appropriate for the environment in which it is used, and must be used in the manner intended by the manufacturer.

C. Mechanical generation

1. All labels shall be printed or generated by a mechanical device.
2. Hand written labels are NOT acceptable.

END of SECTION

27 1000 Structured Cabling System

1. GENERAL

1.1. Related Documents

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 & 27, Basic Materials and Methods sections apply to work specified in this section.

1.2. Scope of Work

A. The extent of telephone/data system work is indicated and is hereby defined to include, but not be limited to cable, cable supports, raceway, connectors, racks, cabinets, panels, wire management, device plates, patch cords, backboard, grounding, firestop and miscellaneous items required for a complete, tested and operational system.

B. Provide, install and test the complete cable and outlet system as indicated and described herein. Work includes procurement, project management, installation, labeling, termination, testing and cleanup of all cables installed under this project.

C. Provide system testing, as-builts (redlines) of installed cables and numbering plan, Operations & Maintenance Manuals (O&M's), and processing of warranty registration with Manufacturer.

D. Project coordination with General Contractor, Owner, Owners Representative, and other trades before, during and upon completion of project as necessary for a well-executed project.

E. Refer to other Master Division sections, bid proposal and project responsibilities matrix for responsibility and requirements for raceways, boxes and fittings, wiring devices (plates), and supporting devices, and other sections, as applicable.

F. Horizontal cabling may contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.

G. Bridged taps and/or splices will not be installed in the horizontal cabling.

H. Communications cables shall be rated CMR or CMP. CMP cable ratings are required for cables passing through or contained within plenum air handling spaces, such as above drop ceilings and return or supply air shafts. The contractor is responsible for installing the correct cable type in the appropriate environment, and any failures to do so according to the Owner or the Authority Having Jurisdiction (AHJ) will result in the contractor removing the unsuitable cable and installing the correct cable, at their own expense.

I. The maximum allowable horizontal cable length installed in the permanent link (jack to jack) is 295 feet (90 m). This maximum allowable length does not include an allowance for patch cords, maximum length of 16 feet (5 m) to the workstation equipment and of 16 feet (5 m) in the horizontal cross-connect.

1.3. References

A. ANSI/TIA-492.AAAC-B – Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class 1a Graded-Index Multimode Optical Fibers

B. ANSI/TIA-492.AAAD – Detail Specification for 850-nm Laser- Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class la Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber

C. ANSI/TIA-492.CAAB – Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak. Current Edition

D. ANSI/TIA-568.0-D – Generic Communications Cabling for Customer Premises

E. ANSI/TIA-568.1-D – Commercial Building Communications Cabling Standard

F. ANSI/TIA-568-C.2-1 – Balanced Twisted-Pair Telecommunications Cabling and Components Standards

G. ANSI/TIA-568.3-D – Optical Fiber Cabling and Components Standard

H. ANSI/TIA-569-D – Telecommunications Pathways and Spaces

I. ANSI/TIA-606-B.1 – Administration Standard for the Commercial Telecommunications Infrastructure.

J. ANSI/TIA-607-C – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

K. ANSI/TIA-862-B – Structured Cabling Infrastructure Standard for Intelligent Building Systems

L. ANSI/TIA-942-A – Telecommunications Infrastructure Standard for Data Centers

M. NFPA 70. Current edition at time of bid.

N. BICSI – TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM)

1.4. Quality Assurance

A. Contractor shall assign competent person as project manager who has demonstrated the ability to supervise a project of similar size and scope. Submit a resume of the proposed Project Manager for the District's review and acceptance. The Project Manager must attend meetings as required.

B. Use adequate numbers of skilled workers thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance of the work of this Section.

C. The system Contractor shall warrant any equipment installed under this specification to be free from defect for a period of one (1) year from the date of final acceptance.

D. The contractor shall certify completion in writing and schedule the commissioning walkthrough. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

E. The contractor shall coordinate with the commissioning staff and schedule appropriate walk through and testing. Testing is outlined in section 3.2 Tests and Instruction.

F. Comply with applicable portions of CEC as to type products used and installation of components. Provide products and materials, which have been UL-listed and labeled. Comply with NEMA, ANSI and TIA standards manufacturer's recommendations for horizontal cabling.

1.5. Warranty

A. The system Contractor shall warrant any equipment installed under this specification to be free from defect for a period of one (1) year from the date of final acceptance.

B. A Manufactures Limited Lifetime Product & Performance Warranty covering all components, equipment and workmanship shall be provided to the Owner, submitted in writing with system documentation. The warranty period shall begin on the system's first use by the owner.

1. Horizontal channels shall be completed with Leviton Network Solutions factory-terminated copper and/or fiber optic patch cords in order to be eligible for the applicable Leviton Warranty with channel performance guarantees.

2. Approved product shall be listed on the most recent version of the applicable Leviton data sheets for each listed Berk-Tek Leviton Technologies solution.

3. The Contractor must pre-register the project with the Manufacturer before installation has begun. Following project completion, contractor is responsible for completing all warranty registration procedures on behalf of the Owner.

4. Should the cabling system fail to perform its expected operation within this warranty period due to inferior or faulty material and/or workmanship, the contractor shall promptly make all required corrections without cost to the owner.

C. Certified Installer shall provide labor, materials, and documentation in accordance with Leviton Network Solutions requirements necessary to ensure that the Owner

will be furnished with the maximum available Manufacturer's Warranty in force at the time of this project.

D. The installed structured cabling system shall provide a warranty guaranteeing the specified performance in the installed channel performance above the ANSI/TIA-568 requirements for Augmented Category 6 (CAT 6A) cabling systems or ISO 11801 requirements for Class EA.

1. Standards-compliant channel or permanent link performance tests shall be performed in the field with a Leviton-approved certification tester in the appropriate channel or permanent link test configuration.

E. Necessary documentation for warranty registration shall be provided to the manufacturer by the installer (within 30 days) following 100 percent testing of cables.

1. Installation Contractor shall submit test results to Leviton Network Solutions in the certification tester's original software files.

2. Installation Contractor shall ensure that the warranty registration is properly submitted, with all required documentation within 30 days of project completion.

3. Certified Contractor/Integrator must adhere to the terms and conditions of the respective manufacturer's warranty programs.

F. Manufacturer shall ensure that the Owner receives the project warranty certificate within 60 calendar days of warranty registration.

1.6. Submittals and Substitutions

A. REFER TO SUBMITTAL SECTION 013300 FOR REQUIREMENTS.

B. Provide product data for the following:

1. Manufacturers cut sheets, specifications and installation instructions for all products.

C. The Owner has standardized on a unified, end-to-end copper and optical fiber cabling system design based on Leviton jacks, patch panels, patch cords, fiber cords, fiber connectors, trunk cables, fiber enclosures and modules, as well as Berk-Tek field-terminable copper and fiber cables.

D. Subject to compliance with requirements, provide products of the following:

1. Leviton Manufacturing Co, Inc.

2. Berk-Tek, a Nexans Company

3. Pre-approved equal (Commscope & Panduit)

E. Any substitutions must be approved by Designer, Owner and/or Owner's Representative in writing prior to acceptance of bid.

F. Products which are proposed in the bid response which are of an alternative solution are to be prequalified as "equal or better" by the Designer and Owner, in writing, prior to bid acceptance. If substitutions are allowed, they are at the discretion of the Owner and based on performance, suitability, quality, administrational requirements, warranty and other factors deemed important to the Owner. Written acceptance of substitutions from Owner must be included in bid package to avoid disqualification of bid.

G. Submit manufacturer's data and installation details for all devices, plates, cable, terminal blocks, patch cords, racks, wire management, labels and similar equipment which are not in accordance with Owner standards.

2. PRODUCTS

2.1. General

A. The UTP cabling system will have TIA/EIA T568B pin/pair termination assignment. All conductors provided will be properly and consistently terminated at both ends throughout the entire systems. Maintain proper untwist of pairs and removal of jacket per TIA, BICSI, and Manufacturer's recommendations.

2.2. Copper Cabling

A. Category 6A (CAT6A) Unshielded Twisted Pair (UTP) Systems

1. Category 6A 23AWG UTP copper cabling system shall be guaranteed to exceed all TIA-568 link and channel performance requirements and be capable of supporting 10G Base-T (802.3an) and ISO/IEC 11801 Class EA applications for a total distance of 100 meters with equipment cords. System is guaranteed to meet all CAT6A requirements for short links and channels down to a 10 foot link (5 meter channel) with a guaranteed 5 dB margin of Alien Crosstalk. Field testing is not required for Alien Crosstalk clearance.

2. Basis of Design is Berk-Tek Leviton Technologies CX6850 Cat6A Premium UTP System.

3. Category 6A (CAT6A) Unshielded Twisted-Pair (UTP) cable

   a. 100-Ohm, 23 AWG, Category 6A 4-pair balanced unshielded twisted pair solid annealed copper

   b. Cable shall be characterized to 750 MHz and UL/ETL Listed by the Manufacturer printed on the cable jacket and package, as well as Intertek (ETL) Verified to TIA-568 Category 6A and ISO/IEC 11801 Class EA requirements for channel, link and component performance to support IEEE 10GBASE-T (802.3an) networks

c. Maximum Cable Outer Diameter: 0.275".

d. Documentation available from an independent third-party testing agency that verifies through random sampling that cable components perform at or above the levels contained on their product specifications, not simply at or above the standard.

e. Guaranteed cable balance improves overall performance and reduces emissions which results in error-free performance up to 10 Gigabit Ethernet with full duplex transmission

f. The unshielded twisted pair conductors are surrounded by a non-conductive aluminum/polyester tape and jacketed with flame-retardant polymer alloy to reduce alien crosstalk, reduce cable diameter and improve performance.

g. Provided on spools or reels-in-box to reduce risk of kinking cable upon deployment

h. Cable shall be Plenum-rated (CMP) for any location where plenum cable is required.

i. Color: Blue, or as directed.

j. Be made by an ISO 9001 and 14001 Certified Manufacturer.

k. Guaranteed to meet or exceed Channel margin guarantees as stated above under System Performance

4. Approved Products:

a. Berk-Tek LANmark XTP, CAT6A CMP, Blue, 1000' reel, # 11082057

b. Berk-Tek LANmark XTP, CAT6A CMR, Blue, 1000' reel, # 11082062

B. CAT6A Shielded (F/UTP, or FTP) Systems

1. Horizontal FTP Category 6A 23AWG copper cabling system shall be guaranteed to exceed all TIA-568-C.2 link and channel performance requirements and be capable of supporting 10G Base-T (802.3an) and ISO/IEC 11801 Class EA applications for a total distance of 100 meters with equipment cords. System is guaranteed to meet all Cat 6A requirements for short links and channels down to a 10 foot link (5 meter channel) with a guaranteed 4 dB margin of Alien Crosstalk. Field testing is not required for Alien Crosstalk clearance.

2. Basis of Design is Berk-Tek Leviton Technologies CS6700 CAT6A Shielded System.

3. Category 6A (CAT6A) Shielded, or Foiled Twisted Pair (FTP) cable

a. 100-Ohm, 23 AWG, Category 6A 4-pair balanced twisted pair solid annealed copper with a single overall foil shield.

b. Shielded with an overall polyester/aluminum foil with stranded tinned copper drain wire and ripcord and jacketed in flame-retardant PVC

c. Characterized to 750 MHz, 75ºC and UL/ETL Listed by the Manufacturer printed on the cable jacket and package, as well as Intertek (ETL) Verified to TIA-568 Category 6A and ISO/IEC 11801 Class EA requirements for channel, link and component performance to support IEEE 10GBASE-T (802.3an) networks

d. Maximum Cable Outer Diameter: 0.280".

e. Documentation available from an independent third-party testing agency that verifies through random sampling that cable components perform at or above the levels contained on their product specifications, not simply at or above the standard.

f. Guaranteed cable balance improves overall performance and reduces emissions which results in error-free performance up to 10 Gigabit Ethernet with full duplex transmission

g. Provided on spools to reduce risk of kinking cable upon deployment

h. Cable shall be Plenum-rated (CMP) for any location where plenum cable is required.

i. Color: White, or as directed.

j. Be made by an ISO 9001 and 14001 Certified Manufacturer.

k. Guaranteed to meet or exceed Channel margin guarantees as stated above under System Performance

4. Approved Products:

a. Berk-Tek LANmark-10G FTP, CAT6A CMP, White, 1000' reel, # 10167485

b. Berk-Tek LANmark-10G FTP, CAT6A CMR, White, 1000' reel, # 10189801

2.3. Copper Connectivity

A. Category rated data connectors (RJ45 jacks)

1. Provide mission-critical, modular-type, information connectors/outlets (jacks) for 24-23 AWG copper cable. These connectors shall be individual snap-in style, and exceed compliance with TIA-568 specifications. The connectors shall comply with the following:

a. Shall be 8-position 8-conductor (8P8C) "RJ45"-style modular jack, Category 6 (CAT6) and/or Category 6A (CAT6A), with IDC terminals, T568A/B wiring scheme (use T568B), and utilize a non-punchdown simplified manual termination style.

b. Shall be encased in a die-cast housing to protect from potential EMI/RFI, and utilize a universal Keystone-style insertion footprint as the manufacturer's main "flagship" line of products.

c. CAT6A connectors shall exceed all component performance requirements for Augmented Category 6 in the ANSI/TIA-568 standard, as well as Class EA requirements as described in ISO/IEC 11801, from 1 MHz to 500 MHz to support the IEEE 802.3an standard for 10GBASE-T network performance.

d. Shielded connectors shall utilize the same form factor, design, and tool-less installation process as the unshielded connectors in the product line.

e. Shall be tested by an Independent testing body such as Intertek (ETL) for component compliance (i.e. "Component rated") to ANSI/TIA-568 and for POE+ applications. Test results shall be published and publicly available without special request.

f. Shall be in compliance will all California Electrical Codes; compliant with ANSI/TIA-1096-A (formerly FCC Part 68); cULus Listed.

g. When used in the plenum spaces, shall be plenum-rated per UL 2043, and all plastic components shall be made of high-impact, fire-retardant plastic rated UL 94V-0.

h. Shall have a maximum depth of 1.31".

i. Cable shall be terminated by the use of a snap-on wire manager that holds individual conductors in place during termination, and allows for termination without a complete untwist of each conductor pair. Cables shall terminate onto jack via a "clamshell" closure at rear of connector, affixing termination manager to connector IDC

j. Shall be terminated without the need for any punch down tool or other specialized or proprietary termination tool.

k. Shall be reusable and support a minimum 20 termination and re-termination cycles and be facilitated by simple termination release levers.

l. Shall utilize a method of tine tensioning using polymer springs above the tines ("Retention Force Technology" or similar functionality) that prevents six-position modular plug insertion from damaging either the cord or the module and promotes return of tines to original position.

m. Shall fit the full manufacturer's range of telecommunications faceplates, outlets, and field-configurable patch panels. No separate product line or style of connectors shall be required for patch panels, faceplate, biscuit, furniture, raceway and/or floor feed applications.

n. Shall be available in 13 TIA 606-B compatible colors and supplied with interchangeable icons (Voice, Data, A/V, and blank, color coded to match

the connector face) for easy identification and tracking of data, voice, or other functions. Additional bulk Icons for the connector shall be available separately.

o. Shall be available with an optional internal shutter to protect against dust and debris such as in above-ceiling and in-floor locations.

2. Approved Products:

a. Leviton Atlas-X1 UTP Cat 6A Connector, no shutters, 6AUJK-R*6

b. Leviton Atlas-X1 UTP Cat 6A Connector, with shutters, 6AUJK-S*6

c. Leviton Atlas-X1 STP (Shielded) Cat 6A Connector, no shutters, 6ASJK-R*6

d. Leviton Atlas-X1 STP (Shielded) Cat 6A Connector, with shutters, 6ASJK-S*6

e. Additional Icons: ICONS-IC* (72 two-sided Icons)

Where * = one of 13 colors. See drawings or check with Owner for application.

(W)=White, (T)=Light Almond, (A)=Almond, (I)=Ivory, (Y)=Yellow, (O)=Orange, (L)=Blue, (B)=Brown, (C)=Crimson, (R)=Dark Red, (P)=Purple (V)=Green, (G)=Grey, (E)=Black

B. Copper patch panels

1. Telecommunications Room Patch panels shall be manufactured with empty ports, which allow for the insertion of appropriately-graded and colored jacks. Panels shall be Shielded, standard density, and used for all CAT6 and CAT6A terminations at IDF and MDF locations. Panels shall be:

a. Unshielded for UTP, and Shielded for either FTP or UTP applications, and shall accept both styles (UTP/FTP) of jacks in the same panel. Shielded panels shall include star washers and grounding lug for flexibility in panel grounding, and/or hardware to accept standards-compliant grounding connectors.

b. Available in either 24- or 48-ports.

c. Independently tested and verified by Intertek (ETL) to meet or exceed all TIA component, permanent link, and channel requirements of TIA-568 for Cat 5e, Cat 6, and Cat 6A, FCC part 68, and IEC 60603-7. An appropriate cable management bar shall be included with standard density flat panels.

d. QuickPort High-Density modular panels shall be available in 48-ports/1RU form factors for authorized situations.

e. Shall be sized to fit an EIA standard, 19 inch relay rack and hole pattern.

f. Shall utilize a universal Keystone-style insertion footprint as the manufacturer’s main “flagship” line of products and receive the same jacks

as are used in the workstation outlets. No special “Panel jack” shall be required.

2. Approved Products:

   a. Leviton QuickPort Shielded Angled Patch Panel # 4S256-*xx

   b. Leviton QuickPort Shielded Flat Patch Panel # 4S255-*xx

   c. Leviton QuickPort Angled Patch Panel # 49256-*xx

   d. Leviton QuickPort Flat UTP Patch Panel # 49255-H24 (1RU) or 49255-H48 (2RU)

   e. Leviton QuickPort Flat UTP 1RU 48-port Patch Panel # 49255-Q48

   Where: xx = # of ports per panel, * = S (Shielded), H (24 ports per RU), D (48 ports per RU)

C. Faceplates

1. Faceplates (wallplates) secure information outlets to the work area. Contractor shall provide and install single gang faceplate kits to house all jacks as required for all work area outlets, workstation base feeds, and furniture openings. Unused telecom backboxes shall receive a solid blank faceplate. Telecommunications faceplates shall:

   a. Utilize a keystone-type (“QuickPort”) footprint to match the approved connectivity manufacturer, and be made by the same manufacturer as the connectors.

   b. Precisely match colors and materials of the power wiring device plates.

   c. Support any connectivity media type, including fiber, AV and copper applications.

   d. Have write-on or printable designation labels for circuit identification together with a clear plastic cover.

   e. Be available in single-gang and double-gang configurations.

   f. Have surface-mount boxes and standoff rings available for both single and double gang faceplates.

   g. Have single-port matching color blank inserts available in packs of 10.

   h. Color shall match nearby electrical devices exactly. Off-color ivories or whites will not be accepted.

   i. Furniture faceplates shall fit existing knockouts for telecom receptacles, and snap in without screw mounts.

2. Approved Products:

a. Leviton QuickPort Single-Gang, Plastic, with ID Windows, # 42080-#xS

b. Leviton QuickPort Single-Gang, Stainless Steel, with ID Windows, # 43080-1L#

c. Leviton QuickPort Blank Inserts, pack of 10, #41084-BxB

d. Leviton QuickPort Single-Gang Stainless Steel Wall Phone faceplate, #4108W-0SP

e. Leviton Blank Plate #zz014 (1-gang), xx025 (2-gang)

f. Leviton Extended-Depth Furniture Faceplate, #49910-Ex4

Where: # = number of ports: 2, 4, 6, x = color: White (W), Ivory (I), Light Almond (T), Gray (G), Black (E) zz= 88 (White), 77 (Lt. Almond), 86 (Ivory), 88 (Stainless Steel)

D. Surface mount boxes

1. Surface-Mount Boxes are used to protect terminated CAT6 and CAT6A cables at the endpoints where they are not contained within walls or furniture. Example locations may be Wireless Access Points (WAPs), Group Work Areas fed by conduits run down columns, security cameras, or other network-enabled device locations.

2. Ceiling, WAP, Camera and other non-wallmount locations will use a 2-port box.

3. Small Surface-Mount Boxes shall exhibit the following characteristics:

a. Outlet housings for WAPs and other devices shall be a high-density, low profile design with (2) or (4) field-configurable ports, snap-lock cover, and cable knockouts on back.

b. Housing cover shall have raceway knockouts for top and bottom entry. Base shall include Tie-wrap anchor points at all cable entrances.

c. The housing shall be mountable with screws, tape or a single magnet.

d. The cover shall provide the option of securing it to the base with a screw that is hidden under the outlet identification window.

e. Shall be constructed of high-impact self-extinguishing plastic rated UL 94V-0, and be UL Listed and compliant with FCC Part 68 and TIA-568 specifications.

4. Approved Products:

a. Leviton QuickPort Surface-mount Housing, White, #41089-#xP

5. Where: # = number of ports: 1, 2, 4, 6, x = color: White (W), Ivory (I), Light Almond (T), Gray (G), Black (E)

E. Copper Patch Cables

1. Copper patch cords for CAT6A UTP and FTP cable systems shall exhibit the following characteristics:
    a. Patch cord plug shall be a Slimline, integrated snag-less plug design made of industry standard, FCC compliant 94V-0 clear material without incorporating the use of a rubber molded overboot.
    b. A narrow profile for less congestion in higher density applications and a clear plastic strain relief boot ensures long-term network performance
    c. Cable construction provides excellent alien crosstalk suppression and EMI/RFI protection.
    d. Constructed of shielded 26 AWG stranded conductor cable for maximum flexibility and outside diameter of .240”, for use in shielded and unshielded systems.
    e. Patch cords in Plenum areas shall be Plenum-rated, and utilize solid conductors.
    f. Complies with TIA 568-C.2-10 component requirements for connecting hardware from 1 MHz to 500 MHz, ISO 11801 Class EA, IEEE 802.3an to support 10GBASE-T networks and cULus listed. Patch cords shall meet ANSI/TIA-1096-A requirements to include 50 micro inches of gold plating.
    g. The patch cords shall be available in standard 3, 5, 7, 10, 15, and 20 foot lengths. Custom lengths from 1’ and above shall also be available through a made to order program.
    h. The patch cord shall be available in 7 standard colors.
2. Provide and install only factory-assembled patch cords of the same or better Category rating of the permanent link cabling system, in quantities as described in Part 3 of this Specification.
3. Approved Products:
    a. Leviton Slimline Atlas-X1 CAT6A Component-rated Patch Cord, Blue, # 6AS10-xx*
    b. Leviton Plenum-rated CAT6A Component-rated Patch Cord, Blue, # UAPPP-xx*
4. Where: xx = Length, in Feet. * = one of 13 colors. (W)=White, (Y)=Yellow, (L)=Blue, (R)= Red, (G)=Green, (S)=Slate Grey, (E)=Black

2.4. Backbone Cabling

A. General

1. Copper cables allowed for use in the backbone include: 4-pair 100-ohm unshielded twisted-pair 100% annealed-copper solid-conductor cables, 100-

ohm UTP multi pair copper cables. Fiber optic backbone cables shall be 50/125um Laser-Optimized Multimode Fiber and 8.3um low-water peak singlemode optical fiber cables compliant with ITU-T G.652D (or OS2). The cable shall support voice, data, and multimedia applications. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

2. All cables to be secured to walls with cable rings

    a. Storage rings shall provide mechanical support and protection for optical fiber and copper cabling service loop storage. Ring shall have VELCRO Brand loops to contain and secure cable. Storage rings shall be available in 12-inch and 24-inch diameters.

    b. Approved Products

        i. Leviton 48900-IFR comes with six removable 3-inch VELCRO® Brand loops

        ii. Leviton 48900-OFR comes with six fixed 9-inch VELCRO® Brand rings

        iii. For double the capacity, install two storage rings side by side and route the cable in a figure eight pattern

B. Copper Backbone (Voice Riser)

1. Power-Sum Multi-Pair Category 3 cable, 24 AWG solid-copper conductors in 25-pair binder groups to support 10BASE-T, 100BASE-T and Analog Voice communications at 16Mhz.

2. Copper backbone cables shall be terminated onto a rack-mounted modular RJ45-style patch panel.

3. Terminate Category 3 cables onto Category 5e patch panels at 1 pair per port, with the last of the 25-pair cable coiled (full length) for future use. Use black outlet colors on patch panel for Category 3 connectivity.

4. Approved Products:

    a. Leviton 24-port 110 punchdown patch panel, #5G596-U24

    b. Berk-Tek # 10032111, 25-pr CMP, Gray.

    c. Berk-Tek # 10032396, 25-pr CMR, Gray

    d. Other multiples of 25 acceptable (50, 100, 200, 300pr as required)

C. Copper Backbone (Voice OSP)

1. Outdoor Type (used to interconnect buildings and run in underground duct) shall consist of a core of 24- gauge, Category 3, unshielded twisted (UTP) solid copper conductors dual insulated with foam skin and plastic encapsulated with a water blocking compound, surrounded by a corrugated aluminum shield, a

corrugated steel shield and a polyethylene outer jacket. Pair sizes shall be available in 25, 50, 100, 150, 200, 300, 400, 600 and 900 pair. Pair quantities as specified herein and shown on the drawings.

a. Gauge 24 AWG

b. DC Resistance 26.5 (ohms/1000 ft.)

c. Mutual Capacitance (1 kHz) 15 pf/ft.

d. Impedance (1 kHz) 100 OHM (25 pair)

e. Max Attenuation (1 kHz) 6.707.8 dB (25 pair)

f. Cable shall terminate in a protector panel upon entrance to building. Cable and protector panel grounds shall be bonded to the electrical service ground as required by the N.E.C. Protector panel shall be Circa Technologies #188ENA1 series with #3B1E-W gas tube protector modules or equals by 3M. Provide protector panel fully loaded. Protector panel shall be sized to accommodate backbone cable pair count as specified herein.

g. All cable must be lightning protected at both ends.

h. Cable shall be labeled at both ends and at all accessible points. Coordinate labeling scheme with Owner and submit to Owner/Architect for review. PRIOR TO INSTALLATION

D. Fiber Optic

1. MULTIMODE FIBER OPTIC CABLE – FIELD TERMINATED

a. Multimode fiber optical fiber cables shall meet all of the requirements delineated within the specifications of ANSI/TIA-568 and ANSI/TIA-492.CAAB (OM4). Must be a minimum of 12 strands, typically 24 strands, of Laser-Optimized 50 micron optical fiber. Cable jacketing must be appropriate for the environment in which it is installed (Indoor, Indoor/Outdoor, Outside Plant, OFNP or OFNR).

b. Fiber optic cables will utilize an interlocking armor outer cover around an integrated Tight-Buffered (indoor only) cable construction and fiber strands with a 900 micron protective sheath.

c. See plans and scope of work for total strand count between locations.

d. Approved Manufacturers

i. Berk-Tek Indoor Plenum tight buffered cable, 12-strand OM4 Armored,

ii. # PDPK012FB3010/25

iii. Berk-Tek Indoor Plenum tight buffered cable, 24-strand OM4 Armored,

iv. # PDPK024FB3010/25

v. Berk-Tek Adventum Indoor/Outdoor Plenum cable, 12 strand, # LTP012FB3010/25

vi. Berk-Tek OSP cable, Loose Tube 12-strand, # OPD012FB3010/25

vii. Leviton 12-fiber, 24” fan-out Kit, # 49887-12S

viii. * Or other strand counts as specified

2.5. Fiber Optic connectivity

A. Optical Enclosures

1. All Fiber enclosures shall provide cross connect, inter connect, and splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.

2. Fiber Adapter panel openings shall accept Fiber Adapter Plates (bulkheads), Splice Modules, and plug-n-play MTP modules/cassettes or any combination thereof.

3. 1RU, 2RU and 4RU enclosures shall hold up to 3, 6 or 12 adapter plates or cassettes, respectively.

4. All Fiber enclosures, panels and trays (units) shall provide cross connect, inter connect, and splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.

5. Fiber enclosures shall exhibit the following characteristics:

   a. Fiber enclosure shall be available in 1RU, 2RU or 4RU versions to accommodate fiber adapter plates, MTP Modules, and/or termination and splicing of fiber as needed

   b. Enclosure shall inherently accept a 1-panel integrated splice cassette.

   c. Enclosures shall have a sliding tray which can be removed completely from enclosure (from front or rear) to facilitate field terminations and splicing. Sliding tray glides forward and backward providing accessibility to front and rear bulkhead after installation.

   d. 17" depth for high density fiber termination and/or splicing.

   e. Removable transparent hinged doors and slide away covers allow easy access during install and visibility of interior after installation.

   f. Patch cord bend radius guides minimize macro bending.

   g. Stackable and adjustable fiber rings simplify cable routing and organization

h. Fiber Jumper saddles pivot for improved patch cord routing and organization

i. Removable rubber grommets protect cable and minimize dust build-up

j. Multiple mounting bracket positions for 19" or 23" rack and cabinet installation (23" 1RU mounting bracket sold separately)

k. Constructed of durable polycarbonate plastic and 16 gauge steel, powder-coated black

l. Door lock option available on front, rear, or both doors

m. Fiber cable management shall allow for routing, storage, and protection of patch cords, tight-buffer fiber, and backbone cables.

n. Enclosure shall be available either empty or in custom pre-loaded configurations.

6. Approved Products:

a. Leviton Opt-X SDX 2000i Rack-Mount Enclosure, #5R1UH-S03 (1RU)

b. Leviton Opt-X SDX 2000i Rack-Mount Enclosure, #5R2UH-S06 (2RU)

c. Leviton Opt-X SDX 2000i Rack-Mount Enclosure, #5R4UH-S12 (4RU)

d. Leviton armored cable ground kit, # DPGRD-KIT

B. Panel Adapter Plates

1. The fiber adapter plate shall be modular and functional for use in either a wall-mount or rack-mount enclosure. The adapter plate shall be provided in LC styles, in 12- or 24-fiber configurations. 12-fiber adapter plates are used to terminate 12-fiber cables, and 24-fiber adapter plates are used to terminate 24-fiber (or greater) cables. Do not utilize adapter plates with unused ports at the rear.

2. The adapter plate shall be compliant to TIA-568 (for performance) and respective TIA-604-X (for intermateability) standards. Adapter plates shall use zirconia ceramic sleeves and be offered in standard fiber type colors pursuant to TIA-568 standards.

3. LC adapter plates shall be precision-molded in the USA and integrated to eliminate “rattle” and loose fit. All ferrules shall be zirconia-ceramic. Adapter plates shall be offered in standard fiber type colors. Singlemode color shall be BLUE.

4. Approved Products:

a. Leviton Opt-X Fiber Adapter Plate, 12 LC LOMM Aqua, #5F100-2QL

b. Leviton Opt-X Fiber Adapter Plate, 24 LC LOMM Aqua, #5F100-4QL

C. Fiber Termination (Connectors)

1. Pre-polished fiber optic connectors shall be the primary means of field-terminating individual fiber strands at the enclosure or faceplate location.
2. Shall meet or exceed the requirements described in TIA-568 and ANSI/TIA-604-10 (LC) Connector Intermateablity Standards
3. Shall be pre polished and field installable to eliminate the need for hand polishing, bonding, or epoxy in the field.
4. Shall utilize a precision zirconia ceramic ferrule, and be re-terminable up to 3 times during testing without loss of performance.
5. Shall require the use of a cleaver with a guaranteed maximum cleaving angle of 2 degrees for multimode and 1 degree for singlemode fibers.
6. Shall be provided in LC, single-mode or multimode (laser optimized) configurations, terminated on 250 or 900 µm buffered fiber and/or 2mm or 3 mm jacketed fiber.
7. Maximum connector insertion loss shall be no greater than 0.5 dB, with an average of 0.1 dB (MM) or 0.2dB (SM). Typical connector return loss shall be 35 dB (multimode) and 56 dB (single mode). All versions shall allow continuity to be verified by use of a visual fault locator (VFL).
8. Approved Products:
    a. Leviton FastCAM LC Multimode LOMMF, # 49991-LLC
    b. Leviton / Lynx cleaver # 49886-LNX or equal

D. Fiber Patch cables

1. Fiber optic LC-LC patch cords, or jumpers, will make LC connections from the rack termination points to the equipment. The jumpers will meet the following requirements:
    a. Factory-manufactured using Singlemode OS2 optical fiber. Field terminations on fiber jumpers are not acceptable.
    b. Shall utilize A-B polarity.
    c. Shall exhibit <0.3 dB insertion loss and -25 dB return loss.
    d. Shall be available in standard lengths of 1, 2, 3, 5 and 10 meters and custom-orderable up to any length of feet or meters
    e. Provide factory assembled patch cords meeting or exceeding all criteria specified in the horizontal cabling standard
    f. Verify lengths, quantities and configuration with owner prior to delivery.

g. Fiber-Optic MTP-MTP “array cords” shall utilize 8-strand MTP (female) to 8-

2. Approved Products:

a. Leviton LC-LC MM OM4 duplex jumper, 54DLC-Mxx

b. Where: xx = Length in Meters (01, 02, 03, 05 or 10) as required

2.6. Frames, Racks and Cabinets

A. Floor mounted 2-post racks

1. Universal junction hole pattern matches most manufacturers racks. #12-24 panel mounting holes. Conformance to EIA/ECA-310-E and UL Listed (File No. E171936) as a communications circuit accessory.

2. Load Rating: 1200 Lbs. (544kg) weight capacity when evenly distributed for the height of the rack (84” (2133mm) and shorter).

3. Material: Aluminum. Twin top angles for rigidity.

4. Add (1) front/rear vertical wire manager on each side or between racks. See Wire Management, below.

5. Permanently stamped rack mount unit (RMU) markings included. Double sided universal (5/8" (16mm), 5/8" (16mm), 1/2" (13mm)) mounting spacing.

6. Includes thirty (30) dog point combo head (Phillips and flat blade) mounting screws.

7. Tapped assembly holes eliminate the need for nuts and simplifies assembly and squaring.

8. Approved Products:

a. B-Line 2-Post Network Relay rack, 19” x 7’ x 3” channel, 45RU, Black, SB506084XUFB

B. Floor mounted 4-post racks

1. Open 19” 4-post frame with #12-24 tapped hole extruded aluminum mounting rails designed to provide nearly 360 degrees of accessibility and unrestricted air flow.

2. 84" (2133mm) 45RMU height with EIA/ECA-310-E universal 5/8" (16mm), 5/8" (16mm), 1/2" (13mm) hole pattern. Permanently stamped rack mount unit (RMU) markings and (100) #12-24 mounting screws included.

3. Depth adjustable in 1" (25.4mm) increments from 30" (762mm) to 36" (914mm) overall depth.

4. Load Rating: 2000 lb. (907kg) capacity, evenly distributed along rack height.

5. UL Listed to the UL60950 Standard - File No. E171936.
6. Approved Products:
    a. B-Line Four-Post Adjustable-Depth Equipment Rack, Black, SB837084CFB

C. Vertical wire managers for 2-post/4-post racks

1. Provide full height, front-and-rear, 8” wide Vertical Wire Managers at the side of and between each 2-post and/or 4-post termination rack or frame. If space will not allow, the 5” wide wire manager may be substituted at row ends only, leaving the 8” vertical wire manager between each rack. Owner approval in writing is required prior to this substitution.
    a. The vertical cable management system shall be cULus listed, PCI rated for 94V-O, ABS rated for UL94HB, and compliant with ANSI/TIA/EIA 568-B standards.
    b. Mounting hardware shall be included to insure the proper installation to infrastructure. It shall mount onto a standard TIA/EIA recognized equipment rack.
    c. The management system shall offer an assortment of accessories, including a bend radius slack loop organizer, cable retainers, and shall accommodate top, bottom, side and pass-through cable routing. Dual hinged, cable concealing covers shall be included.
2. Approved Products:
    a. Leviton Versi-Duct 8” Vertical Cable Manager, 8980L-VFR
    b. B-Line RCM+ Vertical Wire Manager, Black, SB86486D084FB

D. Wall mounted cabinets

1. 19RU usable 36” tall, 30” depth, 24” wide, 19” hole pattern, locking Plexiglass door
2. Enclosure features fully welded, 16 gauge (1.5mm) cold rolled steel construction.
3. Mounts to wall as left hinged or right hinged opening with Heavy duty, field reversible hinge and lock system.
4. Rear section can easily be separated from the cabinet for simple installation onto a wall and rear sections feature removable plates with either multiple knockouts for conduit or bushing installation, or a high-density foam gland plate for ease of installing pre-terminated patch panels.
5. Gland Plate Kit shall be available to adapt cabinet to fit over existing installed or terminated cables, as needed.

6. Provisioned for 16" (406mm) on-center mounting and multiple wire management lances for cable tie points or accessory mounting. Provide one Vertical cable lacing bar for each wall mount cabinet
7. Fully adjustable EIA/ECA-310-E compliant mounting rail system with #12-24 tapped rails. UL listed to the UL60950
8. 36" (914mm) high cabinets rated for 200 lb (91kg) load; 48" (1219mm) high cabinets are rated for 300 lb (136kg) load. 36# cabinet is standard, use 48” as required.
9. Approved Products:
    a. B-Line V-LINE WallMount cabinet, 36Hx30Dx24W, Black, VLWM3630PB
    b. B-Line V-LINE Gland Plate Kit, Black, VLWMGPB
    c. B-Line V-LINE Wallmount Cable Lacing Bar, Black, VLWMCLBB
    d. B-Line V-LINE Wallmount 105 Cfm Fan Kit with Filter and Power Cord, VLWMFKB
    e. B-Line V-LINE 90 Degree Vertical Equipment Mounting Bracket, VLWMSMBV90B

E. Horizontal Wire Managers

1. Provide 2RU duct-style horizontal wire managers above and below or between every 2RU of patch panel, as space allows.
2. Cable managers shall be flat, covered duct style with front and rear channels.
3. Use recessed flat wire manager as needed within enclosed cabinets to route patch cords to opposite sides, where the rings of the flat wire managers would interfere with cabinet door closure.
4. Approved Products:
    a. Leviton Versi-Duct Horizontal Wire Manager, 2RU, 492RU-HFR
    b. B-Line V-Horizontal Wire Manager, Black, SB87019D2

2.7. Cable Support Systems

A. J-Hooks

1. All cable shall be supported above ceiling on dedicated cable support hardware.
2. Cable saddles and J-hooks shall be used where cable tray or wire basket is not available. These must be supported on their own ceiling wires, threaded rod, or affixed to building structure by use of beam clamps (on metal beams) or wood

screws (on wood beams). Affixing communication cable supports to existing ceiling support wires is not allowed.

3. Approved Products:
    a. B-Line Cable Hook, BCHxx
    b. B-Line Cable Hook, Cable to Beam Fastener, BCHxx-C2
    c. B-Line Cable Hook, Cable to Fastener, 2”, BCHxx-C442
    d. B-Line Cable Hook, Cable to Rod Fastener, 2”, BCHxx-W2
    e. Where: xx = 21 (1.25”), 32 (2”), or 64 (4”)

B. Cable Tray

1. In Telecom Rooms, cable tray (ladder runway) shall be installed to support all cable running to racks and cabinets.
2. Cable tray to be added to all Telecom Rooms in places where cable is run horizontally.
3. Cable tray shall be aluminum, with 9” rung spacing. Rungs can be removed or repositioned to accommodate specific project or building requirements.
4. Cable shall be combed and bundled in all exposed runs outside walls, in TR/TE, and inside cabinets and wire managers.
5. All appropriate cable tray support hardware including angle brackets, rack-to-runway brackets, wall-to-runway brackets, elevation kits, junction splices, butt splices, and grounding jumpers shall be used for a complete and professional installation.
6. Approved Products:
    a. B-Line Redi-Rail Runway, 12”, Black, SB13AL12FB
    b. B-Line Wall-Mount Brackets, Black, SB211312FB
    c. B-Line top mounting rack-to-rail plate, Black, SB213312FB
    d. All other associated mounting hardware and metals from B-Line

C. Jack/Outlet Brackets

1. Above-ceiling cable termination locations shall be either wall-mounted or suspended from structure above the drop ceiling. Cables or terminations shall not rest on ceiling grid or equipment above ceiling grid.
2. For Wireless Access Points and other above-ceiling-mounted communications devices, cables shall land in an above-ceiling bracket which is affixed to dedicated cable support hardware.

3. Two category-rated jacks may be installed in each above-ceiling bracket. Each above-ceiling bracket will hold a 2-port Surface-Mount Box or 1-U MOS SMB for multimedia applications.
4. For wall-mounted device locations (above or below ceiling), devices needing to be mounted directly to a backbox will utilize the in-wall mounting bracket to secure the jack inside the backbox.
5. One category-rated jack can be installed in each in-wall backbox jack mounting bracket. For devices requiring (2) category-rated jacks, (2) in-wall brackets must be used.
6. Approved Products:
    a. Leviton QuickPort In-Ceiling Bracket, rod/wire hanger, 49223-CBC
    b. Leviton QuickPort In-Ceiling Bracket, accepts beam and screw mounts, 49223-CB0
    c. Leviton QuickPort In-Wall Bracket, 49223-BA5 (pack of 5)

2.8. Fire Stop Systems

A. A. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur. Such devices shall:

1. Meet the hourly rating of the floor or wall penetrated.
2. Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.
3. Permit multiple devices to be ganged together to increase overall cable capacity.
4. Allow for retrofit to install around existing cables.
5. Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes
6. Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
    a. Opening or closing of doors.
    b. Twisting an inner liner.
    c. Removal or replacement of any material such as sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.

7. Where single cables (up to 0.27 in. (7 mm) diameter) penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be substituted. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.
8. Approved Products
    a. Specified Technologies, Inc. EZ-PATH series 22, 33 and 44+ fire-rated pathway devices
    b. Specified Technologies, Inc. EZ-PATH GROMMET

B. Where non-mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.
1. Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.
2. Utilize an EMT sleeve as a stub through a rated wall
3. Surround annular space between EMT sleeve and wall material with a hardening intumescent caulk.
4. Utilize re-enterable, non-hardening putty around cables inside a metal sleeve. Do not exceed 40% fill capacity of sleeve and follow all rated assembly requirements per Manufacturer, local codes, and AHJ.

C. Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.
1. Approved Products
    a. Specified Technologies, Inc. SSS Intumescent Caulk
    b. Specified Technologies, Inc. SSP Intumescent Putty

3. EXECUTION

3.1. Additional Information

A. Refer to Section 27 00 00 for the following Part 3 - Execution information
1. General
2. Cable Pathways

3. Work Area Outlets
4. Installation Practices
5. Labeling
6. Firestopping
7. Sealing of Penetrations and Openings
8. Cable Supports
9. Cable Protection
10. Grounding
11. Documentation
12. Training
13. Cleaning
14. Project Closeout

3.2. Cable Handling / Cable Management

A. Proper cable handling is critical to maintaining the design integrity of high-performance cabling. Cable handling recommendations include:

1. Cable must be conditioned above 32 degrees F for 48 hours prior to installation.
2. Do not use excessive force when pulling cable. The maximum pull-force guideline for a 4-pair horizontal UTP should not exceed 110N (25lbf). Meeting this guideline avoids stretching conductors during installation and the associated transmission degradation.
3. The minimum bend radius for UTP should not exceed 4 times the cable outside diameter (O.D.) The O.D. of Cat 6A 100 ohm, balanced UTP cable is .30 in. (4 x .3 = 1.2 in. bend radius).
4. The minimum bend radius for fiber should not exceed 10x the cable outside diameter.
5. Traditional bundling of Category 6 and 6A cabling for a combed appearance is required in all exposed locations.
6. In TR, use appropriate horizontal cable management for patch cords on front of patch panels. Also, use appropriate cable management bar(s) for support of terminated horizontal cable.
7. Do not use vinyl or plastic cable ties due to the potential for over-cinching of cable bundles which can alter the cable geometry and degrade the system

cabling performance. Use only hook and loop ("Velcro") fasteners for bundling of horizontal cables.

8. Store cable slack in an extended loop configuration to alleviate cable stress. Excessive cable slack in bundled loops or traditional 'service loops' to provide additional cable length in TR has been shown to degrade cabling performance and are not recommended.

3.3. Separation of Data and Power cabling

A. Design cable pathways to avoid potential sources of EMI. Avoid installing cable near sources of EMI (X-ray equipment, large motors/generators, electrical power cabling and transformers, Radio frequency (RF) sources and transmitters, lighting, copiers, etc.).

B. Physically separate power & data cabling according to relevant code and standard requirements when run in a common pathway.

1. Never run data and Class 1 power cabling in parallel closer than 2".
2. Avoid crossing cables if possible. If necessary, always cross cables at 90 degrees.
3. Maintain a minimum of 5 in. separation between data cable and all ballast controlled lighting.

C. Minimum separation distances of telecommunications cabling from potential sources of EMI exceeding 5kVA:

1. 24" away from Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways
2. 12" away from Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway
3. 6" away from Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway
4. 47" away from Electrical motors and transformers

3.4. Installation of Structured Cabling System

A. PRE-Installation Conference

1. Schedule a conference a minimum of five calendar days prior to beginning work of this section.
2. Agenda: Clarify questions related to work to be performed, scheduling, coordination, etc.
3. Attendance: Communications system installer, General Contractor, Owners Representatives and any additional parties affected by work of this section.

Owner's Information Technology must be represented at a pre-conference meeting prior to scheduling of any work.

4. Copy of Leviton warranty application will be provided by Contractor.

5. Pre-Installation conference may be waived only by Owner.

B. Warranty

1. A lifetime performance warranty covering all components, equipment and workmanship shall be submitted in writing with system documentation. The warranty period shall begin on the system's first use by the Owner.

2. The project must be pre-registered with Leviton by the installation contractor before installation has begun, and shall be concluded by contractor with uploading of test results to Leviton and a full project closeout. Warranty paperwork will be delivered directly from Leviton to the Owner.

3. Should the cabling system fail to perform within its expected operation within this warranty period due to inferior or faulty material and/or workmanship, the Contractor shall promptly make all required corrections without cost to Owner.

C. Drawings and Specifications

1. The Contract drawings and specifications form an integral part of the contract documents. Neither the drawings nor the specifications shall be used alone. Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work. Work omitted from the drawings but mentioned or reasonably implied in the specifications, or vice versa, shall be considered as properly and sufficiently specified and shall be provided. Misinterpretation of any requirements on drawings, or specifications shall not relieve the Contractor of his or her responsibility of properly completing the Contract.

2. The Owner's Project Manager has the option of changing the location of Electrical and Communication outlets to within 3 meters of designed location prior to rough-in stage at no extra cost to Owner. Owner and Owner's Representative requests a chalk/rough-in walk prior to installation to verify locations.

3. The Contractor is responsible to take field measurements where equipment and material dimensions are dependent upon building dimensions and to coordinate and provide a chalk/rough-in walk prior to installation to verify locations.

4. The Contractor shall coordinate with General, Mechanical and Electrical trades as well as Furniture Layout Designer for final workstation outlet locations.

5. Where conflict exists between drawings and specifications the Contractor shall, make allowance for provision of the component, system, or installation process

in a manner which will provide the highest monetary cost components, systems, or installation process. Contractor shall inform the Owner's Project Managers of the conflict and obtain approvals prior taking corrective measures.

D. Pathways and Topology

1. Utilize "thin film" lubricants only! It has been shown that cable-pilling lubricants will affect your testing as the cable needs several weeks to dry before attenuation levels recover. Use of incorrect cable lubricants will erode cable jacket and void cable warranty.
2. All cable and wire shall be concealed in conduits, floor ducts, paneling, ceiling or similar areas except at mutually agreed upon areas.
3. Fill capacity in conduit, modular furniture and other horizontal pathways should not exceed 40%. A maximum of 60 % pathway fill is allowed to accommodate unplanned additions after initial installation. The Cat 6A cable is a larger O.D. (0.275" – 0.30" vs. .23" for typical for Cat6 cable). The increased diameter of Cat 6A cable will require appropriate design considerations when sizing conduit and other pathways. In most installations, conduit sizes will have to be increased in order to accommodate all of the cables being installed. This will impact the design and material selection of the project. To calculate the fill ratio, divide the sum of the cross-sectional area of all cables, by the most restricted cross-sectional area of the pathway.
4. Fill ratios for Augmented CAT6 cable (CAT6A) requires 1" EMT for 4 cables and sized larger for additional cables as required to maintain a 60% fill ratio.
5. Flat-rung and/or solid bottom cable tray shall be utilized for large, high-density installations. J-hooks and other specific cable support hardware shall be used at all locations outside of cable tray.
6. Pathway design should not exceed (2) 90 degree bends between pull points or pull boxes (PB). If more than (2) 90 degree bends are required, install a pull box between bends.
7. Provide pullboxes for any run greater than 100 feet, or with more than two ninety-degree bends.
8. J-hooks should be randomly spaced 60" or less. Do not exceed J-hook capacity for size and weight limitations.
9. Land wireless access cabling above ceiling, secured onto in-ceiling bracket. A slack loop in the horizontal cabling is not required. Utilize varying-length patch cords when installing wireless access point devices for flexibility in length.
10. Crimp-on plugs at wireless access points are not allowed. Terminate all WAP cabling onto jacks and ceiling-mount brackets and test all cables as appropriate.

11. Mixing of various Category cables in the same pathway is allowed as long as the applications are appropriate for each category of cable used.
12. Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.
13. Maintain a distance of at least 12 inches from all power conduits and cables, and 6 inches from all fluorescent lighting fixtures. Do not install power feeders 100 amps or greater above or within 5 feet of telecommunications backboard. Do not install telecommunications conduits above power panels or switchboards.
14. 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.
15. The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications room/closets (TCs or IDFs) and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications room/closets and the main or intermediate cross-connect in a long single story building.
16. Unless otherwise recommended by the Owner, all fiber cables will be encased in interlocking armor. All fibers will be terminated in the Telecom Rooms or Cabinets in rack-mounted enclosures equipped with sufficient ports to allow for growth, slack storage space and splice trays if required to terminate and secure all fibers.
17. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all Telecommunications rooms/closets, such that no drilling of additional sleeves/slots is necessary. Sleeves may need to be provided and installed under the scope of this Project.
18. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room/closet. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect.
19. For voice or data applications, 4 pair UTP or fiber optic cables shall be run using a star topology from the telecommunications room/closet serving that floor to every individual information outlet.
20. Backbone and Horizontal pathways shall be installed or selected such that the minimum bend radius is maintained both during and after installation.

21. All horizontal pathways shall be designed, installed and grounded to meet applicable local and California building and electrical codes.
22. Install ¾" x 4' x 8' fire-rated plywood across all walls in telecom rooms, from 6" AFF to 8'-6" AFF. Coat with 2 coats of white paint. Do not paint over fire rating stamp.
23. Contractor shall firestop all used pathways which enter or leave the telecom rooms via conduit, cable tray or slot. Contractor is responsible for installing sleeves at each wall or partition penetration, and firestopping all fire-rated penetrations. Intumescent caulk shall be applied around the outside of each sleeve, and intumescent putty inside the sleeve or conduits around the cables. Appropriate fill ratios must be followed when penetrating fire-rated walls.
24. Do not run fiber cables in conduits which are less than 2" in diameter.
25. Abandoned cable shall be removed from pathways (i.e., from tunnels, manholes, plenum spaces, and conduit) under scope of this project. Previously unknown or unidentified cable which is apparently abandoned prior to work shall be brought to the attention of the Owner for authorization prior to removal.

E. Grounding

1. Refer to section 27 05 26 for specifications on Grounding and Bonding.
2. All grounding (earthing) and bonding shall be done to applicable codes, standards and regulations.
3. Shielded cabling channels shall include appropriate method of bonding shield to approved ground for proper EMI/RFI mitigation.
4. Shield Continuity Testing shall be Enabled when shielded cabling channels are installed.
5. All shielded and armored cables shall be bonded to a telecom grounding system via shielded patch panels at the rack locations. Shielded Category-rated connectors must be properly installed to maintain electrical ground conductivity along entire length of cable and at both ends of the cable. UTP connectors shall not be used on shielded cables at either end.
6. Shielded Patch cords shall be provided for use and employed at each workstation location utilizing shielded cable. Shielded patch cords can be identified by their gray color and metallic RJ45 plug. Shielded patch cords are not required at the patch panels.
7. Telecom Contractor shall bond and ground all telecom room metals. Telecom Contractor shall provide and install TIA-rated Telecommunications Grounding Busbar (TGB) at all MDF and IDF locations, and an in-cabinet grounding busbar

at each remote wall-mounted cabinet or telecom enclosure. All ground lugs shall be 2-hole make-up.

8. Electrician will provide connection between TGB and building ground; Telecom contractor (if separate, otherwise electrician) will provide a busbar and ground all equipment and telecom metals to the busbar.

9. Telecom installer will ground and bond all armored and/or shielded cables, racks, cabinets, cable tray, ladder racking, and shielded panels to telecom grounding busbar.

F. Cables and Terminations

1. Check plans and symbology for final determination of faceplate constitution or consult with Owner prior to bid.

2. Install additional cables at drop locations and in quantities indicated on the drawings. Do not exceed manufacturers' recommendations for maximum allowable pulling tension, side wall pressure or minimum bending radius. Use pulling compound as recommended by cabling manufacturer.

3. All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.

4. The combined length of jumpers, or patch cords and equipment cables in the telecommunications room/closet and the work area shall not exceed 10m (33 ft).

5. The Contractor shall observe the bending radius and pulling strength requirements of the 4 pair UTP and fiber optic cable during handling and installation.

6. No run of UTP cable between horizontal portions of the cross-connect in the telecommunication closet and the information outlet shall contain splices.

7. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling. Minimum 6" is preferred.

8. J-hooks shall be provided for all suspended cable, at a semi-irregular spacing not to exceed 5 feet between supports. Cables shall be supported by dedicated low-voltage cable support hardware. Support of cables or hanging hardware by means of supports or surfaces related to other trades or applications is not allowed.

9. Provide a full-size service loop (at least once around the inside edge of the box) in each J-box in the communications system.

10. Install all cable in plenum spaces with J-hooks of at least 1" in width to disperse the weight on the bottom cables. Homerun all cable to nearest TR Cabinet.

11. Comply with ANSI/TIA-569 for conduit and splice box sizing.
12. Install modular jacks at all outlets shown; one data jack for each data cable at each faceplate or termination point. Install additional cables and modular jacks as indicated on the drawings. Do not “split pairs” between different jacks.
13. Terminate cables at each jack location and at termination board or patch panel. Follow industry guidelines and manufacturers’ recommendations and procedures as required. All termination hardware shall be rated to exceed their associated Category rating as specified above.
14. For enclosed ceiling WAP locations, install and terminate CAT6A cables to approximate location as shown on plans. For open-ceiling environments, secure cables and surface-mount boxes to nearest appropriate support structure.
15. For in-ceiling WAP locations, secure jacks inside a surface-mount block mounted to in-ceiling metal assembly, and provide a 5’ patch cord or longer, as needed, to connect device to its final determined location in ceiling.
16. For wall-mounted device locations, utilize an in-wall bracket in lieu of faceplate as described above. Secure mounting bracket and device hardware directly over backbox. Connect device with 1’ CAT6A cord (Security, AV, or WAP), or 1’ high-flex CAT6 patch cord for other CAT6-based devices. Coil patch cord inside backbox.
17. Label and identify each outlet and cable for data circuits. Label at outlet end and at termination board or patch panel with matching designations.
18. Provide data outlets in surface raceway at 26” on center unless otherwise indicated.
19. Extreme care must be taken not to nick any of the copper conductors when removing jacket. Use rip cord to expose pairs for termination onto Insulation Displacement Contacts. You can also use a precision stripper that allows the technician to set the depth of the blade.
20. Maintain twists as close as possible to the point of termination. Untwisting of copper pairs should not exceed ¼” to the termination point.
21. Manage the cable bundles in a symmetrical orientation. For example, in a 48-port patch panel, distribute 24 cables through the vertical cable management on the left rear side of the rack and 24 cables through the vertical cable management on the right rear side of the rack.
22. Do not dress cables in bundles larger than 24 cables. Multiple 24-cable bundles may be run in parallel with evenly-spaced Velcro cable ties in an orderly sequence.

23. For cable management on rear of patch panel, cable shall sweep into termination points and be supported by appropriate rear cable management.
24. Horizontal patch cord management is required on all installations which do not use angled patch panels.
25. Maintain cable bend radius 4X outer diameter (UTP only) when mounting faceplate onto EMT backbox, box-eliminators or furniture knock-outs.
26. Faceplates and SMBs shall be fully installed and labeled prior to testing.

G. Above-Ceiling and wall mounted wireless access points and devices

1. All WAP locations shall receive (2) Category 6A cables from the nearest TE or TR (IDF). Multimedia, security and other video devices shall receive CAT6A cables as shown on drawings, documents and details.
2. Clock/Speakers and other low-bandwidth mounted devices shall receive (1) CAT6A cable.
3. WAP, IP Camera and other communications cables shall terminate on patch panels in the TE/TR (IDF).
4. WAP cables shall terminate on Category 6A information outlets and shall be supported by an in-ceiling termination bracket. Affixing of a 2-port SMB to the bracket is recommended.
5. SMB, jacks, and patch cords used in plenum spaces shall be plenum-rated.
6. SMB shall be mounted in the ceiling on a specially-designed clip attached to a cable support ceiling wire or threaded rod support per cable management section in Part 2. SMB shall not be tie wrapped to supports, or left on ceiling tiles or other equipment located above the ceiling.
7. Wall-mounted devices not requiring faceplates will be mounted directly to the backbox. Jacks will be secured inside backbox on a specially-designed in-wall bracket clip per cable management section in Part 2.
8. Contractor shall mount Access Point (AP) electronics to the drop-ceiling suspended T-grid system. (AP and mounting hardware provided by Owner). Contractor to provide and install (2) white Cat 6A patch cords from the overhead WAP outlets to the AP. Contractor shall neatly cut holes into the ceiling tile and finish the holes with grommets or other industry-standard finishing piece for a professional look.

H. Furniture Cabling

1. The contractor will pull all voice and data cables in advance of the installation of the modular furniture workstations, and coil at basefeed or above ceiling for power pole feeds. Upon furniture arrival, the contractor will feed the cables

through power poles or base feed/wall connected data/telecom conduit, and terminate as specified on the floor plans.

2. Contractor to coordinate with Owner's furniture vendor for timing of the installation of systems furniture, and installation of electrical and voice/data cabling. Overtime may be required for this and other phases of the project work, and bids, plans and schedules must reflect actual work demands. Contractor shall consider all costs in their bids for installation.

I. Terminal Blocks and Patch Panels

1. Arrange all terminal blocks in a manner that allows natural wiring progression and minimizes crossing of wires.

2. Dress and comb all incoming cable bundles in groups of 24 cables each. Eliminate crossed cables and "divers".

3. Ground all shielded patch panels to telecom ground source via paint-piercing washers to a grounded rack, or via direct ground wire to telecom bus bar.

J. DATA/TELCOM Rooms (MC/MDF, HC/IDF)

1. The Data and Telco Rooms are a transition point between the backbone and horizontal distribution pathways. The rooms shall be able to contain data or telecommunications' equipment, cable terminations and associated cross-connection wiring. Closet spaces are not to be shared with electrical installations, other than those directly for telecommunications, video, security and information systems equipment. The rooms are not to be shared with other unrelated building service, for example plumbing. Any conflicts with these specifications require the approval of the Owner's project manager.

2. Contractor shall submit a drawing of the IDF room showing layout of all components including necessary and required electrical outlets, conduits, environmental requirements and wire termination fields prior to start of the job. Any jack densities noted in these specifications are estimates only. The drawing will designate the most effective, scalable, jack termination cabling design to facilitate data/telecom outlets shown on the lease exhibits. Owner's Project Managers must approve drawings prior to installation.

3. All racks, panels, and equipment finished shall be anchored to meet local seismic zone requirements and industry standards. The equipment racks are to be anchored to the concrete floors via "Unistrut or equal metal framing strut systems", threaded rod, concrete anchors, bolts and washers.

4. The overhead cable ladder system will provide a route for the Category 6 and 6A, and other communication cables while providing stability to the equipment racks.

5. The vendor is responsible to provide and install the specified count of 19" EIA rack-mount 7' (45U) 2- post racks, Black, as required in the new IDF. The

vendor is responsible for submitting IDF layout drawings to Owner for approval prior to installation.

6. The contractor shall provide high capacity horizontal and vertical cable manager channels are required in all data and equipment racks, and the racks will contain sufficient vertical and horizontal cable managers to facilitate the patch panel density and placement installed by the contractor.

7. Contractor will install raceways, boxes, managers, and enclosures as indicated according to manufacturer's written instructions. Securely fasten each component to the surface to which it is mounted and remove burs and sharp edges from all cable tray.

8. A 12" ladder rack system is required and will be provided by the contractor and installed in the IDF to provide cable support to the rack system. This includes all of the required ladder rack support items such as rack to runway kits, wall angle brackets, ceiling supports, splices (junction and butt), radius drops and j-bolts. The final ladder rack layout will be included in the IDF layout drawing described above.

9. Provide and install as needed in the room 4' x 8" x 3/4" fire-rated plywood board and labeled with fire rating stamp facing into the room to accommodate rack ladder support, cabling support, grounding platform, data and voice equipment. Paint backboard white (leave stamp visible) to match existing backboard in room, if appropriate. Location of installation is to be determined with approval by Owner.

K. Patch Cords

1. Contractor to provide and install fiber and copper patch cords in quantities as described below. Neatly install patch cords in lengths as appropriate to reduce unnecessary length in wire managers.

2. Install patch cords at the equipment cabinet between patch panel and owner-provided switches for each patch panel and workstation location. Patch cords shall direct-connect between patch panel and networking switch or other electronics equipment. Dress and bundle patch cords as appropriate for final installation. Provide any unused equipment patch cables to Owner in original packaging upon completion of project.

3. Install Wireless Access Point patch cords as described above, and connect Cameras and other field-installed networkable device via a vendor-supplied patch cord at the remote locations. Return unused patch cords to Owner in original packaging.

4. Provide workstation patch cords to Owner in original packaging.

5. Use the following guidelines for project bid. Verify all lengths with Owner prior to purchase:

a. Provide and install one (1) 7-foot patch cord, of the same category rating, for each cable terminated at the patch panel

b. Provide one (1) 10-foot patch cord, of the same category rating, for each cable terminated at the terminal outlet location

c. Provide one (1) 2-meter patch cord, of the same grade of fiber, for each LC connector pair installed at the IDF, MDF, and all other terminal enclosure locations.

6. All fiber patch cords and required workstation/equipment patch cords not installed shall be provided in hand to Owners Representative prior to project closeout.

L. Labeling

1. Provide machine-generated labels appropriate for all components supplied and installed. Under no circumstances shall hand written labels be used.

2. Each faceplate, cable, or data outlet (drop) will be numbered with a unique identifier clearly indicating the voice and data jacks by floor number, station, and outlet identification. This labeling scheme will be independent of any assigned telephone numbers.

3. The labeling scheme shall not include duplicates of any new or existing cable identification across the entire cable plant.

4. Labeling procedure will meet TIA-568, TIA-606 (Class 2 Administration) and BICSI Standards.

5. The labeling scheme will be provided at all locations within the cable infrastructure:

6. Labeling will be as follows:

a. The numbering scheme will be Floor Number, Jack Number.1 or .2. (7.###.1 and 7.###.2)

b. Label patch panel RJ-45 jacks numbered sequentially with 2 data jacks per station in line, designated by".1" and ".2".

c. Label Wireless Access Point cabling as AP01.1 / AP01.2, AP02.1/AP02.2, etc.

d. Label Racks containing patch panels as "DATA" and "VOICE".

3.5. Testing of Structured Cabling System

A. Copper Testing

1. Test all equipment and each outlet, horizontal cable, termination block, patch cords, etc. to verify compliance with requirements. Testing shall consist of

attenuation and NEXT across all splices and devices installed in the field and shall meet latest requirements of EIA/TIA. Re-terminate any cable or connection found to be defective.

2. Tester is to be a Level IV device or better, and configured with the specific cable installed, and the Permanent Link test will be performed according to the Category's standard methodology. All parameters must exhibit a PASS test result prior to project completion. PASS*, FAIL* or FAIL test results will not be accepted.

3. Only a permanent link test for Category 6A will be required. If situations demand a "hybrid", "Mixed" or a standard "Channel" design, approval must be obtained for those specific circumstances prior to testing.

B. Fiber Optic Testing

1. Each pre-terminated fiber strand shall be tested for continuity and attenuation with an Optical Power Meter and light source for actual length and splice/connector loss. Each field-terminated fiber strand (if any) shall be tested for attenuation with an Optical Power Meter and light source and with an Optical Time Domain Reflectometer (OTDR) for actual length and splice/connector loss.

2. Cable length shall be verified using sheath markings. The guidelines and procedures established for Tier 1 testing in TIA/TSB-140 shall apply.

3. All fiber optic cables shall be tested from the site's MDF to each fiber terminals located in the IDF.

4. The Contractor shall conduct a bi-directional power meter (loss) test of each fiber optic station and riser cable at both wavelengths, 850/1300nm for MM and 1310/1550nm for SM.

5. No individual station or riser fiber link segment (including connectors) shall measure more than 2.0 dB loss for LC, and 1.5dB loss for MTP. LC links shall be tested with LC jumpers from the LC cassette to the tester. MTP links shall be tested either with an MTP tester and array cord, or with an MTP-LC breakout harness and LC duplex fiber tester.

6. Tests shall be conducted using ANSI/TIA-526-14A, Method B. Test results evaluation for the panel to panel (backbone) shall be based on the values set forth in ANSI/TIA-568.

7. The Contractor shall provide an electronic printout for each strand tested with the Power Meter and the OTDR.

8. Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall

be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.

9. All installed cables must meet or exceed the defined standards for performance. The Contractor shall take all steps and all expense necessary to clean, repair or replace any optic link not meeting the standard.

C. Test Results

1. Repair and resolve any shortcomings in the test results. Mitigation efforts may require re-termination or replacement of the jack, outlet or cable. Repairs or attempts to resolve test failures will be completed solely at the expense of the Contractor.
2. Provide test results to Manufacturer and Owner representative in native Tester format. Upon request, provide a copy of the tester software and license, if needed, at no charge to Owner representative.
3. Include PDF of full test results, summary index in electronic format on CD or memory stick in the O&M package upon project completion.
4. Cabling systems shall meet or exceed the electrical and transmission characteristics of the systems specified.
5. Cable segments and links shall be tested from both ends of the cable for each of the construction phases. (Verify that cable labeling matches at both ends).
6. The system shall not be considered certified until the tester has acknowledged that the performance of the physical layer of the system has been fully tested and is operational at the completion of the installation phase.
7. After the installation is complete, in addition to any other required testing as described herein, and at such times as the Owner/Engineer directs, the Contractor shall be present while the Owner conducts an operating test for approval. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be corrected promptly at the Contractor's expense and the tests performed again.
8. After review of the completed test results, the Owner reserves the right to retest cables, utilizing the Contractor's tester and the Contractor's labor.
9. The test results information for each link shall be recorded in the memory of the field tester upon completion of the test. The tester shall be capable of storing test data in either internal or external memory. The external media used shall be left to the discretion of the user.
10. Test results saved by the tester shall be transferred into a Windows based database utility that allows for maintenance, inspection and archiving of these test records. A guarantee must be made that the measurement results are

transferred to the PC unaltered as well as any printed reports generated from the software application.

11. Test results shall be provided in both native Tester format as well as comma separated variable (.csv), Portable Document File (.pdf), plain text (.txt), or hypertext markup language (.html/.htm). A copy of the tester native test software must be provided to Owner or Owner's representative for comparison of results.

12. Test Results for CAT6/6A shall include the following:

    a. Applicable room number of jack location (room number per Contract Documents)

    b. Applicable Telecommunications Room number

    c. Circuit I.D. number with corresponding jack identifier

    d. Wire Map – shall include the following:

    e. Continuity to the remote end

    f. Shorts between any two or more conductors

    g. Crossed pairs

    h. Reversed pairs

    i. Split pairs

    j. Any other mis-wiring

    k. Length

    l. Insertion Loss

    m. Near-end Crosstalk (NEXT) Loss

    n. PS-NEXT (Power Sum Near End Cross Talk)

    o. FEXT (Far End Crosstalk)

    p. ELFEXT (Equal Level Far End Cross Talk)

    q. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)

    r. Propagation Delay

    s. Delay Skew

    t. Return loss

    u. PSFEXT (Power Sum Far End Crosstalk)

    v. PSACRF (Power Sum Attenuation to Crosstalk Ratio, Far End)

13. Test Results for CAT6A shall include all of the above, plus the following:
    a. AACRF (Alien Attenuation to Crosstalk Ratio, Far End)
    b. AFEXT (Alien Far End Crosstalk)
    c. ANEXT (Alien Near End Crosstalk)
    d. PSANEXT (Power Sum Alien Near End Crosstalk)
    e. PSAACRF (Power Sum Alien Attenuation to Crosstalk Ratio, Far End)
14. Approved Tester Products:
    a. Softing WireXpert series tester
    b. Fluke DTX or later platform Cable Certification testers
    c. Linkware Record Management Software

3.6. Project Closeout

A. Operating and maintenance manuals shall be submitted prior to testing of the system. A total of (4) manuals shall be delivered to the Owner. Manuals shall include all service, installation, and programming information.

B. Provide a full set of “as-built” (redline) drawings in AutoCAD DWG and PDF format. Drawings to depict final location and drop/cable identification numbers and labels which match the test reports. Include (1) hard copy paper format of all as-builts in 30”x42” size or equivalent, posted in each telecom room involved in the project.

C. Contractor to provide all warranty information to Leviton for processing. Leviton will send warranty document direct to Owner.

3.7. Training

A. Provide four (4) hours training on the operation and installation of the data system, at job site, at no cost to owner.

B. Training shall be a walk thru of all systems cabling locations and required maintenance procedures.

END of SECTION

SECTION 27 5100 INTERCOM / MASTER CLOCK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, General and Special Conditions and Division 1 Sections apply to this Section.

B. 27 00 05 – Basic Requirements

C. 27 00 10 – Basic Materials and Methods

1.02 SYSTEM DESCRIPTION AND SCOPE OF WORK

A. The work to be provided herein consists of furnishing and installing all equipment, cabling and labor required for complete, operable, new building-wide public address/paging system as shown on plans and defined in these specifications.

B. The System shall provide communications used for "all call and emergency announcements. The system shall incorporate a master program clock/bell system to generate tone signals for class changes.

C. The systems shall be interfaced to the telephone system allowing any telephone location, with the entry of a password, to initiate a page, call a specific zone, or initiate an emergency or time tone.

D. The contractor shall have a factory trained service department on call 24 hours a day, 365 days a year, to service the specified product. Response time for service calls shall be 4 hours.

1.03 QUALITY ASSURANCE

A. California Electrical Code & NFPA 70.

B. Underwriter’s Laboratory.

C. TIA/EIA-607 Telecommunications Grounding.

1.04 SYSTEM WARRANTY

A. The System shall be warranted by the contractor for a period of one (1) year from date of substantial completion.

1.05 VOICE COMMUNICATIONS AND SOUND SYSTEM.

A. ADD to EXISTING CISCO INFORMACAST / ATLAS-IED voice communication system with all wire, outlets and equipment as may be required, as shown on the drawings, and as herein specified to provide a complete and operational sound and voice communication system.

1. In-service Training: Provide the owner with a training program designed to make all administrative control center users familiar with the operation of

the voice communication system.

2. System vendor shall provide programming changes free of charge for (1) year following installation and acceptance of the system.

1.03 SYSTEM DESCRIPTION

A. The system shall consist of speaker zone control cards, separate, classroom loudspeaker assemblies, and all associated material, hardware, wiring, and options as described herein to provide a complete working system which shall meet the specified requirements.

PART 2 - PRODUCTS

2.01 CENTRAL EQUIPMENT

A. The EXISTING equipment specified herein and shown on the drawings is based upon equipment as manufactured by CISCO INFORMACAST / ATLAS-IED. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds all standards set forth in these specifications. Products of other manufacturers will be considered, providing their products equal or exceed the quality specified; and they can provide products of the type, function, size, arrangement, and configuration required.

B. Microprocessor based control unit. EXISTING verify make model and ports in field.

C. Master clock time control for class change and scheduling. EXISTING verify make model and ports in field.

D. Speaker Zone control cards EXISTING verify make model and ports in field.

L. Classroom and Corridor Ceiling Speakers

1. Provide ceiling mounted, recessed, Low-voltage PoE speakers.

2. Provide a white round recessed steel baffle with each unit and matching back box and tile support.

3. Reflected Ceiling Plans are available at the construction office. Installation of all ceiling speakers shall be coordinated with these plans.

M. Other Speakers

1. Provide surface mounted PoE Paging Horn. Unit shall be installed on building structure.

2.02 CLOCKS

A. Refer to plans for IP Clock part numbers.

B. Provide wire guards on all clocks located in gymnasium, locker rooms, and auxiliary gymnasiums.

2.03 SPEAKERS / HORNS

A. Refer to plans for IP Speaker / Horn part numbers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install per manufacturers specifications.

C. Speakers on the drawings are shown for in their approximate location and for quantities needed. Reflected Ceiling Plans are available at the construction office. Installation of all ceiling speakers shall be coordinated with these plans. In general: Corridor speakers shall be centered and spaced 20 feet apart. Classroom speakers shall be centered in the room. Gym, media center and cafetorium speakers shall be positioned for proper sound coverage, avoiding ceiling sound panels.

3.02 WIRING

A. Size and quantity of conductors shall be in accordance with manufacturer's requirement for cabling. Cables shall be UL listed for plenum use.

B. Cable manufactured by West Penn, Belden or General .

3.03 WARRANTY AND TRAINING

A. The system contractor shall warrant any equipment installed under this specification to be free from defect for a period of one year from date of final acceptance.

B. The system contractor shall provide a minimum of 20 hours training for school district personnel on proper operating procedures for the system.

C. All training shall be video taped.

END OF SECTION

27 5120 Assistive Listening Systems (CBC 2019/ADA 2010)

1. GENERAL

1.1. Work Includes

A. This specification is to be used where an Assistive Listing System is not called for within a specific audio visual system or room but is required by the CBC and/or ADA.

B. 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 specified herein.

C. The Contractor shall furnish and install all equipment, cables, devices, and other materials even though not specifically mentioned herein, which are necessary for the proper integration of the system, so that the system shall perform the function listed herein compliance with all the specified requirements.

1.2. Scope of Work

A. Provide Assistive Listening Systems per CBC Section 11B.219 & 11B.706.

1. CBC 11B-219.3 Receiver Quantity based on space.

a. The minimum number of receivers to be provided shall be equal to 4 percent of the total number of seats, but in no case less than two. Twenty-five percent minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with Section 11B-706.3.

B. The Americans with Disabilities Act (ADA) 2010 ADA Standards requires public facilities to provide auditory assistance devices.

http://www.ada.gov/regs2010/2010ADAStandards/2010ADAStandards.pdf

Section: **706 Assistive Listening Systems**

Capacity of Seating in Assembly Area	Minimum Number of Required Receivers	Minimum Number of Required Receivers Required to be Hearing-aid Compatible
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats*	2
201 to 500	2, plus 1 per 25 seats over 50 seats*	1 per 4 receivers*
501 to 1000	20, plus 1 per 33 seats over 500 seats*	1 per 4 receivers*
1001 to 2000	35, plus 1 per 50 seats over 1000 seats*	1 per 4 receivers*
2001 and over	55 plus 1 per 100 seats over 2000 seats*	1 per 4 receivers*

*Or fraction thereof

1.3. References

A. California Building Code (CBC 2019)

B. Americans with Disabilities Act (ADA)

C. California Electric Code (CEC)

D. American National Standards Institute (ANSI)

E. Underwriters Laboratories, Inc. (UL)

1.4. Quality Assurance

A. The system Contractor shall warrant any equipment installed under this specification to be free from defect for a period of one (1) year from the date of final acceptance.

B. The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

C. The contractor shall coordinate with the commissioning staff and schedule appropriate walk through and training.

1.5. Submittals

A. REFER TO SUBMITTAL SECTION 013300 FOR REQUIREMENTS.

B. Provide product data for the following:

1. Manufacturers cut sheets, specifications and installation instructions for all products.

2. PRODUCTS

2.1. Assistive Listening Systems

A. Furnish a portable assistive listening system for use by the hearing-impaired. The system shall be capable of operating on the 1.9 GHz unlicensed PCS band utilizing Frequency-Hopping Spread Spectrum (FHSS) techniques allowing interference free one way communication. The devices shall employ a multiply layer security protocol consisting of a 40-bit (pin free) group subscription, 32-bit authentication and a 64-bit encryption scheme enabling secure audio. They shall be easy to pair and form groups via Near-field communication (NFC), Docking Station or Software Suite. The system devices shall be simple to operate with a Power and Volume Up and Down buttons. The devices shall allow up to 10 simultaneous groups to operate in the same area. They shall be powered via a removable non-proprietary rechargeable lithium-ion battery or via an optional 3 AAA alkaline battery compartment.

1. The system devices shall have a 3.5 mm TRRS CTIA compliant headset connection allowing use with personal ear buds. They shall have a 64 x 128 OLED display with auto diming allowing display of all current status (group name, volume levels, battery status, time remaining, signal strength, unit ID, etc.) The leader/presenter device shall have a leader clip and when inserted the unit automatically designates itself as a leader and allows the leader/presenter to control pairing/group creation.

2. The system devices shall have a signal-to-noise ratio of 70 dB or greater and shall have an audio frequency response of 40 Hz – 15 kHz (±3 dB). The devices shall incorporate automatic battery charging circuitry to charge and maintain the lithium-Ion battery either via the micro USB port or via the docking station using the additional charging contacts on the bottom of the devices.
3. The LKS-8-A1 ListenTALK Portable ADA Kit 2 is specified..

B. Listen Technologies LA-304 ADA Access/Compliance signage kit. (Qty 1 ea.)

C. Approved equals; Williams Sound, Shure, Phonic Ear , Telex and Sennhieser of equal type and quantities.

D. Contractor to provide additional equipment as required by ADA assembly area table.

3. EXECUTION

3.1. Installation

A. None. Provide the Owner boxed sets for storage in each room.

B. The installation shall be accomplished by and under the direction of skilled electronic craftsmen, factory trained by the equipment manufacturer, and experienced in the installation of systems of this type in the State of California. Workmanship shall be of the highest quality.

C. During preparation for installation of any of the systems described in this Section of these Specifications and prior to ordering any material, coordinate all options and requirements with the Owner.

3.2. Instruction/Training

A. The equipment supplier/installer shall instruct the Owner or his designated representative(s) in the proper operation and maintenance of the system. Allow a minimum of four (4) hours for this on-site "hands-on" instruction. The Electronics Contractor shall provide sufficient personnel to provide adequate operations and maintenance training for all aspects of the system to the school staff.

END of SECTION

SECTION 28 1600 INTRUSION DETECTION

28 16 01 GENERAL

0.1 SUMMARY

A. ADD TO EXISING CAMPUS SYSTEM.

1. Add to existing system with new expander panels and devices.

2. Replace existing master panels as required for new equipment connection and expansion.

B. Section Includes:

1. Intrusion detection with multiplexed, modular, microprocessor-based controls, intrusion sensors and detection devices, and hard-wired premise communication links to perform monitoring, alarm, and control functions.

C. Related Sections:

1. Division 27 Section COMMUNICATIONS STRUCTURED CABLING for cabling between central-station control units and field-mounted devices and controllers.

0.2 DEFINITIONS

A. LCD: Liquid-crystal display.

B. LED: Light-emitting diode.

C. PIR: Passive infrared.

D. RFI: Radio-frequency interference.

E. UPS: Uninterruptible power supply.

F. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

G. Standard Intruder: A person who weighs 100 lbor less and whose height is 60 inchesor less; dressed in a long-sleeved shirt, slacks, and shoes.

H. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.

0.3 SUBMITTALS

A. Product Data: Components for sensing, detecting, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
   1. Device Address List: Coordinate with final system programming.
   2. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
   3. Details of surge-protection devices and their installation.
   4. Sensor detection patterns and adjustment ranges.

B. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are not acceptable.

C. Qualification Data: For Installer, testing agency.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section Administrative Requirements, include the following:

   1. Data for each type of product, including features and operating sequences, both automatic and manual.
   2. Central-station control-unit hardware and software data.

F. Warranty: Special warranty specified in this Section.

G. Other Information Submittals:

   1. Test Plan and Schedule: Test plan defining all tests required to ensure that system meets technical, operational, and performance specifications within 60 days of date of Contract award.
   2. Examination reports documenting inspections of substrates, areas, and conditions.
   3. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

0.4 QUALITY ASSURANCE

A. Installer Qualifications:

   1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
   2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

0.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

28 16 02 PRODUCTS

0.6 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

0.7 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Supervision: System components shall be continuously monitored for normal, alarm, supervisory, and trouble conditions. Indicate deviations from normal conditions at any location in system. Indication includes identification of device or circuit in which deviation has occurred and whether deviation is an alarm or malfunction.

1. Alarm Signal: Display at central-station control unit and actuate audible and visual alarm devices.
2. Trouble Condition Signal: Distinct from other signals, indicating that system is not fully functional. Trouble signal shall indicate system problems such as battery failure, open or shorted transmission line conductors, or controller failure.
3. Supervisory Condition Signal: Distinct from other signals, indicating an abnormal condition as specified for the particular device or controller.

B. System Control: Central-station control unit shall directly monitor intrusion detection devices and connecting wiring in a multiplexed distributed control system or as part of a network.

C. System shall automatically reboot program without error or loss of status or alarm data after any system disturbance.

D. Operator Commands:

1. Help with System Operation: Display all commands available to operator. Help command, followed by a specific command, shall produce a short explanation of the purpose, use, and system reaction to that command.
2. Acknowledge Alarm: To indicate that alarm message has been observed by operator.

3. Place Protected Zone in Access: Disable all intrusion-alarm circuits of a specific protected zone. Tamper circuits may not be disabled by operator.
4. Place Protected Zone in Secure: Activate all intrusion-alarm circuits of a protected zone.
5. Print Reports.

E. Response Time: Thirty seconds maximum between actuation of any alarm and its indication at central-station control unit.

F. Circuit Supervision: Supervise all signal and data transmission lines, links with other systems, and sensors from central-station control unit. Indicate circuit and detection device faults with both protected zone and trouble signals, sound a distinctive audible tone, and illuminate an LED. Maximum permissible elapsed time between occurrence of a trouble condition and indication at central-station control unit is 20 seconds. Initiate an alarm in response to opening, closing, shorting, or grounding of a signal or data transmission line.

G. Manual Secure-Access Control: Coded entries at manual stations shall change status of associated protected zone between secure and access conditions.

H. Alarm Transmission to Remote Monitoring Station: Transmit all alarm [**and trouble, supervisory]** indications to a designated remote monitoring station via [**telephone lines**] [**radio transmitter**] [**dedicated alarm network**]. Transmissions must be compatible with monitoring station equipment used. Coordinate with local authority having jurisdiction.

0.8 SYSTEM COMPONENT REQUIREMENTS

A. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor entry connection to components.

1. Minimum Protection for Power Lines 120 V and More: Auxiliary panel suppressors complying with requirements in Division 26 Section Surge Protective Devices.
2. Minimum Protection for Communication, Signal, Control, and Low-Voltage Power Lines: Comply with requirements in Division 26 Section Surge Protective Devices as recommended by manufacturer for type of line being protected.

B. Interference Protection: Components shall be unaffected by radiated RFI and electrical induction of 15 V/m over a frequency range of 10 to 10,000 MHz and conducted interference signals up to 0.25-V RMS injected into power supply lines at 10 to 10,000 MHz.

C. Tamper Protection: Tamper switches on detection devices, controllers, annunciators, pull boxes, junction boxes, cabinets, and other system components shall initiate a tamper-alarm signal when unit is opened or partially disassembled and when entering conductors are cut or disconnected. Central-station control-unit alarm display shall identify tamper alarms and indicate locations.

D. Addressable Devices: Transmitter and receivers shall communicate unique device identification and status reports to central-station control unit.

0.9 ENCLOSURES

A. Interior Sensors: Enclosures that protect against dust, falling dirt, and dripping noncorrosive liquids.

B. Interior Electronics: NEMA 250, Type 12.

C. Screw Covers: Where enclosures are accessible to unauthorized persons, secure with security fasteners of type appropriate for enclosure.

0.10 SECURE AND ACCESS DEVICES

A. Available Manufacturers:
1. GE Interlogix; General Electric Company.
2. Honeywell International Inc.
3. NAPCO Security Systems, Inc.
4. Optex.

B. Keypad and Display Module: Arranged for entering and executing commands for system-status changes and for displaying system-status and command-related data.

0.11 DOOR AND WINDOW SWITCHES

A. Available Manufacturers:
1. GE Interlogix; General Electric Company.
2. Honeywell International Inc.
3. Optex.

B. Description: Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of two encapsulated reed switches shall resist compromise from introduction of foreign magnetic fields.

C. Flush-Mounted Switches: Unobtrusive and flush with surface of door and window frame.

D. Overhead Door Switch: Balanced-magnetic type, listed for outdoor locations, and having door-mounting magnet and floor- or frame-mounting switch unit.

0.12 PIR SENSORS

A. Available Manufacturers:
1. GE Interlogix; General Electric Company.
2. Digital Security Controls, Ltd.
3. Honeywell International Inc.
4. NAPCO Security Systems, Inc.
5. Optex.

B. Description: Sensors detect intrusion by monitoring infrared wavelengths emitted from a human body within their protected zone and by being insensitive to general thermal variations.

1. Wall-Mounting Unit Maximum Detection Range: 125 percent of indicated distance for individual units and not less than 50 feet.
2. Ceiling-Mounting Unit Spot-Detection Pattern: Full 360-degree conical.
3. Ceiling-Mounting Unit Pattern Size: 84-inchdiameter at floor level for units mounted 96 inches above floor; 18-foot diameter at floor level for units mounted 25 feet above floor.

C. Device Performance:

1. Sensitivity: Adjustable pattern coverage to detect a change in temperature of 2 deg For less, and standard-intruder movement within sensor's detection patterns at any speed between 0.3 to 7.5 fps across 2 adjacent segments of detector's field of view.
2. Test Indicator: LED test indicator that is not visible during normal operation. When visible, indicator shall light when sensor detects an intruder. Locate test enabling switch under sensor housing cover.

0.13 DURESS-ALARM SWITCHES

A. Available Manufacturers:
1. GE Interlogix; General Electric Company.
2. NAPCO Security Systems, Inc.

B. Description: A switch with a shroud over the activating lever that allows an individual to covertly send a duress signal to central-station control unit over supervised wiring, with no visible or audible indication when activated. Switch shall lock in activated position until reset with a key.

1. Minimum Switch Rating: 50,000 operations.
2. Push Button: Finger activated, suitable for mounting on horizontal or vertical surface.

0.14 VIBRATION SENSORS

A. Available Manufacturers:
1. Potter Electric Signal.
2. TAKEX America, Inc.

B. Description: A sensor controller and piezoelectric crystal sensor elements that are designed to be rigidly mounted to structure being protected.

C. Device Performance: Detects high-frequency vibrations generated by use of such tools as oxyacetylene torches, oxygen lances, high-speed drills and saws, and explosives that penetrate a structure while not responding to any other mechanical vibration.

1. Circular detection pattern, with at least a 72-inch radius on protected structure.
2. Hookup Cable: Factory installed, not less than 72 inches.
3. Controller: Integral with sensor housing or in a separate assembly, locally adjustable by control under housing cover.

0.15 CENTRAL-STATION CONTROL UNITS

A. Available Manufacturers:
1. GE Interlogix; General Electric Company.

B. Description: Panel shall provide supervision of sensors and detection subsystems and their connecting communication links, status control (secure or access) of sensors and detector subsystems, activation of alarms and supervisory and trouble signals, and other indicated functions. The above manufacturers are only approved if compatible with the Host installation.

C. Construction: Modular, with separate and independent alarm and supervisory system modules. Alarm-initiating protected zone boards shall be plug-in cards. Arrangements that require removal of field wiring for module replacement are not acceptable.

D. Comply with UL 1076.

1. Alarm Indication: Audible signal sounds and a plain-language identification of protected zone originating the alarm appears on LED or LCD display at central-station control unit. Annunciator panel alarm light and audible tone identify protected zone signaling an alarm.

E. Operator Controls: Manual switches and push-to-test buttons that do not require a key to operate. Include the following:

1. Acknowledge alarm.
2. Silence alarm.
3. System reset.
4. LED test.

F. Resetting Controls: Prevent resetting of alarm, supervisory, or trouble signals while alarm or trouble condition persists.

G. Alphanumeric Display and System Controls: Arranged for interface between operator and addressable system components, including annunciation and supervision. Display alarm, supervisory, component status messages, and programming and control menu.

1. Display: LED or LCD, 32 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

H. Protected Zones: Quantity of alarm and supervisory zones as indicated, with capacity for expanding number of protected zones by a minimum of 25 percent.

I. Power Supply Circuits: Central-station control units shall provide power for remote power-consuming detection devices. Circuit capacity shall be adequate for at least a 25 percent increase in load.

J. Emergency Power Supply: Provide standby rechargeable batteries complete with built-in charger for direct power supply to the system.

K. Cabinet: Lockable, steel enclosure arranged so operations required for testing, normal operation, and maintenance are performed from front of enclosure. If more than a single cabinet is required to form a complete control unit, provide exactly matching modular enclosures. Accommodate all components and allow ample gutter space for field wiring. Identify each enclosure by an engraved, laminated, phenolic-resin nameplate. Lettering on enclosure nameplate shall not be less than 1 inch high. Identify, with permanent labels, individual components and modules within cabinets.

0.16 SECURITY FASTENERS

A. Provide fasteners approved by Host Installation. Operable only by tools produced for use on specific type of fastener by fastener manufacturer or other licensed fabricator. Drive system type, head style, material, and protective coating as required for assembly, installation, and strength.

B. Socket Flat Countersunk Head Fasteners:

1. Heat-treated alloy steel, ASTM F 835.
2. Stainless steel, ASTM F 879, Group 1 CW.

C. Socket Button Head Fasteners:

1. Heat-treated alloy steel, ASTM F 835.
2. Stainless steel, ASTM F 879, Group 1 CW.

D. Socket Head Cap Fasteners:

1. Heat-treated alloy steel, ASTM A 574.
2. Stainless steel, ASTM F 837, Group 1 CW.

E. Protective Coatings for Heat-Treated Alloy Steel:

1. Zinc chromate, ASTM F 1135, Grade 3 or 4; for exterior applications and interior applications where indicated.
2. Zinc phosphate with oil, ASTM F 1137, Grade I, or black oxide, unless otherwise indicated.

PART 2 - EXECUTION

0.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

B. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

0.2 SYSTEM INSTALLATION

A. Comply with UL 681.

B. Security Fasteners: Where accessible to unauthorized persons, install intrusion detection components using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials except that a maximum of two different sets of tools shall be required to operate security fasteners for Project. Provide stainless-steel security fasteners in stainless-steel materials.

0.3 WIRING INSTALLATION

A. Wiring Method: Install wiring in metal raceways according to Division 26 Section Raceways and Boxes for Electrical Systems. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Wiring Method: Cable in metal raceways, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.
2. 120-V Power Wiring: Install according to Division 26 Section Low-Voltage Electrical Power Conductors and Cables, unless otherwise indicated. Connect intrusion detection panel(s) to non-filtered emergency power source.
3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable, unless otherwise indicated or if manufacturer recommends shielded cable, according to Division 27 Section Communications Horizontal Cabling.
4. Computer and Data-Processing Cables: Install according to Division 27 Section Communications Horizontal Cabling.

E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.

G. Identify components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section Identification for Electrical Systems.

H. All cable shall be clearly identified on the outside jacket as being RoHS compliant.

0.4 GROUNDING

A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.

C. Install grounding electrodes of type, size, location, and quantity indicated. Comply with installation requirements in Division 26 Section Grounding and Bonding for Electrical Systems.

0.5 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Perform the following field tests and inspections and prepare reports:

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.
3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:

    a. Verify the absence of unwanted voltages between circuit conductors and ground.
    b. Test all conductors for short circuits using an insulation-testing device.
    c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
    d. Verify that each controller is in normal condition as detailed in manufacturer's operation and maintenance manual.
    e. Test signal and data transmission circuits complying with requirements in Division 27 Section Communications Horizontal Cabling for proper signal transmission under open-circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
    f. Verify that surge protective devices are installed according to manufacturer's written instructions.
    g. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.
    h. Test both primary and secondary power. Verify, by test, that UPS is capable of operating the system for period and in manner specified.

C. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.

D. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

0.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain intrusion detection. Refer to Division 01 Section Demonstration and Training.

0.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

END OF SECTION

SECTION 28 3100 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Divisions 0 and 1 and Sections 26 6000 and 26 7000 Specifications, apply to work of this Section.

1.2 SECTION INCLUDES

A. Emergency evacuation fire alarm system.

1.3 REFERENCES

A. State Codes

1) 2019 California Electrical Code (C.E.C.), Part 3, Title 24 C.C.R. (2017 National Electrical Code and California Amendments)

2) 2019 California Fire Code (C.F.C.) Part 9, Title 24 C.C.R. (2018 International Fire Code and California Amendments)

B. Electrical Industries Association (EIA):

1) EIA-232-D – Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange

C. National Fire Protection Association (NFPA):

1) NFPA 72, 2016 Edition – National Fire Alarm and Signaling Code.
2) NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems.
3) NFPA 13 – Installation of Sprinkler Systems.
4) NFPA 15 – Standard for Water Spray Fixed Systems for Fire Protection.
5) NFPA 16 – Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.
6) NFPA 16A – Standard for the Installation of Closed Head Foam-Water Sprinkler Systems.
7) NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
8) NFPA 101 – Life Safety Code.
9) NFPA 750 – Standard on Water Mist Fire Protection Systems.
10) NFPA 5000 – Building Construction and Safety Code.

D. Underwriters Laboratories (UL):

1) UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems.
2) UL 864 – Standard for Control Units and Accessories for Fire Alarm Systems.
3) UL 1971 – Standard for Signaling Devices for the Hearing Impaired.

1.4 SYSTEM DESCRIPTION

A. A new intelligent reporting, microprocessor-controlled fire detection and notification system shall be installed in accordance with the specifications and as indicated on the Drawings.

B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.

C. Control Panel shall be expandable from 2 to 128 SLC loops as necessary to accommodate future expansion

D. Basic Performance:

1) Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Style 6 (Class A) or Style 4 (Class B).

2) Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class A (NFPA Style D) or Class B (NFPA Style B).

3) Notification Appliance Circuits (NAC) Serving Strobes and Horns: Wired Class A (NFPA Style Z) or Class B (Style Y).

4) On Style 6 (Class A) or Style 7 (Class X) Configurations: Single ground fault or open circuit on Signaling Line Circuit shall not cause system malfunction, loss of operating power, or ability to report alarm.

5) Alarm Signals Arriving at Control Panel: Not lost following primary power failure until alarm signal is processed and recorded.

6) Network Node Communications:
   a. System shall have the capability of networking with other Control Panels on single pair of copper wires or fiber optic cables.

7) Signaling Line Circuits (SLC):
   a. Reside in remote panels with associated audio zones.
   b. SLC modules shall operate in peer-to-peer fashion with all SLC modules in the Control Panel.
   c. On loss of an SLC module, each remaining panel shall continue to communicate with remainder of system, including all SLC and control functions

8) NAC Circuits: Arranged such that there is a minimum of 1 audible device per fire alarm zone.

9) Notification Appliance Circuits (NAC), and Control Equipment: Arranged such that loss of any 1 NAC circuit will not cause loss of any other NAC circuit in system.

10) NAC Circuits:
   a. Electrically supervised for open and short circuit conditions.

b. If short circuit exists on NAC circuit, it shall not be possible to activate that circuit.

E. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:

1) System Alarm LEDs: Flash.
2) Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
3) 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
4) Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
5) System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6) Strobes flash synchronized continuously.
7) Audible devices sound continuous Temporal pattern until system is reset.

F. Fire Alarm System Functionality:

1) Provide complete, electrically supervised distributed, Style 7 networked analog/addressable fire alarm and control system, with analog initiating devices.
2) Fire Alarm System:
   a. Incorporate E3 Series multiprocessor-based control panel one or more Intelligent Loop Interface (ILI-MB-E3), and 80 character LCD annunciator.
3) Each ILI-MB-E3 SLC module: Incorporate 2 Signaling Line Circuits (SLC), with capacity to support up to 159 analog addressable detectors and 159 addressable modules per SLC.
4) Control Panel shall incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, and Timer functions.
5) Control Panel shall have the capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
6) Control Panel shall have the capability of having an optional DACT (digital alarm communicator transmitter) that can report to single central station monitoring account.
7) Control Panel shall have the capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
8) Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.

1.5 SUBMITTALS

A. Comply with Section 01 3300 – Submittal Procedures.

B. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.

C. Equipment Submittals:

1) Cover Page: Indicate the following:
   a. Project name and address.
   b. Engineered systems distributor's name and other contact information.
   c. Installing contractor's name and other contact information.
   d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
2) Table of Contents: Lists each section of equipment submittal.
3) Scope of Work Narrative: Detail indented scope of work.
4) Sequence of Operations: Use matrix or written text format, detailing activation of each type of device and associated resulting activation of the following:
   a. Control panel.
   b. Annunciator panels.
   c. Notification appliances.
   d. Building fire safety functions, including elevator recall, elevator power shutdown, door lock release, door holder release, HVAC unit shutdown, smoke evacuation system activation, and stair pressurization fan activation.
5) Bill of Material: Indicate for each component of system the following:
   a. Quantity.
   b. Model number.
   c. Description.
6) SLC Circuit Schedule: Detail address and associated description of each addressable device. Clearly provide information that indicates number of both active and spare addresses.
7) Battery Calculations: Show load of each of, and total of, components of system along with standby and alarm times that calculations are based on. Show calculated spare capacity and size of intended battery.

D. Shop Drawings:

1) Cover Page: Indicate the following:
   a. Project name and address.
   b. Engineered systems distributor's name and other contact information.
   c. Installing contractor's name and other contact information.
   d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.

2) Floor Plans:
   a. Provide separate floor plan for each floor.
   b. If a floor plan must be split using match lines to fit on the page, provide match lines and match line references that refer to sheet number that shows area on opposite side of match line.
   c. Prepare using AutoCAD.
   d. Prepare to scale 1/8 inch = 1'-0", unless otherwise required by the Architect or Engineer.
   e. Show equipment and device locations.
   f. Show wiring information in point-to-point format.
   g. Show conduit routing, if required by the AHJ.

3) Title Block: Provide on each sheet and include, at a minimum, the following:
   a. Project name.
   b. Project address.
   c. Sheet name.
   d. Sheet number.
   e. Scale of drawing.
   f. Date of drawing.
   g. Revision dates, if applicable.

4) Control Panel: Provide sheet that details exterior and interior views of control panel and clearly shows associated wiring information.

5) Annunciator Panels: Provide sheet that details exterior and interior views of annunciator panels and clearly shows associated wiring information.

E. Certification: Submit with equipment submittals and shop drawings, letter of certification from major equipment manufacturer, indicating proposed engineered system distributor is an authorized representative of major equipment manufacturer.

F. Project Record Drawings:

1) Submit complete project record drawings within 14 calendar days after acceptance test.

2) Project record drawings shall be similar to shop drawings, but revised to reflect changes made during construction.

G. Operation and Maintenance Manuals:

1) Submit complete operation and maintenance manuals within 14 calendar days after acceptance test.

2) Operation and maintenance manuals shall be similar to equipment submittals, but revised to reflect changes made during construction.

3) Include factory's standard installation and operating instructions.

1.6 QUALITY ASSURANCE

A. Codes and Standards:

1) NFPA: System shall comply with the following NFPA codes and standards:
   a. NFPA 12.
   b. NFPA 13.
   c. NFPA 15.
   d. NFPA 16.
   e. NFPA 16A.
   f. NFPA 70.
   g. NFPA 72.
   h. NFPA 90A.
   i. NFPA 101.
   j. NFPA 750.

k. NFPA 5000.

2) ADA: System shall conform to American with Disabilities Act (ADA).

B. To ensure reliability and complete compatibility, all items of fire alarm system, including control panels, power supplies, initiating devices, and notification appliances, shall be listed by Underwriters Laboratories Inc. (UL) and shall bear "UL" label.

C. Fire Alarm Control Panel Equipment: UL-listed under UL 864 Ninth Edition.

D. Equipment, Programming, and Installation Supervision:

1) Provide services of approved Engineered systems distributor of Gamewell-FCI for equipment, programming, and installation supervision.
2) Provide proof of factory training within 14 calendar days of award of the Contract.

E. Software Modifications:

1) Provide services of Gamewell-FCI factory-trained and authorized technician to perform system software modifications, upgrades, or changes.
2) Provide use of all hardware, software, programming tools, and documentation necessary to modify fire alarm system software on-site.
3) Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones.
4) System structure and software shall place no limit on type or extent of software modifications on-site.
5) Modification of software shall not require power-down of system or loss of system fire protection while modifications are being made.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials from damage during handling and installation.

1.8 COORDINATION

A. Coordinate the Work of this section with the Work of other sections, including sprinkler systems as specified in Section 21 0000 and HVAC systems as specified in Sections 23 0000 and 23 0001.

1.9 WARRANTY

A. Warranty Period for System Equipment: 1 year from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Gamewell-FCI, Honeywell Fire Systems, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com.

B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from Gamewell may be substituted for the specified equipment, as long as minimum standards are met. No other manufacturers, other than Gamewell-FCI, FCI, and Gamewell will be considered for use on this project.

C. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System, provide proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System.

2.3 CONTROL PANEL HARDWARE

A. Intelligent Control Panel: Supply user interface, including LCD or touch-screen 1/4 VGA display Intelligent Loop Interface Modules (ILI-MB-E3), manual switching, Control Panel shall consist of the following units and components:

1) System Cabinet (B-, C-, or D-Size Cabinet) with associated inner door.
2) Power Supply Module (PM-9) with batteries.
3) 80-Character LCD Display (LCD-E3).
4) Intelligent Loop Main Board Interface (ILI-MB-E3).
5) Optional Intelligent Loop Supplemental Interface (ILI-S-E3).
6) Optional DACT (DACT-E3).
7) Optional 1/4 VGA touch-screen display (NGA).
8) Optional Auxiliary Switch Module (ASM-16).

B. System Cabinet:

1) Surface or semi-flush mounted with texture finish.
2) Consist of back box, inner door, and door.
3) Available in at least 3 sizes to best fit project configuration.
4) Houses 1 or more PM-9 Power Supply Modules, 1 or more ILI-MB-E3 or ILI-S-E3 assemblies, and other optional modules as specified.
5) Construction: Dead-front steel construction with inner door to conceal internal circuitry and wiring.
6) Wiring: Terminated on removable terminal blocks to allow field servicing of modules without disrupting system wiring.

C. Power Supply Module (PM-9): Use latest technologies to provide power to the Control Panel and incorporate the following features:

1) Power-saving switching technology using no step-down transformers.
2) 9-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.
3) Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.

D. Batteries:

1) Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.
2) Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 60 hours with 15 minutes of alarm signaling at end of this 60-hour period, as required by NFPA 72, Auxiliary Systems.

E. LCD Display Module (LCD-SLP):

1) LCD Display: 80-character RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
   a. AC Power On: Green.
   b. Alarm: Red.
   c. Supervisory: Yellow.
   d. System Trouble: Yellow.
   e. Power Fault: Yellow.
   f. Ground Fault: Yellow.
   g. System Silenced: Yellow.

2) 80-Character Alphanumeric Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.

3) Panel shall contain 4 functional keys:
   a. Alarm Acknowledge.

b. Trouble Acknowledge.
c. Signal Silence.
d. System Reset/Lamp Test.

4) Panel shall contain 3 configuration buttons:
a. Menu/Back.
b. Back Space/Edit.
c. OK/Enter.

5) Panel shall have 12-key telephone-style keypad to permit selection of functions.

F. Intelligent Loop Interface (ILI-MB-E3): System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Intelligent Loop Interface shall be capable of mounting in stand-alone enclosure as specified.

1) Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer from any node on network.
2) RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.
3) RS-485 Serial Output: Each ILI-MB-E3 shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for connection of modules up to 3,000 feet from cabinet. Each ILI-MB-E3's RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 6 LCD-E3 main annunciators, and 5 LCD-7100 annunciators.
4) Peer-to-Peer Panel Configuration: All Loop Interface Modules shall incorporate own programming, log functions, Central Processor Unit, and control-by-event (CBE) programming. If any loop driver becomes disabled, each remaining loop driver shall continue to communicate with remainder of network and maintain normal operation.
5) Control-by-Event (CBE) Program: ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.
6) Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
7) Alarm Signals: All alarm signals shall be automatically latched or "locked in" at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, "SIGNAL SILENCE" switch may be bypassed, if required by AHJ.
8) Electrically Supervised:

a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall

activate system trouble circuitry, but shall not interfere with proper operation of other circuits.

b. Yellow "SYSTEM TROUBLE" LEDs shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or system ground faults shall activate this trouble circuit. Trouble signal shall be acknowledged by operating "TROUBLE ACKNOWLEDGE" switch. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow "SYSTEM TROUBLE" LEDs.

9) Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display units that requires maintenance.

10) Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.

11) Off-Premises Connection:

a. Fire Alarm System: Connect via leased telephone lines to central station or remote station.

b. Fire Alarm System: Connect to local energy city master box.

c. Fire Alarm System: Connect via Digital Alarm Communicator Transmitter (DACT) and telephone lines to central station or remote station. Panel shall contain disconnect switch to allow testing of system without notifying fire department.

12) Remote Station Option: Fire department shall be consulted regarding authorized remote station serving municipality. Fire alarm system shall transmit alarm, supervisory, and trouble signals with alarm having priority over supervisory and trouble signals. Required phone lines shall be provided and installed between incoming telephone service and fire alarm system by Owner's telephone contractor under separate contract. Owner will be responsible for phone company costs.

13) Local Energy City Master Box Option: Fire alarm system shall be connected to local energy city master box. City master box shall be coded and timed in accordance with requirements of fire department. Box shall be surface or flush mounted and located as specified by building engineer and fire department.

14) Central Station Option: Fire alarm control panel shall provide Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central

station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.

15) Network Annunciator Option: Each ILI-MB-E3 and associated display shall provide option of being configured as network annunciator. Options for annunciation shall default as regional annunciator with capability of selecting global annunciation to provide system-wide protection and Acknowledge, Silence, and Reset capabilities.

16) Redundant History Log: Each ILI-MB-E3 shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power followed by extraction of history log from any loop driver location

17) LEDs Indicator and Outputs: Each ILI-MB-E3 Loop Interface shall incorporate, as a minimum, the following diagnostic LED indicators:
    a. Power: Green.
    b. Alarm: Red.
    c. Supervisory: Yellow.
    d. General Trouble: Yellow.
    e. Ground Fault: Yellow.
    f. Transmit: Green.
    g. Receive: Green.

18) Auxiliary Power Outputs: Each ILI-MB-E3 Loop Interface shall provide the following supply outputs:
    a. 24 VDC non-resettable, 1 amp. maximum, power limited.
    b. 24 VDC resettable, 1 amp. maximum, power limited.

19) Microprocessor: Loop interface shall incorporate 32-bit RISC processor. Isolated “watchdog” circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.

20) Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.

21) Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.

22) NON-FIRE Alarm Module Reporting: Non-reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display message at panel LDC. Activation of NON-FIRE point shall activate control by event logic, but shall not cause indication on control panel.

23) 1-Man Walk Test:

a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.

b. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.

24) Signaling Line Circuits: Each ILI-MB-E3 module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices. Unique 40-character identifier shall be available for each device. Devices shall be of the Velocity series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.

25) Notification Appliance Circuits: 2 independent NAC circuits shall be provided on ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z.

26) Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.

27) Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.

28) Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.

2.4 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT (HPFF8)

A. Supplemental Notification Appliance Circuit shall be Model HPFF8 offering up to 8.0 amps continuous of regulated 24-volt power. HPFF8 shall include the following features:

1) Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.

2) 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
3) Surface-mount back box.
4) Ability to delay AC fail delay in accordance with applicable NFPA requirements.
5) Power limited circuitry in accordance with applicable UL standards.
6) Operates as sync follower or a sync generator.

2.5 SYSTEM PERIPHERALS

A. Addressable Devices – General:

1) Provide address-setting means using rotary-decimal switches.
2) Use simple to install and maintain decade-type (numbered 0 to 15) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3) Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4) Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5) Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6) Using software, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
7) Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
8) Following bases and auxiliary functions shall be available:
   a. Standard base with remote LED output.
   b. Sounder base rated at 85 dBA minimum.
   c. Form-C relay base rated 30 VDC, 2.0 A.
   d. Isolator base.
9) Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10) Detectors shall store internal identifying type code that control panel shall use to identify type of device (PHOTO, THERMAL).

B. Intelligent Photoelectric Smoke Detectors (ASD-PL3F): Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.

C. Intelligent Multi-Criteria Fire/CO Detectors (MCS-COF3):

1) Addressable device designed to monitor both fire and carbon monoxide (CO) detection. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings.
2) Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.
3) Intelligent multi-criteria detection device shall include four separate sensing elements to sense multiple components of a fire: smoke, CO, light/flame and heat.

D. Addressable Dry Contact Monitor Modules (AMM-2F):

1) Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2) Mount in standard deep electrical box.
3) IDC Zone: Suitable for Style B operation.

E. Addressable Dry Contact Monitor Modules (AMM-4SF):

1) Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2) Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3) IDC Zone: Suitable for Style D or Style B operation.
4) LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

F. Addressable Dry Contact Monitor Modules (AMM-2IF):

1) Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2) Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3) IDC Zones: Suitable for Style B operation.
4) LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

G. 2-Wire Detector Monitor Modules (AMM-4SF):

1) Provided to connect 1 supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2) Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to optional surface-mounted back box.
3) IDC Zone: Wired for Class A or B (Style D or Style B) operation.

4) LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

H. Addressable Control Modules (AOM-2SF):

1) Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2) Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3) Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4) Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

I. Addressable Relay Modules (AOM-2RF):

1) Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2) Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

J. Isolator Modules (M500X):

1) Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
2) If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3) Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4) Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
5) Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

K. Sprinkler Waterflow Switches (provided and installed by the sprinkler contractor):

1) Integral, mechanical, non-coded, non-accumulative retard type.
2) Alarm transmission delay time conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 to 45 seconds.
3) Single manufacturer and series.
4) Where possible, locate waterflow switches a minimum of 1 foot from fitting which changes direction of flow and a minimum of 3 feet from valve.
5) Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

Q. Speakers:

1) Shall have a dual transformer to operate at 25 or 70.7 nominal Vrms.
2) Have a rotary switch to select power taps and voltage.
3) Have at frequency range of 400 to 4000 Hz.

R. Strobes:

1) Compliance: ADA and UL 1971.
2) Maximum Pulse Duration: 0.2 second.
3) Strobe Intensity: UL 1971.
4) Flash Rate: UL 1971.
5) Strobe Candela Rating: Determine by positioning selector switch on back of device.

S. Speaker/Strobes:
1) Shall have a dual transformer to operate at 25 or 70.7 nominal Vrms.
2) Have a rotary switch to select power taps and voltage.
3) Have at frequency range of 400 to 4000 Hz.
4) Maximum Pulse Duration: 0.2 second.
5) Strobe Intensity: UL 1971.
6) Flash Rate: UL 1971.
7) Strobe Candela Rating: Determine by positioning selector switch on back of device.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive fire alarm system.

1) Notify Architect of conditions that would adversely affect installation or subsequent use.
2) Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state codes, manufacturer’s instructions, and as indicated on the Drawings.

B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.

C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.

D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.

E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, nor more than 48 inches, above finished floor measured to operating handle.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.

B. Testing:

1) Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
2) Close each sprinkler system control valve and verify proper supervisory alarm at Control Panel.
3) Verify activation of flow switches.
4) Open initiating device circuits and verify that trouble signal actuates.
5) Open signaling line circuits and verify that trouble signal actuates.
6) Open and short notification appliance circuits and verify that trouble signal actuates.
7) Ground initiating device circuits and verify response of trouble signals.
8) Ground signaling line circuits and verify response of trouble signals.
9) Ground notification appliance circuits and verify response of trouble signals.
10) Check installation, supervision, and operation of intelligent smoke detectors.
11) Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
12) Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:

1) Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
2) Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
3) Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4) When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
5) Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 1 year (365 days) from date of final acceptance by the owner.

3.4 DEMONSTRATION

A. Provide instruction as required for operating fire alarm system.

B. Provide hands-on demonstrations of operation of fire alarm system components and functions.

END OF SECTION 28 3100

SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Clear and grub the site as shown on the Drawings and specified in this Section.

B. Related Sections:
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.
2. Section 31 2000: Earthwork.
3. Section 02 4100: Selective demolition.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide materials, not specifically described but required for proper completion of the work of this Section, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 PROTECTION

A. Protect existing utilities indicated or made known.

B. Protect trees and shrubs, where indicated to remain, by providing a fence around the tree or shrub of sufficient distance away and of sufficient height so trees and shrubs will not be damaged in any way as part of this Work.

C. Protection of persons and property:
1. Barricade open depressions and holes occurring as part of this Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.
4. Barricade and post or backfill all open trenches outside of fenced areas when not on job site.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to the site at all times.

3.3 CLEARING

A. Prior to earthwork operations, strip entire site of vegetation, organic topsoil. Clear surface and subsurface obstructions and miscellaneous debris from the proposed building, exterior concrete, and paving areas.
   1. Stripping: Approximately 4" deep. The actual depth of stripping will be reviewed by the responsible inspecting Geotechnical Engineer.

B. Clear organic matter, vegetation, rubbish, debris, and loose soil deposits from the banks and bottoms of the irrigation canal and ditch.

3.4 CONSERVATION OF TOPSOIL

A. Stockpile the stripped organic topsoil in an area clear of new construction in order to provide topsoil for areas shown on the Drawings to be turfed or planted, and to fill planters, without contamination with subsoils.

B. Maintain the stockpile in a manner which will not obstruct the natural flow of drainage.
   1. Maintain stockpile free from debris and trash.
   2. Keep the topsoil damp to prevent dust and drying out.

3.5 DISPOSAL

A. Remove brush, grass, roots, trash, and other material from clearing operations. Dispose of away from the site in a legal manner.

B. Do not store or permit debris to accumulate on the job site.

C. Dispose of any excess topsoil after fine grading has been accepted by the Architect.

D. Do not burn debris at the site.

E. Excavated Soils and Land Clearing Debris: 100% of trees, stumps, rocks, and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled, except for reuse, either on site or off site of vegetation or soil contaminated by disease or pest infestation.
   1. Refer to Section 01 7425.

3.6 UTILITIES

A. Coordinate with utility companies and agencies as required. See Section 02 3100.

B. Where utility cutting, capping, or plugging is required, perform such work in accordance with requirements of the utility company or governmental agency having jurisdiction.

END OF SECTION 31 1000

SECTION 31 2000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. In accordance with pertinent provisions of this Section, trench, excavate, fill, backfill, compact, and grade the site to the elevations shown on the Drawings and as needed to meet the requirements of the construction shown in the Contract Documents.

B. The work of this Section includes, but is not limited to, the following:
   1. Preparation of sub-grade for buildings, walks, pavements, and landscaping.
   2. Site grading, cut, fill, and finish, off-haul or import of soil necessary to meet finish grades indicated on the Drawings.
   3. Excavation, backfill and compaction for filling construction and trenches.

C. Related Sections:
   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.
   2. Section 01 4520: Testing and inspection requirements.
   3. Section 01 5725: Storm Water Pollution Protection Plan.
   4. Section 01 7120: Field engineering.
   5. Section 22 0000: Excavation and backfill for plumbing work.
   6. Section 26 6000: Excavation and backfill for electrical work.
   7. Section 31 1000: Site clearing, removal and storage of top soil.

1.2 QUALITY ASSURANCE

A. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

B. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the geotechnical engineer.

C. Verify all grade and trench elevations as specified in Section 01 7120.

D. All improvements within property owned by a City, County or State Entity shall be in accordance with the Standard Specifications of the authority having jurisdiction.

1.3 TRENCHING AND EXCAVATION SAFETY

A. All trenches and excavation in excess of 4'-0" in depth and areas of visibly unstable soils shall be shored or otherwise stabilized in conformance with current local or state codes, ordinances and requirements. In addition, the Contractor shall notify the Owner of suspected hazardous waste or other unusual physical conditions as provided by law.

B. All open trenches and excavations outside the fenced construction area shall be properly barricaded for public and worker safety. Trenches shall be adequately covered or backfilled prior to ceasing work or leaving the work site.

C. Slope height, slope inclination, and excavation depths (including utility trench excavations) must in no case exceed those specified in local, state, or federal safety regulations, (e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations).

1.4 EXISTING UTILITIES

A. Field verify the location of all existing underground utilities prior to beginning any earthwork. Work around and protect all existing utilities during the course of the Work. Raise or lower each existing utility box flush with new finish surface.

B. Where existing utilities are indicated on the drawings, extreme care shall be exercised in excavating near these utilities to avoid damage, and the Contractor will be held responsible for any damage caused by construction operations.

C. Should utilities not indicated on the drawings be found during construction, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage arising from construction operations after discovery of these utilities.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Products specified are for establishing the type, design, and quality required. Products of equal or better type, design, and quality produced by other manufacturers will be considered provided the request for substitution is submitted in accordance with Section 01 2500.

2.2 SOIL MATERIALS

A. Fill and Backfill Materials: Fill shall consist of select material. Native soil, free from organic matter and rocks or cobbles larger than 3", may be used as fill at the site as follows:
   1. Satisfactory Soil Materials: Are defined as those complying with ASTM D2487 Soil Classification Groups GW, GP, GM, SM, SW, and SP.
   2. Unsatisfactory Soil Materials: are defined as those complying with ASTM D2487 Soil Classification Groups GC, SC, MH, ML, CL, CH, OL, OH, and PT.

B. Import Material: Import material, if required, shall consist of homogenous, non-corrosive, non-expansive, inorganic granular soils free of toxic materials and conforming to the following criteria:
   1. Gradation:
      a. 3" Sieve: 100% passing
      b. 3/4" Sieve: 80-100% passing
      c. No. 4 Sieve: 60-100% passing
      d. No. 200 Sieve: 20-70% passing
   2. Plasticity Index, ASTM D4318:
      a. Liquid limit: < 25
      b. Plasticity index: < 12
   3. Expansion Index: < 15
   4. Organic Content: < 3% by dry weight.
   5. Minimum "R" Value (pavement area): 40
   6. Corrosivity:
      a. pH: 6 to 8
      b. Minimum resistivity (ohm-cm): > 2,000
      c. Soluble sulfate (ppm): < 2,000

d. Soluble chloride (ppm): < 500

7. Import fill material shall be approved by the geotechnical engineer prior to transport to the site and provided at no additional cost to the Owner.

C. Engineered Fill Materials:
1. Satisfactory Soil Materials as defined in paragraph 2.2.A.1 above, or
2. Import Material defined in 2.2.B above.

D. Sand for Utility Bedding: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

E. Toxic Testing of Import Fill Material:
1. The Contractor shall notify the Owner, Architect, and Testing Laboratory for the project, of the location and origin of all fill material intended for this project. Such notification shall be not less than 21 days prior to transport of the material.
2. Both native and stockpile soils shall be subject to testing to determine suitability of the soil as related to toxic substances on school sites.
3. The Owner will pay for only one passing test from one import source. Additional tests, and retests of failed material shall be paid by the Contractor.
4. Should testing indicate toxic substances at levels above those acceptable on school sites by the State of California, Department of Toxic Substance Control (DTSC), the subject soil will not be permitted on the proposed school site.
5. Any delay caused by materials found not to be compliant, shall not be accepted as justification for contract time extension or related claims.

2.3 TOPSOIL

A. Topsoil:
1. Friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoils, roots, heavy or stiff clay, stones and gravel, noxious weeds, sticks, brush, litter, and other deleterious matter.
2. Provide from stockpile developed on site as specified in Section 31 1000.

2.4 ACCESSORY MATERIALS

A. Utility Identification Tape: 2" wide metallic plastic material inscribed with caution message related to the buried utility below (i.e., **ELECTRICAL LINE BURIED BELOW, SEWER LINE BURIED BELOW**, etc.) by McMaster-Carr or approved equal.

B. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by governmental agencies having jurisdiction.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. 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.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with pertinent provisions of this Section, Section 01 7120, and the Grading Plan.

3.3 DEWATERING AND WATER CONTROL

A. Water Control:
1. Establish and construct storm drainage features at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils.
2 Completely drain construction site during periods of construction to keep soil materials sufficiently dry.
3. Temporary excavations for the project construction should be left open only for as short a time as possible and should be protected from water runoff.

B. Dewatering:
1. Remove all water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
2. Keep excavations and site construction area free from water.
3. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
4. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
5. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from open excavations, unfinished fills, or other low areas to prevent softening of exposed surfaces.
6. Dispose of water away from the work in a suitable manner without damage to adjacent property or menace to public health.
7. Protect existing storm drain system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the Owner.

C. Unsuitable Soil Support: When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified.

3.4 DUST CONTROL

A. The San Joaquin Valley Air Pollution Control District regulates all dust control and emission standards throughout the Central Valley. Regulation VIII – Fugitive PM10 Prohibitions requires that a Dust Control Plan be completed for a large majority of construction projects.

B. The Contractor shall implement all measures listed in the Dust Control Plan as required for the project.

C. Construction work shall not commence until the Dust Control plan is completed and approved by the District.

D. Whether a Dust Control Plan is required for the project or not, the Contractor shall be responsible for complying with the requirements of Rule 8021.

3.5 PROCEDURES

A. Utilities:
1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Architect and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Utility Company.

B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

D. Maintain access to adjacent areas at all times.

3.6 BORING

A. Provide mechanical boring equipment to bore under existing asphalt, concrete, or other surfaces or objects as noted on the drawings. All borings shall be a minimum of 24" under the substrate material unless otherwise authorized by the Architect.

B. Holes shall be bored not to exceed 1" larger diameter than the largest component remaining in the excavation.

C. **Water or air pressure jetting** are not permitted, unless they comply with the following requirements.
1. All surfaces of the hole can be visually inspected with 6' maximum length and,
2. All objects shall be supported continuously to prevent sagging and,
3. The hole shall be filled with compacted damp sand and inspected by the Project Inspector or Materials Testing Lab technician.

D. Comply with requirements of Section 01 7330.

3.7 SITE PREPARATION

A. Preparation at Buildings:
1. After clearing, scarify the top 8" of subgrade at building pad recompact at a moisture content that will permit proper compaction to 95 percent of maximum density; ASTM D1557.
2. Extend compaction 5'-0" beyond the exterior footing line, including 5'-0" beyond exterior column footings.

B. Preparation at Asphalt Pavement:
1. After clearing, scarify the top 8" of subgrade at asphalt pavement areas and recompact at a moisture content that will permit proper compaction to 95 percent of maximum density; ASTM D1557.
2. Extend compaction 2'-0" beyond the outer limits of pavement areas.

C. Preparation at Site Concrete:
1. After clearing, scarify the top 8" of subgrade at site concrete areas and recompact at a moisture content that will permit proper compaction to 90 percent of maximum density; ASTM D1557.
2. Extend compaction 2'-0" beyond the outer limits of site concrete at new construction. No extension is required at areas of site concrete removal and replacement.

A. Over-excavation and Preparation at Buildings:
   1. After clearing, excavate native soils in areas indicated to a depth of 2'-0" below stripped ground surface, 4'-0" below final grade, or 2'-0" below bottom of proposed footing, whichever is deeper.
   2. At a minimum, include entire building areas, and extend at least 10'-0" beyond exterior footing line, including 10'-0" beyond exterior column footing edges.
   3. Remove roots and other vegetation remaining in excavated area which are larger than ½" in diameter.
   4. Scarify bottom of excavation to minimum depth of 6".
   5. Bring moisture conditions to above optimum moisture content and compact excavated area to a minimum of 90% of maximum dry density; ASTM D1557. The subgrade, to a depth of 24 inches, shall have a moisture content of at least 4 percent above optimum, immediately prior to pouring the slab or placing a vapor barrier; ASTM D3017.
   6. Place engineered fill materials required to establish finish grade in lifts no greater than 8" loose depth and compact to a minimum of 90% of maximum dry density; ASTM D1557.

B. Over-excavation and Preparation at Asphalt Pavement:
   1. Excavate native soils to a minimum depth of 2'-0" below the bottom [the top] of pavement subgrade or existing subgrade, whichever is deeper, in an area extending a minimum of 10'-0" beyond the edge of the pavements.
   2. Remove roots and other vegetation remaining in excavated area which are larger than ½" in diameter.
   3. Scarify bottom of excavation to minimum depth of 6".
   4. Bring moisture conditions to above optimum moisture content and compact excavated area to a minimum of 95% of maximum dry density; ASTM D1557. The subgrade, to a depth of 24 inches, shall have a moisture content of at least 4 percent above optimum; ASTM D3017.
   5. Place engineered fill materials required to establish finish grade in lifts no greater than 8" loose depth and compact to a minimum of 95% of maximum dry density; ASTM D1557.
   6. Compact the top 12" of subgrade to a minimum of 95% of maximum dry density; ASTM D1557.

C. Over-excavation and Preparation at Site Concrete:
   1. Excavate native soils to a minimum depth of 2'-0"below the bottom [the top] of concrete subgrade or existing subgrade, whichever is deeper, in an area extending a minimum of 5'-0" beyond the edge of the improvements.
   2. Remove roots and other vegetation remaining in excavated area which are larger than ½" in diameter.
   3. Scarify bottom of excavation to minimum depth of 6".
   4. Bring moisture conditions to above optimum moisture content and compact excavated area to a minimum of 90% of maximum dry density; ASTM D1557. The subgrade, to a depth of 24 inches, shall have a moisture content of at least 4 percent above optimum, immediately prior to pouring concrete or placing a vapor barrier; ASTM D3017.
   5. Place engineered fill materials required to establish finish grade in lifts no greater than 8" loose depth and compact to a minimum of 90% of maximum dry density; ASTM D1557.
   6. Compact the top 12" of subgrade to a minimum of 95% of maximum dry density; ASTM D1557.

D. Root Removal at Trees:
   1. Completely remove root systems to a minimum depth of 24" below the bottom of the lowest structure or footing or 36" below finished subgrade, whichever is lower.
   2. Excavate root systems deeper than the elevation indicated above to allow no roots larger than 2" in diameter.
   3. Treat roots remaining in the soil with a weed killer approved by the State of California for that purpose.
   4. Backfill cavities resulting from root removal with earth materials placed and compacted as required by this Section.

3.8 EXCAVATION

A. Perform excavation of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Earth excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

C. Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42" wide bucket on a track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90 HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10'-0" in width and pits in excess of 30'-0" in either length or width are classified as open excavation.

D. Surplus Materials: Dispose of unsatisfactory excavated materials, and surplus satisfactory excavated material, away from the site at disposal areas arranged and paid for by the Contractor.

E. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect who will make an inspection of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect/Engineer. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Unauthorized Excavation:
   1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from the Architect or the geotechnical engineer.
   2. Under footings, foundations, or retaining walls:
      a. Fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
      b. When acceptable to the geotechnical engineer, lean concrete (minimum 2000 psi) may be used to bring bottom elevations to proper position.
   3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by the geotechnical engineer.

H. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

I. Stability of Excavations:
   1. Slope sides of excavation to comply with local codes and ordinances having jurisdiction.
   2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.
   3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

J. Shoring and Bracing:
   1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with requirements of governmental agencies having jurisdiction.
   2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.
   3. Carry shoring and bracing down as excavation progresses.

K. Use of Explosives: **NOT PERMITTED**.

3.9 FILLING AND BACKFILLING

A. Backfill excavations as promptly as progress of the Work permits, but not until:
1. Acceptance of construction below finish grade:
2. Inspecting, testing, approving, and recording locations of underground utilities;
3. Concrete formwork is removed;
4. Shoring and bracing are removed, and voids have been backfilled with satisfactory materials;
5. Trash and debris have been removed; and
6. Horizontal bracing is in place on horizontally supported walls.

B. Placing and Compaction:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for the area.

C. Moisture Content:
1. When the moisture content of fill material is below the lower limit specified by the Geotechnical Engineer, add water until the moisture content is as specified.
2. When the moisture content of fill material is above the upper limit specified, the material shall be aerated by blading or other satisfactory methods until the moisture content is as specified.
3. Do not place, spread, or compact fill while it is frozen or thawing or during unfavorable weather conditions. When work is interrupted by weather conditions, do not resume fill operations until moisture content and density of previously placed fill are satisfactory.
4. Where soil has been softened or eroded by flooding, by placement during unfavorable weather, remove damaged areas and recompact as described for fill and compaction.
5. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
6. Where subgrade is spongy or pumping due to conditions beyond the Contractor's control, and aeration or other methods do not bring moisture content within specified levels, stop work and contact the Architect and Geotechnical Engineer for further direction.

3.10 TOPSOIL

A. Place topsoil to the following compacted thicknesses:
1. Areas to be seeded: 6"
2. Areas to be sodded: 4"
3. Shrub beds: 18"
4. Flower beds: 12"

B. Topsoil Placement:
1. Where topsoil is to be placed, scarify surface to depth of 6".
2. Place topsoil during dry weather.
3. Remove roots, weeds, rocks, and foreign material while spreading.
4. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
5. Roll placed topsoil.

3.11 TRENCHING

A. Trenching:
1. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
2. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
3. Do not interfere with 45 degree bearing splay of foundations.
4. Cut trenches wide enough to allow inspection of installed utilities.

5. Hand trim excavations. Remove loose matter.
6. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
7. Remove lumped subsoil, boulders, and rock up to 1.0 cu yd measured by volume.
8. Remove excavated material that is unsuitable for re-use from site.
9. Stockpile excavated material to be re-used in area designated on site in accordance with this Section 31 2000.
10. Remove excess excavated material from site.

B. Preparation for Utility Placement:
1. Cut out soft areas of subgrade not capable of compaction in place. Backfill with engineered fill.
2. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
3. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

C. Backfilling:
1. Backfill to contours and elevations indicated using unfrozen materials.
2. Employ a placement method that does not disturb or damage other work.
3. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
4. Maintain optimum moisture content of fill materials to attain required compaction density.
5. Slope grade away from building. Make gradual grade changes. Blend slope into level areas.
6. Correct areas that are over-excavated.
7. Reshape and re-compact fills subjected to vehicular traffic.

D. Utility Installation: Install underground utilities according to the manufacturer's written recommendations. In addition to the manufacturer's recommendations, install underground utilities as follows:
1. Underground Utility Line Cover: No less than 12".
2. Bedding: Minimum of 6" compacted sand bedding under the pipe or conduit.
3. Envelope: Compacted sand extending 6" above and around the pipe or conduit.
4. Backfill Material: Remaining backfill material may consist of native soil or engineered fill material as described above.
5. Place and compact utility trench backfill in accordance with the requirements for engineered fill.

E. Utility Identification:
1. Utility Identification Tape: 2" wide metallic plastic material inscribed with a CAUTION message related to the buried utility.
2. Identify each utility pipe or conduit by the use of a continuous underground warning tape.
3. Locate tape 12" directly above the pipe or conduit, but not more than 12" below or not less than 6" below the finished grade.
    a. Where the top of the pipe or conduit exceeds 4'-0" below finish surface, locate one tape 12" directly above the pipe or conduit and one tape not less than 6" below the finished grade.
4. Provide one strip of identification tape for each 18" of trench width, horizontally.

3.12 GRADING

A. General: Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas. Smooth the finished surfaces within specified tolerance.

B. Finish Grading Outside Building Lines:
1. Grade areas adjacent to buildings to achieve drainage away from the structures, and to prevent ponding.
2. Finish the surfaces to be free from irregular surface changes, and:
    a. Shape the surface of areas scheduled to be under walks to line, grade, and cross-section, with finished surface not more than 0.10 foot above or below the required subgrade elevation.

b. Shape the surface of areas scheduled to be under pavement to line, grade, and cross-section, with finished surface not more than 0.10 feet above or below the required subgrade elevation.
c. Shape finish grade adjacent to building to slope a minimum of 2% away from the exterior footings and wall, for a distance of 5'-0".

3.13 COMPACTION

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557.

B. Moisture Control: Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.

C. Densities: Provide not less than the following maximum density of soil material compacted at each layer of soil material in place, and as approved by the geotechnical engineer.
1. **Buildings, Asphalt Paving and Site Concrete:** As specified in paragraph 3.7.
2. **Lawn and unpaved areas:** Compact the top 6" of subgrade and each layer of fill material or backfill material at 85% of maximum density;
3. **Trenches:** Provide a minimum of 3" of compacted sand bedding under pipe or conduit, and provide envelope extending 12" above pipe or conduit. Compact remaining backfill to 90% of maximum density except the upper 24" of those trenches located within structures, walks, and pavement areas which shall be compacted as specified in section 3.7.

3.14 FIELD QUALITY CONTROL

A. Secure the Geotechnical Engineer's inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon.

B. The Owner's testing laboratory will provide at least the following tests:
1. At paved areas, at least 1 field density/moisture test for every 10,000 sq. ft. of paved area, but not less than 3 tests.
2. In each compacted underlying fill layer, 1 field density/moisture test for every 7,500 sq. ft. of overlaying paved area, but not less than 3 tests.
3. In building areas, at least 1 field density/moisture test for every 2,000 sq. ft. of building coverage.
4. At least 1 field density/moisture test per every 200 lineal foot of trench over 3'-0" of trench depth.

C. If, in the Geotechnical Engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Section 01 4520 of these Specifications.

END OF SECTION 31 2000