Project Manual

Project No.: 17-0311
Issue Date: May 24, 2018

Tri-City Medical Center

Parking Structure

4002 Vista Way
Oceanside, California 92056

Construction Documents

OWNER:

Tri-City Medical Center
4002 Vista Way
Oceanside, California 92056

ARCHITECT:

CUNINGHAM
GROUP

Cuningham Group Architecture, Inc.
1030 G Street
San Diego, California 92101

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SECTION 00 01 00 - CERTIFICATIONS AND SEALS

PROJECT: **TRI-CITY MEDICAL CENTER**
Parking Structure
4002 Vista Way
Oceanside, California 92056

PROJECT NO.: **17-0311**

ARCHITECT'S CERTIFICATION:

I hereby certify that Divisions 01 through 02 Sections of this Specification indicated by "CGA" in the Table of Contents were prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of California.

Architect's Firm Name: Cuningham Group Architecture, Inc.

Date: January 12, 2018

Seal

PARKING STRUCTURE ARCHITECT'S CERTIFICATION:

I hereby certify that Division 01, Divisions 07 through 14, and Division 32 of this Specification were prepared by me or under my direct supervision unless indicated otherwise and that I am a duly Licensed Architect under the laws of the State of California.

Architect's Firm Name: IPD

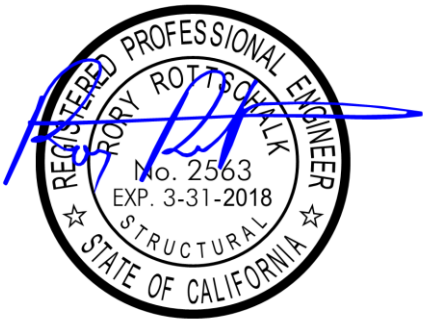
Date: January 12, 2018

Seal

STRUCTURAL ENGINEER'S CERTIFICATION:

I hereby certify that Divisions 03 through 06 of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.

Engineer's Firm Name: Culp & Tanner



Date: January 12, 2018

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MECHANICAL ENGINEER'S CERTIFICATION:

I hereby certify that Divisions 22 through 23 Sections of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.

Engineer's Firm Name: Dufoe Consulting Engineers

Date: January 12, 2018

Seal

ELECTRICAL ENGINEER'S CERTIFICATION:

I hereby certify that Division 26 Sections of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.

Engineer's Firm Name: Randall Lamb

Date: January 12, 2018

Seal

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SECTION 00 01 03 - PROJECT DIRECTORY

PROJECT:	**TRI-CITY MEDICAL CENTER** **Parking Structure** 4002 Vista Way Oceanside, California 92056
PROJECT NO.:	**17-0311**
OWNER:	Tri-City Medical Center 4002 Vista Way Oceanside, California 92056
ARCHITECT:	Cuningham Group Architecture, Inc. 1030 G Street San Diego, California 92101 Telephone: (619) 849-1080 Facsimile: (619) 849-1089
PARKING STRUCTURE ARCHITECT:	IPD 2 Faraday, Suite 101 Irvine, California 92618 Telephone: (818) 986-1494 Facsimile: (818) 906-8697
CIVIL ENGINEER:	BWE 9449 Balboa Avenue, Suite 270 San Diego, California 92123 Telephone: (619) 299-5550 Facsimile: (619) 299-9934
STRUCTURAL ENGINEER:	CULP & TANNER 55 Independence Circle, Suite 201 Chico, California 95973 Telephone: (530) 895-3518 Facsimile: (530) 895-3544
LANDSCAPE ARCHITECT:	James P. Benedetti, Landscape Architect 4403 Manchester Avenue, Suite 201 Encinitas, California 92024 Telephone: (760) 479-0644 Facsimile: (760) 479-0645

MECHANICAL ENGINEER: Dufoe Consulting Engineers
9665 Chesapeake Drive, Suite 320
San Diego, California 92123
Telephone: (858) 368-8630
Facsimile: (858) 517-3293

ELECTRICAL ENGINEER: Randall Lamb
4757 Palm Drive
La Mesa, California 91942
Telephone: (619) 713-5700

LOW VOLTAGE/SECURITY: Guidepost Solutions LLC
633 West Fifth Street, Suite 260
Los Angeles, California 90071
Telephone: (213) 624-9000
Facsimile: (213) 624-9001

END OF DOCUMENT

SECTION 00 01 10 - TABLE OF CONTENTS

DIVISION 04 - MASONRY

DIVISION 05 - METALS

DIVISION 06 - WOOD

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

DIVISION 09 - FINISHES

DIVISION 10 - SPECIALTIES

DIVISION 11 - EQUIPMENT

DIVISION 12 - FURNISHINGS

DIVISION 14 - CONVEYING EQUIPMENT

DIVISION 21 – FIRE SUPPRESSION

DIVISION 22 – PLUMBING

DIVISION 23 - HEATING, VENTING, AND AIR CONDITIONING (HVAC)

DIVISION 26 – ELECTRICAL

END OF SECTION

SECTION 00 50 00 - CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.1 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.

B. Closeout Forms:
   1. Joint Warranty Form: Sample joint warranty form is attached at the end of this section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 50 00.01 - JOINT WARRANTY FORM

Submit the warranties on the following format:

(Contractor's or Subcontractor's Letterhead)

WARRANTY FOR _____
We hereby warrant/guarantee that all materials and equipment for the _____ which we have installed at _____ are new unless otherwise specified, and that all Work is of good quality, free from faults and defects and in conformance with the Contract Documents, and that the Work as installed will fulfill the requirements of the warranty/guarantee included in the specifications. All work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.

If, within _____ year(s) after the Date of Substantial Completion, Final Acceptance of the Work or designated portion thereof or within _____ year(s) after acceptance by the Owner of designated equipment/materials or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, we agree to correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously issued a written acceptance of such condition. We agree to repair or replace any or all of our Work, together with any other adjacent Work which may be displaced by so doing, that may prove to be defective in its workmanship or material, without any expense whatsoever to the Owner, without interruption of building use or service without mutual agreement by the Owner, ordinary wear and tear and usual abuse or neglect excepted. This obligation shall survive termination of the Contract.

If we fail to commence compliance with the above paragraph within seven (7) days after receipt of written notice from the Owner to do so, or fail to pursue such compliance with diligence, we, jointly and severally (collectively or separately), do hereby authorize the Owner to proceed to have the defects repaired and made good at our sole expense, including compensation for the Architect's additional services made necessary by such default, and we will honor and pay the costs and charges for it together with interest at the maximum rate then permitted by governing state law, upon demand. If applicable, the Owner is authorized use of bonding funds as recourse for payment of these expenses. If we fail to fulfill the preceding obligations, and if the Owner brings action to enforce this warranty, we agree to pay the Owner's reasonable attorney's fees incurred in connection therewith.

This warranty is for _____ year(s).

Signed _____ (Subcontractor)

Date _____

Countersigned _____ (General Contractor)

Countersigned _____ (Material Manufacturer)

END OF SECTION

SECTION 00 63 25 - SUBSTITUTION REQUEST FORM

CONTRACTOR: _____ **REQUEST NO.:** _____
TO: CGA, ATTN: _____ **SECTION:** _____

Disciplines Impacted: [ ] Structural [ ] Mechanical [ ] Electrical [ ] Architectural
[ ] Civil [ ] Landscape [ ] Foodservice [ ] _____

By submitting substitution, Contractor stipulates the following statements are correct:
Proposed substitution does not alter dimensions or dimensional relationships shown on drawings.
The Architect's costs caused by proposed substitution will be compensated per Section 01 25 00**.**
Proposed substitution does not adversely impact schedule or coordination of work by others.
Proposed substitution will not adversely impact warranty requirements.
Proposed substitution will not adversely impact availability of service, maintenance or replacement parts.
Summary of Proposed Substitution: _____

Reason for Proposed Substitution: _____

Comparison of proposed item to specified per Section 01 25 00.	[ ] Attached	[ ] Under separate cover
Name and location of three similar applications:	[ ] Attached	[ ] Under separate cover
Description of required changes to the drawings and project manual:	[ ] Attached	[ ] Under separate cover
Description of impact on applicable code requirements:	[ ] Attached	[ ] Under separate cover
Name and location of maintenance service and parts supply:	[ ] Attached	[ ] Under separate cover

If Substitution Request is accepted, there will be:

Possible Cost Impact:	[ ] Increase	[ ] Decrease	[ ] No Change	[ ] Unknown
Possible Time Impact:	[ ] Increase	[ ] Decrease	[ ] No Change	[ ] Unknown

Action on this Substitution Request is requested as soon as possible, but no later than _____ **[ ] Priority Attention Required**

_____ Copies to: _____
Contractor's Representative _____

Architect's Response: Date: _____
[ ] Increase [ ] Decrease [ ] No Change [ ] Unknown

_____ Copies to: _____
Cuningham Group Representative

_____ Copies to: _____
Owner's Representative

END OF SECTION

SECTION 01 10 00 - SUMMARY

PART 1 GENERAL

1.1 PROJECT

A. Project Name: Tri-City Medical Center Parking Structure

B. Owner's Name: Tri-City Medical Center.

C. Architect's Name: Cuningham Group Architecture, Inc..

D. The Project consists of the construction of a parking structure and associated site work.

1.2 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings.

B. Scope of alterations work is indicated on drawings.

1.3 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner after Substantial Completion.

B. Owner will supply and install items indicated as OF/OI (Owner Furnished, Owner Installed) or OF/VI (Owner Furnished, Vendor Installed). Coordinate access to site as required.

C. Owner will supply items indicated as OF/CI (Owner Furnished, Contractor Installed) for installation by Contractor. Coordinate installation.

1.4 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the premises during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.5 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.
   4. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Time Restrictions:
   1. Limit conduct of especially noisy, malodorous, and dusty exterior work to hours specified by Owner and in compliance with City regulations.

E. Utility Outages and Shutdown:
   1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   2. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Procedures for preparation and submittal of applications for progress payments.

C. Documentation of changes in Contract Sum and Contract Time.

D. Change procedures.

E. Correlation of Contractor submittals based on changes.

F. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Project record documents.

1.3 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Schedule of Values per schedule defined in General Conditions, modified per Supplementary Conditions and as specified.

E. Identification: Include on Schedule of Values the following:
   1. Project name and location.
   2. Name of Architect.
   3. Architect's project number.
   4. Contractor's name and address.
   5. Date of Submittal.
   6. Name of subcontractor.
   7. Name of manufacturer or fabricator where applicable.
   8. Name of supplier where applicable.

F. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
   1. Include Change Order amounts allocated to the line item.
   2. Include total dollar value of item. Round amounts to nearest dollar.
   3. Indicate percentage of Contract Sum represented by item, rounded to nearest one hundredth of one percent, adjusted to total 100 percent. The total of the amounts of all scheduled line items shall equal the Contract Sum.

G. Correlate line items with terms and identification used in other administrative work items, including schedules, list of subcontractors, list of products and suppliers, and submittal schedule.

H. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

I. Where Application For Payment includes requests for equipment, components or materials purchased, stored or fabricated, but not yet installed, provide separate line item in Schedule of Values for such items. Break down such items to include component, equipment, or material cost for each phase or sequence of construction, with associated staging, transport and installation cost.

J. Revise schedule to list approved Change Orders and Construction Change Directives, with each Application For Payment.

K. The amounts shown on Schedule of Values may be used by Owner to determine the true value for additive or deductive change orders.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit Applications for Progress Payments as follows:
1. Submit initial rough draft of payment application to Architect and Owner for review.
2. Architect will return initial rough draft of payment application to Contractor following review.
3. Submit adjusted payment application to Architect.

E. For each item, provide a column for listing each of the following:
1. Item Number.
2. Description of work.
3. Scheduled Values.
4. Previous Applications.
5. Work in Place under this Application.
6. Authorized Change Orders.
7. Total Completed to Date of Application.
8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

F. Complete every entry on the form, and execute notarized certification by signature of authorized officer. Incomplete applications will be returned without action.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed .
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

H. List each authorized Change Order and Construction Change Directive issued prior to the last day of the construction period covered by the application as a separate line item, listing Change Order or Construction Change Directive number and dollar amount as for an original item of Work.

I. Submit one electronic and three hard-copies of each Application for Payment unless agreed upon otherwise.

J. Include the following with the application:
1. Transmittal letter as specified for submittals in Section 01 30 00.
2. Construction progress schedule, revised and current as specified in Section 01 32 16.
3. Current construction photographs specified in Section 01 30 00.
4. Conditional lien releases for work covered by current application, and unconditional releases for work covered by previous month's billings.
5. Project record documents as specified in Section 01 78 00, for review by Owner which will be returned to the Contractor.

K. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. General
1. Contractor shall establish measures as needed to assure familiarity of the Contractor’s staff and employees with procedures for processing changes to the Contract Documents.
2. The Contractor shall maintain and coordinate a Register of RFI’s, Architect's Supplemental Instructions, Contractor Change Order Requests, Construction Change Directives, and

Change Orders at the job site, accurately reflecting current status of all pertinent data as submitted by the Contractor.

3. Architect will provide a single copy of all documents issued under this article for transmission to Contractor. Contractor shall prepare copies as required for distribution to subcontractors, suppliers and others at no cost to Owner.

B. Architect's Supplemental Instructions (ASI): The Architect will advise of minor changes in the Work that do not involve an adjustment to Contract Sum or Contract Time by issuing supplemental instructions on AIA Form G710 or other Architect-issued document.
   1. If Contractor considers the minor change does represent a change in the Contract, Contractor shall immediately notify the Architect of Contractor's intention to make a claim.

C. Proposal Request (PR): The Architect may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised drawings and specifications.
   1. Analyze the described change and its impact on costs and time. Submit response within 10 days. If accepted by Owner, Architect will prepare Change Order.
   2. When requested, meet with the Architect as required to explain costs and, when appropriate, determine other acceptable ways to achieve the desired objective.
   3. Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the Owner’s cost for making the change, advising the Architect in writing when such avoidance no longer is practicable.
   4. Following review, and if accepted by Owner, Architect will prepare Change Order.

D. Change Order Request (COR):
   1. Contractor may submit a COR to the Architect for changes in conditions, Owner changes, or other direction from the Architect, jurisdictional authority or Owner's Inspector.
   2. Document the proposed change and its complete impact, including its effect on the cost and schedule of the work.
   3. Present total cost and schedule impacts in documentation, including all markups permitted by General Conditions. Provide detailed substantiating documentation as required by Architect, including supplier costs, subcontractor labor time and rates, and all other data deemed necessary by Architect for Owner’s and Architect’s review of COR.
   4. Following final review by Architect and Owner of original and supplemental information, and if COR is accepted, no additional cost or schedule adjustments will be included.
   5. Architect will review COR. If accepted, Architect will prepare a Change Order or Construction Change Directive.

E. Change Order (CO): Change Orders and Construction Change Directives will be issued by the Architect in accordance with procedures established in General Conditions.
   1. Execution of Change Orders: Architect will issue Change Orders for signatures of Owner, Architect, and Contractor as provided in the General Conditions of the Contract.

F. Construction Change Directives (CCD): CCD's will be issued by the Architect in those cases where contract cost or time for the modification is in dispute..
   1. Construction Change Directive Forms: AIA G714 Construction Change Directive Form, current edition, or other format as selected by Architect.
   2. Execution of Construction Change Directive: Architect will issue CCD with Owner's signature. Proceed with work as defined by CCD.
   3. Unless otherwise agreed, maintain detailed records of work done under the direction of a CCD on Time and Material basis. Provide full information required to substantiate costs for changes in the Work.
   4. Following agreement on cost of the work, a Change Order will be prepared.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.

2. Support each claim for additional costs with additional information:
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
   a. No payment on Time and Materials basis will be made without signature of Owner's Inspector certifying time spent and materials used. Architect and Owner's Inspector shall establish documentation and reporting procedure for Time and Material certification.

H. 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.

I. 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.

J. Promptly enter changes in Project Record Documents.

1.6 PAYMENT FOR CONTRACT DOCUMENT MODIFICATIONS

A. The Contractor shall compensate the Owner, by Owner-Contractor Contract adjustment, for the Architect reasonable costs to modify Contract Documents required by work not performed in accordance with approved Contract Documents.

1.7 OWNER'S INSPECTOR PAYMENT PROVISIONS

A. In the event Contractor's performance of the work activities requires the Owner's Inspector to work overtime, holidays or weekends, Inspector's cost shall be reimbursed by Contractor to Owner by deductive contract adjustment.

1.8 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 21 00 – ALLOWANCES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. This Section of the specification sets forth the extent of Allowances described hereinafter. Work performed under allowances shall conform fully to all applicable parts of these specifications and drawings.
   1. The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents.
   2. The Contractor shall cause the Work/materials covered by these allowances to be performed for such amounts and by such persons as the Owner may direct, but he will not be required to employ persons against whom he makes a reasonable objection. If the actual cost, when determined, is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order.
   3. Allowances shall cover the net cost of the materials/products and equipment delivered and unloaded at the site and all applicable taxes. The Contractor's handling costs on the site, labor, installation costs, overhead, profit, and other expenses shall be included in the Contract Sum and not in the Allowances.
   4. Cash allowance shall include complete work in place with all costs accounted for.

C. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

1.02 SELECTION AND PURCHASE

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

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

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

1.03 REQUIREMENTS

A. Designate in the construction schedule delivery dates for products and assemblies specified by allowances.

B. Notify Architect of any effect anticipated by selection of product or supplier under consideration related to construction schedule or Contract Sum.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.
C. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

1.05 ADJUSTMENTS OF COST

A. Should actual purchase cost be more or less than specified amount of allowance, Contract Sum will be adjusted by Change Order equal to amount of difference.

B. A percentage to cover Contractors overhead and profit, as stated in Agreement, will be applied to difference in cost.

2.00 PRODUCTS - NOT USED

3.00 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 SCHEDULE OF ALLOWANCES

Provide allowances to cover the cost of items listed. Actual costs shall be hereinafter determined from an itemized list or written instructions furnished by the Architect.

A. Allow the sum of One Thousand Dollars ($8,000.00) for sealing of cracks in concrete floor decks, primarily at the roof deck. This allowance is to be used at the Owners discretion, including means and methods, in addition to the caulking and sealant indicated and called for in the Contract Documents and will be utilized for sealing of cracks, if any, not attributable to faulty construction, or improper construction methods by Contractor. Completion of this additional caulking and/or sealing procedure, as mutually approved by the Owner and Contractor shall enact the deck warranty as specified under Section 01 10 00, Special Conditions.

B. Provide allowance for five (5) tons of reinforcing rods fabricated and installed over and above the requirements shown on drawings. This extra steel shall be installed during course of construction at locations and to fabrication shapes and sizes, as directed by the Architect. Credit, using unit prices shall be given the Owner for any such steel not actually used. Refer to Section 03200, Reinforcing Steel.

C. Provide allowance for one (1) ton (2,000 lbs.) of additional post tensioning steel tendons and associated materials, anchorage, plates, enclosures, as required, installed over and above the requirements shown on drawings. These extra materials shall be installed during course of construction at locations as directed by the Architect. Credit, using unit prices, shall be given the Owner for any material not actually used. Refer to Section 03 38 00, Post Tensioned Concrete.

D. Provide allowance for three (3) tons of structural steel shapes and plates fabricated and installed over and above the requirements shown on drawings. This extra structural steel shall be installed during course of construction at locations and to fabrication shapes and sizes, as directed by the Architect. Credit, using unit prices shall be given the Owner for any such steel not actually used. Refer to Section 05 12 00, Structural Steel.

END OF SECTION

SECTION 01 22 00 – UNIT PRICES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. This Section of the specification sets forth the extent of Unit Prices described hereinafter. Work performed under Unit Prices shall conform fully to all applicable parts of these specifications and drawings.

1.02 REQUIREMENTS

A. Description: Adjust changes in the Contract Price in accordance with this list of unit prices stated in the Bid when accepted by the Owner.

B Costs Included: Unit prices include all costs and charges for items installed and completely in place, including costs for material, labor, shop drawings, fabrication, delivery and hauling, handling, installation or application, supervision, taxes, fees, employer's contributions, insurance, bonds, rentals, utility costs, overhead, and profit.

C. Unbalanced Unit Prices: Proposed unit prices which are so unbalanced as to be detrimental to Owner's interests will be rejected and may invalidate entire Bid at Owner's discretion.

D. Quotations: For each unit price item, include a price for added work (additive price) and a price for omitted work (deductive price), or single unit price (add/deduct) where noted.

E. Duration of Unit Prices: All unit prices shall be held good and unchanged until the final acceptance of the entire work unless otherwise specified or agreed.

1.03 CHANGES IN WORK - UNIT PRICES

A. Reinforcing Steel: Quote additive / deductive unit price per pound for various weights of fabricated and non-fabricated (flat) reinforcing steel, complete in place / installed. Fabricated bars shall include an average unit cost per pound for average size indicated for column or beam ties, spandrel panel bars etc., including some straight non-fabricated bars shall include an average cost per pound for average size as indicated for straight bar (flat) installed. Refer to Section 01 21 00, Allowances; and Section 03 20 00, Reinforcing Steel.

B. Post Tensioning Steel: Quote an additive / deductive unit price per ton for sheathed post tensioning steel tendons and associated materials, anchorage, plates, enclosures, caps, etc. Price shall include materials and labor as required to install additional tendons in place, including chairs, wire, associated materials and the stressing required during course of construction at locations as directed by the Architect. Refer to Section 01 21 00, Allowances; and Section 03 38 00, Post Tensioned Concrete.

C. Structural Steel: Quote additive and deductive unit prices per ton for various weights of miscellaneous members, complete in place, including all material, fabrication, shop drawings, shop testing, erection, connections, and related items. Refer to Section 05 12 00, Structural Steel.

END OF SECTION

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

A. Section 00 63 25 - Substitution Request Form: Required form for substitution requests.

B. Section 01 21 00 - Allowances, for cash allowances affecting this section.

C. Section 01 22 00 - Unit Prices, for additional unit price requirements.

D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

F. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.3 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
      a. Consideration of whether a substituted product is equal to that specified will include all characteristics of the specified product, based on published data available from the specified manufacturer, whether listed in the specification or not.
      b. Where the substituted manufacturer's standard product is not equal to that specified, the substituted manufacturer shall provide custom or non-standard products, system components, fabrication, and configuration as necessary to comply with specified criteria, whether or not such criteria are the substituted manufacturers standard or stock item.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

a. The Contractor shall pay the Architect and its Consultants for all services rendered for drawings, calculations, review time, and/or agency plan check time for each substitution request.
b. Compensation shall be made by an adjustment to the Contract amount.
c. Compensation as agreed upon shall be paid by the Contractor regardless of whether the substitution is approved or rejected.
d. Review of substitutions shall proceed upon agreement and approval of fees.
e. Where required by authorities having jurisdiction, Contractor shall pay all plan check fees or fees required to obtain approval.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
1. Use form indicated in the Project Manual for this purpose or other agreed upon form. Contractor's Substitution Request documentation must include the following:
a. Project Information:
1) Official project name and number, and any additional required identifiers established in Contract Documents.
2) Owner's, Architect's, and Contractor's names.
b. Substitution Request Information:
1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
2) Indication of whether the substitution is for cause or convenience.
3) Issue date.
4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
5) Description of Substitution.
6) Reason why the specified item cannot be provided.
7) Differences between proposed substitution and specified item.
8) Description of how proposed substitution affects other parts of work.
(a) Include coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by the Owner and separate contractors, that will become necessary to accommodate the proposed substitution.
c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
1) Physical characteristics.
2) In-service performance.
3) Expected durability.
4) Visual effect.
5) Sustainable design features.
6) Warranties.
7) Other salient features and requirements.
8) Include, as appropriate or requested, the following types of documentation:
(a) Product Data:
(b) Samples.
(c) Certificates, test, reports or similar qualification data.
(d) Drawings, when required to show impact on adjacent construction elements.
d. Impact of Substitution:
1) Savings to Owner for accepting substitution.
2) Change to Contract Time due to accepting substitution.

(a) Include a statement indicating the substitution's effect on the Construction Progress Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

F. Where substitution request is rejected, provide submittal for specified product within five days of receipt of notice rejection.

G. Where decision cannot be made within the time required for orderly and uninterrupted work progress, provide the specified product.

H. No product may be substituted without a prior submittal to and approval by the Architect.

I. Unauthorized and unapproved substitution of material shall be removed from the Site and replaced with specified material at no additional cost to the Owner.

J. A maximum of one substitution request shall be submitted for any one item.

K. Substitutions with material effect on the project will be submitted for approval of authorities having jurisdiction prior to fabrication or installation.

3.2 SUBSTITUTION PROCEDURES DURING BIDDING PHASE

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

3.3 SUBSTITUTION PROCEDURES AFTER BIDDING PHASE

A. Architect will consider requests for substitutions only within 30 days after date established in Notice to Proceed.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
      b. Other construction by Owner.
      c. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
   1. Architect's decision following review of proposed substitution will be noted on the submitted form.

2. Consideration of whether a substituted product is equal to that specified is solely the decision of the Architect.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.
B. Preconstruction meeting.
C. Progress meetings.
D. Progress photographs.
E. Submittals for review, information, and project closeout.
F. Number of copies of submittals.
G. Requests for Information (RFI) procedures.
H. Submittal procedures.
I. Deferred Approvals.

1.2 RELATED REQUIREMENTS

A. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.
B. Section 01 30 00.01 - Request for Information Form.
C. Section 01 60 00 - Product Requirements: General product requirements.
D. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
E. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Conform to requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
B. Make the following types of submittals to Architect:
    1. Requests for Information (RFI).
    2. Requests for substitution.
    3. Shop drawings, product data, and samples.
    4. Test and inspection reports.
    5. Design data.
    6. Manufacturer's instructions and field reports.
    7. Applications for payment and change order requests.
    8. Progress schedules.
    9. Coordination drawings.
    10. Correction Punch List and Final Correction Punch List for Substantial Completion.
    11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Schedule meeting within 15 working days after Notice of Award.
B. Attendance Required:
    1. Owner.
    2. Architect.

3. Contractor and major subcontractors, including assigned Superintendent and Foreman. Obtain Architect's prior approval of major subcontractors' attendance.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
4. Designation of personnel representing the parties to Contract, Owner and Architect.
5. Organizational structure of project and other project characteristics.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling, including coordination of work by others.
8. Use of premises by Owner and Contractor.
9. Owner's requirements and partial occupancy.
10. Construction facilities and controls provided by Owner.
11. Temporary utilities considerations.
12. Security and housekeeping procedures.
13. Procedures for testing.
14. Procedures for maintaining record documents.
15. Requirements for start-up of equipment.
16. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within five days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.2 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
1. Contractor shall assign the same staff members to represent and act on behalf of the Contractor at all progress meetings.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors and suppliers.
7. Others as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.

14. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.
   1. Minutes shall record discussion, actions taken, and issues assigned to parties responsible for resolution.
   2. Published minutes will be accepted as properly stating the activities and decision of the Meeting unless they are challenged in writing prior to the next regularly scheduled Progress Meeting.
      a. Persons challenging published minutes are responsible to reproduce and distribute copies of challenge to all recipients of the particular minutes being challenged.
      b. Settle any challenges as priority items of 'old business' at the next regularly scheduled meeting.

3.3 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01 32 16

3.4 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 5 working days maximum prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:
   1. Structural framing in progress and upon completion.
   2. Final completion, minimum of ten (10) photos.

E. Take photographs as evidence of existing project conditions as follows:
   1. Interior views: Two.
   2. Exterior views: Three.

F. Views:
   1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
   2. Consult with Architect for instructions on views required.
   3. Provide factual presentation.
   4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
   1. Delivery Medium: Via email.
   2. File Naming: Include project identification, date and time of view, and view identification, including orientation.
   3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.5 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
   1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
   2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers. RFIs submitted by subcontractors or suppliers will not be reviewed.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare in a format and with content acceptable to Owner.
      a. Use form indicated in the Project Manual for this purpose or other agreed upon form.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response.
      a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.

4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

G. Review Time: Architect will respond and return RFIs to Contractor within seven working days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 3:00 PM on Mondays through Thursdays will be considered as having been received on the following regular working day; RFIs received after 9:00 AM on Fridays will be considered as having been received on the following Monday at 8:00 AM.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect within seven working days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.6 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Format schedule to allow tracking of status of submittals throughout duration of construction.
   4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.7 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
      a. Using manufacturer's standard sample delivery system, submit two sets of samples of colors and finishes, textures, and patterns from the manufacturer's full range; include custom finish information if specified.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   1. Architect's review of submittals shall not relieve Contractor of compliance with the Contract Documents, or of responsibility for deviations from Contract Documents.
   2. In review of submittals, Architect will not provide dimensions or elevations for field conditions, or for conditions available from a detailed review of documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. Include identification on each sample for verification, with full Project information.

E. After review, distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.8 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Sustainability certification related submittals and reports.
   3. Certificates.
      a. Certificates may be recent or based on previous test results, but must address current regulatory requirements and be acceptable to Architect.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.9 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in conformance to requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect. If a quantity is not specified in an individual section, submit the number required for Contractor's use, plus one for Architect and one for Owner. Architect will not review more than six samples.
   1. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Maintain a complete and current submittal log, indicating status of all submittals and re-submittals. Provide summary of submittal status at pay request meeting.
   2. Use a single transmittal for related items in a specification section.
   3. Do not combine data from more than one specification section or drawing component into a single submittal. Such submittals will be returned without action for re-submittal in the proper form.
   4. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   5. Transmit using approved form.
   6. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.

7. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
8. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
9. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Send submittals in electronic format via email to Architect, except deliver samples to Architect at business address.
    b. Upload submittals in electronic form to Electronic Document Submittal Service website when this type of service is used.
10. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. Failure to make timely submittals will not be a reason for extension of Contract time.
    b. Where no time period for submittals is established, provide submittals no later than the midpoint between notice of award and scheduled start date of the work related to the submittal. Where submittals are not submitted within specified limits, the Architect may delay certification of Payment Request until submittals are received.
        1) Asphalt Paving, including mix designs: No later than 14 days after Notice to Proceed.
        2) Concrete, including Mix Designs: Submit no later than 14 days after Notice to Proceed.
    c. For each submittal for review, allow 15 working days excluding delivery time to and from the Contractor.
    d. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
11. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
    a. Clearly identify, with bold clouding or other graphic notation, all deviations from Contract Documents. Provide boxed note at clouded deviation specifically requesting approval of proposed change. Provide documentation of proposed change, including additional graphics and data as requested by Architect.
12. Provide space for Contractor and Architect review stamps.
13. When revised for resubmission, identify all changes made since previous submission.
14. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
15. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
16. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.
4. Proposed Products: Mark each copy to identify applicable products, models, options, and other data. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate. Supplement manufacturer's standard data to provide information unique to this Project. Mark out items that are not applicable to the project.
    a. Where specified in individual sections, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number for each product and supporting product data.
    b. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
5. Identify conflicts between manufacturer's instructions and Contract Documents.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Do not reproduce the Contract Documents to create shop drawings.
3. Electronic Documents for Contractor's Use:
   a. At Architect's sole discretion, Architect will provide a file containing selected electronic backgrounds for Contractor's use in shop drawing preparation.
   b. Contractor shall sign Architect-provided release form regarding such electronic file information.
   c. Electronic files will be provided in AutoCAD format, in the Architect's current version, as background views only, without dimensions, doors, notes, or similar information. No seals, title blocks, or other approval stamps will be included on backgrounds.
   d. Unless otherwise established, and at Architect's sole discretion, only plan and sections views of architectural, structural, mechanical, and electrical documents will be provided. Under no circumstances will the complete project AutoCAD file be provided.
   e. The Architect will provide a single CD-based file or appropriate file transfer containing backgrounds for all disciplines for the Contractor's use. Contractor shall be responsible for distribution of background files to subcontractors and vendors.
   f. The Architect will prepare a cost for preparation of electronic file package. If the Contractor agrees to such cost, the cost will be processed as a deductive change order to the contract.
4. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and his consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
   a. "Approved", or language with same legal meaning.
   b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
   c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
      1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
2. Not Authorizing fabrication, delivery, and installation:
   a. "Revise and Resubmit".
      1) Resubmit revised item, with review notations acknowledged and incorporated.
      2) Non-responsive resubmittals may be rejected.
   b. "Rejected".
      1) Submit item complying with requirements of Contract Documents.

E. Architect's and his consultants' actions on items submitted for information:

1. Items for which no action was taken:
   a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

3.13 DEFERRED APPROVALS

A. Where shown on drawings and as specified in individual sections, submit documentation as required to obtain Authorities Having Jurisdiction approval of all deferred approval work.

B. Submit deferred approval documentation under the provisions of this section and as specified in the respective individual section.
   1. Submit documentation bearing seal and signature of applicable responsible engineer licensed to practice in the State in which the Project is located. All structural deferred approvals shall be prepared by a Structural Engineer licensed to practice in the State in which the Project is located.
      a. Architect will review and mark with notation indicating that the deferred submittal documents have been reviewed and that they have been found to be in general conformance with the design of the project.
   2. Clearly identify all deviations and proposed alternates to materials and systems shown on drawings and specified in this Project Manual.
   3. Drawings: Produce drawings on substantial bond paper using media of archive quality. Indicate dimensional locations of the various parts of the construction, sizes and type of members, connections, attachments, and openings.
   4. Specifications: Provide specifications in an approved format illustrating materials and systems proposed for use in design.
   5. Structural Calculations: Where required, produce calculations in booklet form, 8-1/2 x 11 inch size, minimum of three wet signed and sealed copies.
   6. Provide sufficient information with respect to design criteria, analysis methodology and material capacity to adequately evaluate documentation for compliance with applicable sections of applicable code.

C. Deferred Approval Submittal Procedure:
   1. Submit completed documentation in accordance with scheduling criteria where defined in contract documents.
   2. The documents will be reviewed by Architect for consistency with specified criteria. If necessary, Architect will return submittal to Contractor for corrections. Any corrections, if any, shall be made by Contractor and returned to Architect within seven working days.
   3. No contract time extensions will be granted for document modification caused by nonconformance with specified criteria.

D. Samples: Provide samples as specified in each Section.

E. Manufacturer's Data: Provide descriptive data on all accessory items and operation.

F. Installation Data: Submit descriptive data on installation procedures.

END OF SECTION

SECTION 01 30 00.01 - REQUEST FOR INFORMATION FORM

CONTRACTOR: _____ **REQUEST NO.:** _____
TO: CGA, ATTN: _____ **SECTION:** _____

Disciplines Impacted: [ ] Structural [ ] Mechanical [ ] Electrical [ ] Architectural
[ ] Civil [ ] Landscape [ ] Foodservice [ ] _____
Reference: Drawing(s) _____ Spec Section(s) _____ Other _____

Please clarify or provide the following information:

Possible Cost Impact: [ ] Increase [ ] Decrease [ ] No Change [ ] Unknown
Possible Time Impact: [ ] Increase [ ] Decrease [ ] No Change [ ] Unknown

This information is required as soon as possible, but no later than _____

[ ] Priority Attention Required

_____ Copies to: _____
Contractor's Representative

Architect's Response: Date: _____

_____ Copies to: _____
Cuningham Group Representative

END OF SECTION

SECTION 01 31 13 – PROJECT COORDINATION

1.00 GENERAL

1.01 SCOPE

A. Contractor shall be responsible for administrative and supervisory requirements for the coordination necessary to execute the work of this Project. Coordinate construction operations, including but not limited to the following:
   1. General project coordination procedures
   2. Coordination drawings
   3. Administrative and supervisory personnel
   4. General installation provisions
   5. Submittals
   6. Cleaning and protection

1.02 COORDINATION

A. It is the declared and acknowledged intention and meaning, through coordination of Specifications, Drawings and Schedules to provide the contemplated structure, complete, and ready for use, and all items shown, or called for, or reasonably implied whether specifically shown or not shall be included as necessary for the completion of this project.

B. Contractor shall review the Contract Documents for requirements related to construction detailing, materials to be provided individually or as system components, requirements for application and/or installation and stated requirements related to warranty. Discrepancies to what is requested and that which could be provided by either the Contractor, sub-contractor or manufacturer shall be brought to the attention of the Architect prior to the award of contract. After award of contract the Contractor agrees that the Owner is entitled to stated conditions without exception. Deviations to the stated and purchased conditions of the contract, shall be assumed to have an associated dollar value that the Owner is entitled in terms of 'Changes in the Contract', as covered under the contract General Conditions.

C. Coordinate construction operations included in various Sections of these specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection and operation.

D. Contractor shall coordinate the Work as stated in the Contract Documents. Contractor shall also coordinate this work with work under separate contracts by Owner. Contractor shall cooperate with Owner and others as directed by the Construction Manager, in scheduling and sequencing the incorporation into the work of the Owner Furnished/Contractor Installed (OFCI) products identified in the Contract Drawings and Specifications.

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

F. In the event of error, omission, ambiguity or conflict in Drawings or Specifications, Contractor shall bring the matter to Architect's attention in a timely manner, for interpretation and direction in accordance with provisions of the Contract Documents.

G. Contractor shall coordinate the work of the all trades to avoid possible interferences, duplication of work, or unfinished gaps and conflicts between operations. Contractor agrees that due to field conditions, minor departures or conflicts from the drawings are bound to occur, and that such departures or conflicts are self compensating so far as cost adjustments are concerned. No claims for extras will be allowed in connection with such minor changes required to execute the work.

H. Contractor shall coordinate and schedule this work with work being performed for the Project under separate contracts by Owner.

I. Notify the Architect in writing, in a timely fashion, stating any conditions in the Drawings or Specifications that would prevent proper application of materials or installation of equipment. State in what way the work is affected. Such notification shall not be construed as a claim for extra compensation. Do not proceed with work affecting such conditions until further instructions by the Owner.

1.03 REQUIREMENTS

A. Coordinate scheduling, submittals, construction activities and work of the various sections included within these Specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items shall be installed at a later date.

B. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Set up control procedures so that approved schedules are adhered to. Properly notify the Architect of anticipated and actual time delays.

C. Interruption of Services: Advance notice (48 hours minimum) shall be given to the Owner when interruptions of utility services or interferences with the use of existing buildings or roads are anticipated. Interruption of utility services shall be made only upon approval of the Owner.

D. Verify that utility requirement characteristics of 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 the temporary controls and enclosures needed for executing work of the Project as well as inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

1.04 ADMINISTRATIVE PROCEDURES

A. Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to the following:
   1. Preparation of schedules
   2. Installation and removal of temporary facilities.
   3. Delivery and processing of submittals
   4. Progress meetings
   5. Laboratory testing and inspections
   6. Project closeout activities.

1.05 MEETINGS

A. In addition to progress meetings specified in Section 01 30 00, hold coordination meetings and preconstruction / pre-installation conferences with requisite personnel to assure coordination of work.

B. Contractor's superintendent and project manager shall coordinate with all subcontractors, trades, crafts and suppliers to prevent scheduling, sequencing, dimensional and other conflicts and omissions.

1.06 SUBMITTALS

A. Schedule and coordinate submittals specified in Section 01 30 00.

B. Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
   1. Show the interrelationship of components shown on separate shop drawings.
   2. Indicate required installation sequences.

C. Prepare all memoranda, required notices, reports and meeting minutes for distribution to each party involved outlining special procedures required for coordination.

1.07 CONSTRUCTION OPERATIONS

A. Layout, scheduling and sequencing of work shall be solely the Contractor's responsibility. Contractor shall bring together the various parts, components, systems and assemblies as required for the correct interfacing and integration of all elements of work. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair. Contractor shall coordinate work to correctly and accurately connect abutting, adjoining, overlapping and related elements, including work under separate contracts by Owner, utility agencies and companies. Coordinate construction operations included under different sections that are dependent upon each other for proper installation, connection and operation.
   1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the work is dependent on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Contractor and subcontractors shall inspect all preparatory work and substrate conditions under which work of that section is to be installed, to ensure that adjacent related work will finish to proper contours, lines, planes and levels. Contractor shall notify the Architect and shall coordinate with the applicable subtrades, of any defects or imperfections in preparatory work that will in anyway, affect satisfactory completion of the work. Absence of such notification will be construed as an acceptance of preparatory work. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

C. Components of work receiving subsequent finishes shall be coordinated with trades following to insure that they will properly provide the necessary substrate for the finishes or applications. Special care should be taken for areas receiving waterproofing materials, for all exposed surfaces and where remedial work is expected to occur. Do not proceed until all affected trades are properly informed and have concurred. This will require advance notice to all parties involved.

D. Responsibility for timely installation of all materials rests solely with the Contractor, who shall maintain coordination control at all times.

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

F. Provide all necessary safeguards and protective devices.

1.08 COORDINATION OF SPACE

A. Coordinate use of Project space and sequence of installation of mechanical and electrical work that is indicated diagrammatically on Drawings. Follow routings shown for pipes, ducts, and conduits as closely as practicable with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, maintenance, and repairs.

B. In finished areas, except as otherwise shown, conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

1.09 COORDINATION OF CONTRACT CLOSEOUT

A. Coordinate completion and clean up of work of separate sections in preparation for Owner occupancy.

B. After Owner occupancy of premises, coordinate access to site by various sections for correction of defective work and work not in accordance with Contract Documents to minimize disruption of the Owner's activities.

C. Assemble and coordinate closeout submittals specified in Section 01 77 00, "Contract Closeout".

2.00 PRODUCTS - NOT USED

3.00 EXECUTION

3.01 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the contractor 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.

B. Manufacturer's Instructions: 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.

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

D. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Allow for expansion and building movement.

E. 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.

F. Recheck measurements and dimensions before starting each installation.

G. 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.

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

I. Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated and in conformance with applicable codes. Refer questionable mounting height decisions to the Architect for final decision.

3.02 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

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

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

C. Short Interval Schedules.

1.2 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

B. M-H (CPM) - CPM in Construction Management - Project Management with CPM; O'Brien; 2006.

1.3 SUBMITTALS

A. Within 30 days after date established in Notice to Proceed, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within five days after joint review.

C. Submit updated schedule every 30 days.

D. Submit Short Interval Schedule at each construction progress meeting

E. Final CPM Schedule at Completion of Contract: At the completion of the contract and prior to the release of any bonds or final payment by the Owner, the Contractor shall submit to the Owner, with copy to the Architect for approval, a final CPM schedule, showing the actual job history.

1.4 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with one years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.5 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: 24 x 36 inches .

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

1.6 EARLY COMPLETION OF PROJECT

A. In the event the Contractor wishes to complete work earlier than the specified contract completion date, and the Owner and/or Architect approve such earlier completion, the following conditions apply:
   1. The contract completion date shall not be amended by the Owner's approval of Contractor's proposed earlier completion date.
   2. Contractor shall not, under any circumstances, receive additional compensation from the Owner for indirect, general, administrative or other forms of overhead costs, for the period between the time or earlier completion proposed by the Contractor and the official contract completion date.

1.7 TIME EXTENSION REQUESTS

A. The monthly Updated construction schedules submitted by the Contractor shall not show a completion date later than the Contract Time, subject to any time extensions granted by the Owner.

B. If the Contractor believes that it is entitled to an extension of the Contract Time due to a Change Order of delay/disruption, the Contractor, within ten (10) workdays of the qualifying event(s), shall submit:
   1. A Time Extension Request notification letter with a detailed narrative justifying the time extension requested;
   2. Fragmentary Network (Fragnet) Analysis of the delay impact, identifying all schedule activities that are impacted by the subject occurrence;
   3. Tabular report of the qualifying update of the CPM schedule the analysis is based on; and
   4. A schedule analysis entitled "Time Extension Request Schedule" that incorporates the findings of the Fragnet analysis into the latest (qualifying) update of the CPM schedule;
   5. The Fragnet and time extension request schedules shall be time scaled, utilizing a computer generated network analysis unless otherwise approved by the Owner.

C. The time extension request shall forecast the adjusted project completion date and impact to any intermediate milestones.

D. Float is not for the exclusive use or benefit of either the Owner or Contractor. Contract time extensions shall be granted only to the extent the equitable time adjustments to the activity or activities affected by a change order of delay/disruption exceed the total float of a critical activity (or path) and extend the Contract Completion Date.

E. When Contractor does not submit a Time Extension Request within ten working days, it is mutually agreed that the particular Change Order (including Proposed Change Order) or delay/disruption does not impact the construction schedule and hence no time extension is due to the Contractor.

F. The Owner shall not have any obligation to consider any time extension request unless the requirements of the contract documents are complied with. The Owner shall not be responsible or liable to the Contractor for any constructive acceleration due to failure of the Owner to grant time extensions under the terms of this contract, should Contractor fail to comply with the time extension submission and justification requirements stated herein.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a preliminary network diagram.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

G. Indicate delivery dates for owner-furnished products.

H. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.

I. Provide legend for symbols and abbreviations used.

3.3 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description and area of work.
   3. Estimated duration of activity, in maximum 20 day intervals. Exception: Fabrication and procurement activities and other activities approved by Owner.
      a. Activity durations shall be the total number of actual days required to perform the work, including consideration of weather impacts.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
      a. Float time is defined as the amount of time between the earliest start date and the latest start date of the earliest finish date and the latest finish date of a scheduled activity.
      b. Float time is not for the exclusive use or benefit of either the Contractor or the Owner. The Contractor acknowledges and agrees that actual delays affecting path of activities containing float, will not have any effect upon the Contract completion date, provided that the actual delay does not exceed the float time associated with those activities.
   11. Monetary value of activity, keyed to Schedule of Values (cost loading). Cost loading should cumulatively equal the Contract Sum. Mobilization, bond and insurance costs may be shown separately; however, general requirements costs, such as overhead and profit, shall be prorated through all activities.
   12. Percentage of activity completed.
   13. Responsibility.
      a. The Contractor shall identify the labor requirement anticipated to complete each work activity. The labor requirement shall be assigned to each schedule activity requiring resources using the resource management capabilities of the scheduling software. For activities involving a number of trades, a written summary of manpower allocation by trade shall be submitted with the schedule.

D. Codes: Activities shall be coded by Responsibility and Area of work. Area codes shall distinguish construction activities related to individual buildings or areas within buildings and site work.

E. For scheduling purposes, include the following holidays.

Holiday	Month
New Year's Day	January
Memorial Day	May
Independence Day	July
Labor Day	September
Veterans Day	November
Thanksgiving Day	November
Day after Thanksgiving	November
Christmas Day	December

   1. It shall be the responsibility of the Contractor to confirm the month, day, and year for the above holidays with the Owner's facilities management. Contractor shall coordinate and schedule his work accordingly. The project site will be available to the Contractor during the

holidays but there is no guarantee that other Owner facilities or services will be made available to the Contractor during the holiday schedule.
2. The inclusion of any union holidays is at the discretion of the Contractor.
3. Contract Time will not be extended under any circumstances due to the inclusion of holidays in the construction progress schedule.

F. Analysis Program: Capable of accepting revised completion dates, and recomputation of all dates and float.
1. Contractor shall use Primavera Project Planner software version 5.0 or better or have the means of providing the Owner with files on CD-ROM Windows formatted floppy disks, in a form that can be completely restored into Primavera without requiring the use of a conversion program or utilizing other software.

G. Required Reports: List activities in sorts or groups:
1. By preceding work item or event number from lowest to highest.
2. By amount of float, then in order of early start.
3. Contractor's periodic payment request sorted by Schedule of Values listings.
4. Listing of basic input data that generates the report.
5. Listing of activities on the critical path.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Owner and Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within five days.

D. Upon acceptance by the Owner, the approved preliminary schedule will become the project Baseline Contract Schedule. The Baseline Schedule shall not be revised without written approval of the Owner.

E. The Owner shall have the right to withhold progress payments from the Contractor at its discretion if the Contractor fails to finalize and obtain approval for the Baseline Contract Schedule within the prescribed period.

F. Failure of the Contractor to incorporate all elements of work required for the performance of the contract or any inaccuracy in the Baseline Contract Schedule shall not excuse the Contractor from performing all work required for a completed project within the specified contract time period, notwithstanding the Owner's acceptance of the Baseline Contract Schedule.

3.5 UPDATING SCHEDULE

A. Submit updated schedules on a monthly basis. The schedule shall be submitted no later than five workdays from the status date.

B. Maintain schedules to record actual start and finish dates of completed activities. Updating the schedule to reflect actual progress shall not be considered to be a revision of the Schedule.

C. Indicate progress of each activity to date of revision, with projected completion date of each activity.

D. Update diagrams to graphically depict current status of Work, including estimated percentages of completion for each activity in progress.

E. Identify errors, if any, and activities modified since previous submittal, major changes in Work, and other identifiable changes.

F. Indicate changes required to maintain Date of Substantial Completion.

G. Submit reports required to support recommended changes.

H. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors. Reports shall also include:
1. Bar chart showing the previous month's work and a projected three month "look-ahead" of the work. The data included on the bar chart shall consist of the activity number, activity

description, early start and finish date, original duration, remaining duration, percent complete, resource units per day, and total float.

I. The Owner shall have the right to withhold progress payments from the Contractor at its discretion until the required monthly updates are submitted and approved.

J. If, during the process of schedule updating, it becomes apparent that the Construction Schedule no longer represents the actual prosecution and progress of the work, the Owner may require the Contractor to submit a revised schedule at no additional cost to the Owner. The Owner shall have the right to withhold progress payments from the Contractor at its discretion, if the Contractor fails to submit a timely, detailed and workable recovery schedule.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute digital and hard copies of preliminary and updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties in both published and native file formats.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

3.7 SHORT INTERVAL SCHEDULES

A. Short Interval Schedules (SIS) shall be submitted to the Owner with copy to the Architect during construction progress meetings.

B. The SIS interval shall be three weeks and shall include the past week, the week submitted and the week thereafter; the SIS may be hand generated.

C. The SIS shall be based on the Contract Schedule and shall be in bar chart form. The SIS shall be in sufficient detail to evaluate the Contractor's performance in the preceding week and planned progress in upcoming weeks vis a vis the Contract Schedule and Updates thereof.

D. Following review and revisions as necessary, the SIS will be accepted by the Owner.

END OF SECTION

SECTION 01 35 00 – SPECIAL PROJECT PROCEDURES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. Description: This section covers special project procedures pertaining to the work and is supplementary to those mentioned elsewhere in the Contract Documents.

C. This Section identifies the deferred approval items under this Contract by Division, Section number and Title of Work. Deferred approval work as covered by this Contract and as indicated by the specific provisions in the General Conditions, Supplementary General Conditions, Special Conditions, Owner-Contractor Agreement and/or Contract Documents shall be in conformance with the requirements as specified herein.

1.02 DEFERRED APPROVALS

A. General Construction Criteria: Installation of all deferred approval items and systems shall not be started until the following procedures have been complied with:
   1. Contractor(s)/Sub-Contractor(s) design professional(s) shall prepare detailed plans/drawings and engineering calculations under the supervision of, and signed by a professional Structural or Civil Engineer registered in that discipline in the State of California.
   2. It shall be the Contractors responsibility, and that of his registered professional(s) to present stamped and signed, by both the design professional and the Contractor, shop drawings and calculations to the Architect/Structural Engineer of record for review, approval, signature and stamp prior to Contractors submittal to Building Department for deferred approval plan check and permit.
   3. The Contractor shall plan to allow sufficient time for review by the Architect/Structural Engineer of record prior to Building Department submittal and for review by Building Department of the deferred approval items.
   4. Obtain and pay for all permits and fees.

B. Access Related Equipment: Installation of deferred approval items shall not be started until contractor's drawings, specifications and engineering calculations for the actual systems to be installed have been accepted and signed by the Architect or Structural Engineer and approved by Building Department.

1.03 REQUIREMENTS

A. The Architect/Structural Engineer will review the Contractors shop drawings, calculations and material data for consistency with the design intent only. Contract drawings indicate design intent and shall be used as providing the minimum standards required for fabrication, support and anchorage. The review does not relieve the Contractor and the Contractors design professionals of their responsibilities.

B. The Architect/Structural Engineer reserves the right to review and/or modify the design professionals drawings / calculations and specifications to suit any project condition created by the acceptance of deferred approval items. Requested changes or revisions shall be re-engineered and resubmitted for re-review in conformance with project submittal Section 01 30 00. If required, Contractor shall resubmit to Building Department as required. Changes resulting from such modifications shall be performed at no extra cost to Owner.

1.04 RELATED REQUIREMENTS

A. Contractor shall coordinate pertinent related work and modify surrounding work as required to properly integrate the Work affected by each deferred approval item, to provide that each is complete and fully integrated into the project/construction required by Contract Documents and in full conformance with agency requirements, at no additional cost to Owner.

B. Include as part of each deferred approval item miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not mentioned or detailed as part of the required approval.

1.05 DEFERRED APPROVAL ITEMS

A. The following list of items and/or equipment require deferred approval of the details and substantiating calculations for their support and seismic anchorage due to the fact that they are identified in the plans and specifications as having more than one acceptable manufacturer and/or model number.
   1. Framed Storefront Systems
   2. Metal Stairs, Handrails, Guardrails, and Landings
   3. Cable Barriers
   4. Elevator Installation: Electric Traction Passenger Elevators, Section 14 21 23, including elevator guide rails and support brackets, plates and anchorage.

1.06 SUBSTITUTIONS

A. Comply with requirements of Section 01 25 00, Substitutions and Product Options.

B. Where "or equal(s)" are accepted which are different from record and Building Department approved contract drawings or documents, it is to be noted that Architect of record is required to revise contract documents of such changes which will also need to be re-reviewed and approved by Building Department, to their satisfaction. Contractor shall include all such anticipated costs for Architects services required for the revision of such documents. This provision also applies to all deferred Building Department approvals.

2.00 PRODUCTS - NOT REQUIRED

3.00 EXECUTION - NOT REQUIRED

END OF SECTION

SECTION 01 35 53 - SECURITY PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: use of premises and occupancy.

B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.3 SECURITY PROGRAM

A. Protect Work and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program in coordination with Owner's existing security system at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site .

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner on request.

D. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

1.5 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. All Contractor's staff, subcontractors, and suppliers shall wear badges at all times. In addition, wear orange safety vests or other approved shirt design at all times.

C. Badge To Include: Personal photograph, name, assigned number, expiration date and employer.

D. Require return of badges at expiration of their employment on the Work.

1.6 RESTRICTIONS

A. Do not enter patient or staff rooms at any time without approval of staff.

B. All Contractor's staff, subcontractors, and suppliers shall avoid interaction, contact, and communication with staff and patients. Under no circumstances shall Contractor's staff, subcontractors, and suppliers be in contact with the aforementioned without Owner staff present.

C. All work, including work of subcontractors, shall be conducted under the observation of the Contractor’s supervisory personnel.

D. Remove all radio or other music-generating devices operated sufficiently loud so as to be objectionable, as determined solely by the Owner or Owner’s operations.

E. Dogs and other pets are not permitted on site.

F. No smoking or use of any tobacco products is permitted on Owner’s property.

G. All Contractor staff, subcontractors, and suppliers shall present a professional and civil manner to staff and the Public. Use of language or behavior judged offensive, obscene, or suggestive by the Owner is not permitted. Clothing that is suggestive, is marked with images that suggest or promote drug, alcohol, or tobacco use, or represents behavior judged offensive, obscene, or suggestive by the Owner is not permitted. Immediately remove from site any Contractor personnel exhibiting such behavior.

H. Persons under the influence of or engaged in the use of drugs or controlled substances shall be immediately removed from site.

I. Use of alcoholic beverages is prohibited on site. Persons under the influence of or engaged in the use of alcoholic beverages shall be immediately removed from site.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Control of installation.
F. Tolerances.
G. Manufacturers' field services.
H. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.
B. Section 01 42 16 - Definitions.
C. Section 01 45 33 - Code-Required Special Inspections.
D. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.3 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.
G. ICC/CBSC (CBC) - California Building Code; 2016.
H. CSI/CSC MF - Masterformat; 2014.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
    1. Include:
        a. Date issued.
        b. Project title and number.
        c. Name of inspector.
        d. Date and time of sampling or inspection.
        e. Identification of product and specifications section.
        f. Location in the Project.

g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Conformance with Contract Documents.
k. When requested by Architect, provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit report in duplicate within five days of observation to Architect for information.
2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

1.6 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
1. Unless the Contract Documents or applicable regulatory requirements include more stringent requirements, applicable reference standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.
1. Although copies of standards needed for enforcement of requirements may be part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for use by others in the enforcement of requirements.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

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

F. Referenced standards take precedence over standards that are not referenced but recognized in the construction industry as applicable.

G. Non-referenced standards are not directly applicable to the Work, except as a general requirement of whether the Work complies with recognized construction industry standards.

H. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

I. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the United States." Contact Architect regarding any questions regarding such abbreviations and acronyms.

1.7 PROJECT MANUAL AND SPECIFICATIONS

A. Format and structure
1. Specifications are organized into Divisions and Sections based on the CSI/CSC MF numbering system.
2. The sections are placed in the Project Manual in numeric sequence; however, this sequence is not complete and the Table of Contents of the specifications must be consulted to determine the total listing of sections.
3. The section title is not intended to limit the meaning or content of the section, nor to be fully descriptive of the requirements specified within the Section.
4. The organization of the specifications shall not control the division of the work among subcontractors or establish the extent of work to be performed by any trade.

B. Definitions
1. Related Work Described Elsewhere: The caption "Related Requirements," "Related Sections," or "Related Work Described Elsewhere" identifies some Sections of the Specifications which may involve work involving coordination or general relationships to the work of the Section at hand. The omission of a Section from "Related Requirements," "Related Sections," or ""Related Work Described Elsewhere" does not limit the Contractor's obligation to perform all portions of the Work with all appropriate and reasonable coordination.
2. Section Includes: The caption "Section Includes" or "Description" or "Summary" paragraph is intended to be a broad, general statement of the work covered by an individual section. The listing of principal items of work shall not be construed as an exhaustive or complete list.

C. Language
1. Specification Language and Intent: The words "the," "shall," "will," and "all" may be omitted in specification Sections. Where such words as "perform," "install," "erect," "test," or words of similar import are used, it shall be understood such words include the meaning of the phrase "the Contractor shall." The requirements indicated and specified apply to all work of the same kind, class, and type, even though the word "all" is not stated.
2. Specifications use certain conventions regarding style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are:
a. Language used in Specifications and other Contract. Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable to maintain the context of the Contract Document indicated.

b. Imperative and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mode are to be performed by the Contractor. Subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
c. The words “shall be” are implied wherever a colon (:) is used within a sentence or phrase.

1.8 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency, approved by Authorities Having Jurisdiction (AHJ), to perform inspection and testing as specified in Section 01 45 33 - Code-Required Special Inspections, unless indicated otherwise.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspection.
1. Unless specified as the Owner's responsibility, all other testing, mix design preparation, and related quality control and certification requirements shall be paid by Contractor at no additional cost to Owner.
2. All concrete mix design shall be prepared at Contractor's cost and in compliance with Section 03 30 00 - Cast-in-Place Concrete.
3. All grout and mortar mix designs shall be prepared at Contractor's cost and in compliance with Section 04 05 11 - Mortar and Masonry Grout.
4. All asphalt concrete mix designs shall be prepared at Contractor's cost and in compliance with Section 32 12 16 - Asphalt Paving.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740 as applicable.
2. Inspection agency: Comply with requirements of authorities having jurisdiction.
3. Laboratory: Authorized to operate in the State in which the Project is located and approved by Authorities Having Jurisdiction.
4. Laboratory Staff: Maintain a full time registered Engineer or specialist, as applicable, on staff to review services.
5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.
6. Welding Inspectors: Certified in accordance with AWS QC1 Standard for AWS Certification of Welding Inspectors.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.3 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   7. Each signed and certified testing report shall be copied to the Owner, Architect, Structural Engineer, Contractor, and Inspector of Record.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.4 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and installation conditions as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. The Owner reserves the right to reject materials and workmanship which are deemed defective or require correction.

C. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 41 00 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY OF REFERENCE STANDARDS

A. Perform all Work in accordance to the latest enforced Statutes, Ordinances, Laws, Rules, Codes, Regulations, Standards, and Lawful Orders of all Public Authorities Having Jurisdiction.

B. Regulatory requirements applicable to this project are the following:

C. California Occupational Safety and Health Regulations (Cal/OSHA), Title 8, Chapter 3.2, California Code of Regulations; current edition; as a work place.

D. City of Oceanside amendments to some or all of the following.

E. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

F. CBSC/ICC (CFC) - California Fire Code (Part 9 of Title 24, California Code of Regulations); 2016.

G. CBSC/ICC (CBC) - California Building Code (Part 2 of Title 24, California Code of Regulations); 2016.

H. CBSC/IAPMO (CPC) - California Plumbing Code (Part 5 of Title 24, California Code of Regulations); 2016.

I. CBSC/IAPMO (CMC) - California Mechanical Code (Part 4 of Title 24, California Code of Regulations); 2016.

J. CBSC/NFPA (CEC) - California Electrical Code (Part 3 of Title 24, California Code of Regulations); 2016.

K. CBSC - California Energy Code (Part 6 of Title 24, California Code of Regulations); 2016.

L. CBSC - California Green Building Standards Code (Part 12 of Title 24, California Code of Regulations); 2016.

M. CBSC - California Referenced Standards Code (Part 12 of Title 24, California Code of Regulations); 2016.

N. County of San Diego Air Pollution Control District (SDAPCD) Rules and Regulations.

1.2 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements.

1.3 QUALITY ASSURANCE

A. Designer Qualifications: Where delegated engineering design is to be performed under the construction contract provide the direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 42 16 - DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements the definitions contained in the General Conditions.

B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

A. Approved: The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

B. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

C. Experienced: The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

D. Furnish: To supply, deliver, unload, and inspect for damage.

E. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

F. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

G. Installer: An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

H. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

I. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

J. Provide: To furnish and install.

K. Regulations: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

L. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 42 19 – REFERENCE STANDARDS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. Certain terms and references used in the Contract Documents are defined in this section. Definitions and explanations continued in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the Contract Documents.

1.02 GENERAL REQUIREMENTS

The provisions or requirements of Division 1 sections apply to the entire work.

1.03 ABBREVIATIONS

The language of specifications and other Contract Documents is of the abbreviated type in certain instances, and implies words and meanings appropriately interpreted. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates.

1.04 APPROVE

Where used in conjunction with the Architect's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to limitations of the Architect's responsibilities and duties as specified in General Conditions. In no case, will "approved" by the Architect be interpreted as a release of the Contractor from responsibilities to fulfill requirements of the Contract Documents.

1.05 APPROVAL

The words "approved", "approval", "acceptable", "acceptance", and words of similar import shall mean that approval or acceptance of the Architect, is intended unless stated otherwise.

1.06 AS SHOWN, AS INDICATED, AS DETAILED

These words, and words of like implications, refer to information contained by drawings describing the work, unless explicitly stated otherwise in other Contract Documents.

1.07 BIDDERS

Any individual, company, corporation, partnership, or joint venture who submits a bid for work required as distinct from a sub-bidder who submits a bid to a prime bidder.

1.08 BIDDING DOCUMENTS

The Invitation to Bid, Instruction to Bidders, Sample Forms, Proposal, Specifications, Drawings and Addenda issued prior to receipt of bids.

1.09 CONTRACT DOCUMENTS

The Proposal, Specifications and Drawings form the construction documents required to execute the work of this contract.

1.10 CONTRACTOR'S OPTIONS

Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, the option is intended to be the Contractor's regardless of whether or not it is specifically indicated as such.

2.00 DRAWING SYMBOLS

2.01 GENERAL

Except as otherwise indicated on the drawings, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards" published by John Wiley & Sons, Inc.

2.02 MECHANICAL/ELECTRICAL DRAWINGS

Graphic symbols used in mechanical/electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.

2.03 EQUAL

Words such as "equal", "approved equal", "equivalent", and terms of equal import shall be understood to be followed by the phrase "in the opinion of the Architect" unless stated otherwise. The burden of proof is entirely the Contractor's to the satisfaction of the Architect. Architect's decision is final.

3.00 FORMAT AND SPECIFICATION CONTENT EXPLANATIONS

3.01 FORMAT EXPLANATION

Although some portions of these specifications may not be in complete compliance with this format, no particular significance shall be attached to such compliance or non-compliance.

3.02 SUBORDINATION OF TEXT

Portions of specification text are subordinated to other portions in the following manner (lowest level to highest):

A. Indented (from left margin) paragraphs and lines of text are subordinate to preceding text which is not indented, or which is indented by a lesser amount.

B. Subarticle titles, which are printed in upper/lower case lettering.
C. Article titles, which are printed in upper case lettering.

3.03 UNDERSCORING

Underscoring is used to assist the reader of specification text in scanning the text for key words.

3.04 OVERLAPPING AND CONFLICTING REQUIREMENTS; MINIMUM ACCEPTABLE STANDARDS

A. Where compliance with two or more industry standards or sets of requirements in Contract Documents are specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement is intended and will be enforced, unless otherwise directed by the Architect. Applicable code standards and requirements will be the minimum acceptable standard and shall be covered in bid and complied with at no extra costs regardless of any conflicting information which may be indicated in Contract Documents or lack thereof. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to the Architect for a decision before proceeding.

B. The physical characteristics and technical properties of items specified or indicated on the drawings are intended as the building standard. Contractor must consult the Architect/Engineer to determine room or area function to verify material selections for specific requirements and code compliance.

3.05 DIRECTED, REQUIRED, ACCEPTED, REQUESTED, ETC.

A. When these words refer to work or its performance, "directed", "required", "permitted", "ordered", "designated", "prescribed", and words like implication, mean "by direction of", "requirements of", "permission of", "order of", "acceptable", "satisfactory", "in the judgement of", and words of like import, mean "recommended by", "acceptable to", "satisfactory to" or "in the judgement of" the Architect.

B. Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed" by Architect, "requested by Architect", and similar phrases. However, no such implied meaning will be interpreted to extend Architect's responsibility into the Contractor's area of construction supervision.

3.06 FURNISH

Except as otherwise defined in greater detail, to "furnish" is used to mean provide/supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, etc., applicable in each instance.

3.07 INDICATED

The term "indicated" is a cross-reference to graphical representations, notes, or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled" and "specified" are used in lieu of "indicated", it is for purpose of helping the reader locate cross-reference and no limitation of location is intended except as specifically noted.

3.08 TYPICAL

The term "typical" is expressly interpreted to mean that the item, detail, material(s) and means and methods required to fabricate said item of question, exhibits the essential trait and characteristic(s) of a kind, class or group. The detailed or articulated item is representative of a conforming to, or being a type.

3.09 SIMILAR

The term "similar" is defined as meaning having resemblance but not identical in detail, orientation, fabrication or construction, but shall be treated as if a 'typical' condition. Contractor shall pay particular attention to the similarities or characteristics and the differences required to execute or achieve like results.

3.10 INSTALL

Except as otherwise defined in greater detail, term "install" is used to describe operations at the Project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

3.11 INSTALLER

The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the Project site, including performance of a particular unit of work at the Project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.

3.12 MANUFACTURER

An individual, company, or corporation who manufactures, fabricates, or assembles a standard product. A standard product is one that is not made to special design, and is furnished by either direct sale or by contract to the Contractor, Subcontractor or Vendor.

3.13 MATERIAL SUPPLIER OR VENDORS

A person or organization who supplies, but who is not responsible for the installation of materials, products and equipment of a standard nature that are not specifically fabricated for this particular contract.

3.14 PERFORM

The word "perform" shall mean that the Contractor, at the Contractor's expense, shall perform all the operations necessary to complete the work or the mentioned portions of the work, including furnishing and installing materials as are indicated, specified, or required to complete such performance.

3.15 PRODUCT

The term "product" includes materials, systems, and equipment.

3.16 PROJECT SITE

The term "Project Site" is defined as the space available to the Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the drawings, and may or may not be identical with the description of the land upon which Project is to be built.

3.17 PROVIDE

Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use.

3.18 TESTING LABORATORIES

The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the Project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

3.19 TRADES

Except as otherwise indicated, the use of titles such as "carpentry" in specification text, implies neither that the work must be performed by an accredited or unionized trades-person of corresponding generic name (such as "carpenter"), nor that specific requirements apply exclusively to work by tradespersons of that corresponding generic name.

3.20 PROJECT MANUAL

The term 'Project Manual', shall be interpreted as including the Bid Documents, General Conditions of the Contract, the Contractors General Requirements for administrating the 'Project' or the 'Work', the technical specifications (Divisions 2-33) and copies of the geotechnical reports. All references herein to the County's Standard Construction Specifications and Special Provisions, shall be deemed as included herein in its entirety. Contractor shall obtain copies and have them on-site for reference.

4.00 INDUSTRY STANDARDS

4.01 APPLICABILITY OF STANDARDS

A. Except to the extent that more explicit or more stringent requirements are written directly into the Contract Documents, applicable standards of the construction industry have the same force and effect (and are made a part of the Contract Documents by reference) as if copied directly into these Contract Documents, or as if published copies were bound herewith. Refer to individual unit of work sections of indications of which specialized codes and standards the Contractor must keep at the Project site, available for reference.

B. Unless the Contract Documents indicate otherwise:
   1. Where conflict exists between one or more referenced documents and Contract Documents, or between referenced documents, in which standards establishing different or conflicting requirements for minimum quantities or quality levels conflict, the one having the more stringent requirements shall apply.
   2. Refer requirements that are different but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before preceding with the affected work.

C. Where both a standard and a brand name are specified for a product in the Project Manual, the proprietary product named shall conform to or exceed the requirements of the specified reference standard. The listing of a trade name in the Project Manual shall not be construed as warranting that such product conforms to the respective reference standard. In cases of non-conformance, the Contractor shall bring the discrepancy to the attention of the Architect.

D. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entities construction activity.

E. No provisions of any referenced standards or specifications, whether or not specifically incorporated by reference in the Contract Documents, shall be effective to change the duties and responsibilities of the Owner, the Architect, or Contractor, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor to assign to any of them any responsibility, duty or authority for safety precautions or procedures, or to supervise or direct the performance of the work.

F. When so required by the Architect during the course of the Work, or by the Contract Documents, deliver affidavits or certificates, signed by the material manufacturer or supplier, stating that the material furnished conforms to the specification or standard specified.

4.02 REFERENCED STANDARDS

A. Work specified by reference to a published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall comply with, or exceed the minimum standards of quality for materials and workmanship established by the designated standard or specification.

B. Standard specifications of the applicable societies, manufacturers associations and agencies shall include the latest issues of the specifications.

C. Referenced directly in the Contract Documents or by governing regulations have precedence over non-referenced standards which are recognized in industry for applicability to work.

4.03 PUBLICATION DATES

Unless a publication date follows the standard, where reference standards and specifications are referenced in the specifications, the applicable edition shall be the date in effect 30 days before receipt of bids, except those issues listed in governing building code and regulations supercede the above requirements.

4.04 UPDATED CODE STANDARDS

At the request of the Architect, the Contractor or governing authority, submit a change order proposal where an applicable industry code or code standard has been revised and reissued after the effective date of the Contract Documents and before the performance of the affected work. The Architect will decide whether to issue the change order to proceed with the updated code standard.

4.05 MANUFACTURERS STANDARDS OR RECOMMENDATIONS

All project materials shall be installed per manufacturer's latest printed product data or specification sheets describing application procedures recommended by the manufacturer based on project conditions. If printed instructions are not available or do not apply to project conditions, consult manufacturers technical representative for specific recommendations before proceeding with installation or application.

4.06 QUALITY/QUANTITY

In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work performed or provided. Quality is defined as the minimum workmanship performed per the industry standard. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are either minimums or maximums as noted, or as appropriate for context of the requirements. Refer instances of uncertainty to the Architect for a decision before proceeding. All work and materials shall be of first quality in all respects.

4.07 SPECIALISTS ASSIGNMENTS

In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the work; they are also not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as an "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the Contractor.

4.08 COPIES OF STANDARDS

Abbreviations and Names: Where acronyms or abbreviations are used in the specifications or other Contract Documents they are defined to mean the industry recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., or to the "Sources of Construction Information", published by the Construction Specifications Institute Alexandria, VA. (703.684.0300), and by the following partial list:

AA	Aluminum Association
AAMA	American Architectural Manufacturer's Association
ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories
ADA	Americans with Disabilities Act
AGA	American Gas Association, American Galvanizers Association
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
AQMD	Air Quality Management District
ASCE	American Society of Civil Engineers
ASFE	Association of Engineering Firms Practicing in the Geosciences
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Eng.
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWPB	American Wood Preservers Bureau

AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builder's Hardware Manufacturers Association
CAL/OSHA	California Occupational Safety and Health Regulations
CARB	California Air Resource Board
CBC	California Building Code
CEC	California Electrical Code
CCR	California Code of Regulations, Title 24 (CA Building Standard Code)
CLFMI	Chain Link Fabric Manufacture Institute
CLPCA	California Lathing and Plastering Contractors Association Inc.
CMACN	Concrete Masonry Association of California and Nevada
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard of NBS (U.S. Dept. of Commerce)
CTI	Ceramic Tile Institute
DHI	Door and Hardware Institute
DOC	Department of Commerce
DSA	Division of State Architect
EIMA	EIFS Industry Members Association
EPA	Environmental Protection Agency
FED SPEC	Federal Specs
FEMA	Federal Emergency Management Agency
FM	Factory Mutual Research Corporation
FTMS	Federal Testing Material Standard
GA	Gypsum Association
GANA	Glass Association of North America (formerly FGMA Flat Glass Marketing Assoc.)
GSA	General Services Administration
HMMA	Hollow Metal Manufacturers Association (a Division of NAAMM)
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronic Engineers, Inc.
IESNA	Illuminating Engineering Society of North America
ISO	Insurance Services Office
ML/SFA	Metal Lath/Steel Framing Association
MSJC	Masonry Standards Joint Committee
NAAMM	National Association of Architectural Metal Manufacturers
NBHA	National Builders Hardware Association (Now Part of DHI)
NEC	National Electrical Code (by NFPA)
NEII	National Elevator Industry, Inc.
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety Health Administration (U.S. Dept. of Labor)
PCA	Portland Cement Association
PWC	Public Works Construction
SCAQMD	Southern California Air Quality Management District
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturers Association
SEAOC	Structural Engineers Association of California
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SSPC	Steel Structures Painting Council
SSPWC	Standard Specifications for Public Works Construction
SWRI	Sealant, Waterproofing and Restoration Institute
TCA	Tile Council of America

TMS	The Masonry Society
UBC	Uniform Building Code
UL	Underwriters Laboratories
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
USASC	Underground Service Agency of Southern California
WCLIB	West Coast Lumber Inspection Bureau (Grading Rules)
WWPA	Western Wood Products Association (Grading Rules)
W.W.P.A.	Woven Wire Products Association

5.00 GOVERNING REGULATIONS/AUTHORITIES

5.01 GENERAL

Contact governing authorities directly for necessary information and decisions having a bearing on the performance of work.

5.02 COPIES OF REGULATIONS

A. Obtain copies of regulations needed for reference, and retain at the Project site during the Contract Time, available for reference by parties at the site who have a reasonable need for such reference.

B. "Regulations" is defined to include laws, statutes, ordinances, and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

5.03 TRADE UNION JURISDICTIONS

The manner in which the Contract Documents have been organized and subdivided is not intended to be an indication of jurisdictional or trade union agreements. Assign and subcontract the work, and employ tradesmen and laborers, in a manner which will not unduly risk jurisdictional disputes of kind which could result in conflicts, delays, claims and losses in the performance of the work.

5.04 PERMITS, LICENSES AND CERTIFICATES

For the Owner's records, submit copies of permits, licenses, certificates, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

END OF SECTION

SECTION 01 43 39 – MOCKUPS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. The work includes fabrication of independent structures that represent a portion or component of the building structure, as indicated and/or where located on the Contract Drawings, identical in all respects to the finished work detailed and/or specified, intended to establish a basis to review basic quality control measures.
   1. Provide submittals, labor, materials, equipment and all services required for the construction of the mock-up panels and removal of work at the completion of the project, without additional cost to the Owner.
   3. Mock-ups will be reviewed for acceptance by the Owner and Architect. When so approved, the mock-up will become the standard by which subsequent work will be evaluated.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 01 30 00: Administrative Requirements
B. Section 08 41 13: Aluminum - Framed Storefronts
D. Section 09 96 23: Graffiti Resistant Coating

1.03 SUBMITTALS

A. Provisions: Comply with Section 01 30 00

B. Product Data and Samples: Submit in accordance with the requirements of each respective section of work. Submit for all materials proposed for use in the construction of the mock-up. Samples shall demonstrate the specified color, texture or finish or other physical characteristics.

C. Shop Drawings: Provide contractor generated (no copies of the Contract Documents are allowed), indicating all details, dimensions, connections, tolerances and relation to adjacent materials and construction.

D. Schedule: Time schedule for the construction of the mock-up shall be incorporated into the overall construction schedule for review prior to start of construction.

E. Quality Control Submittal: All mock-up panels are to be considered Design/Build, where the Contractor will provide and be responsible for the complete engineering design calculations and details of the proposed structural stability of the mock-up panel as required to demonstrate portions of work indicated.

1.04 REQUIREMENTS

A. The exact location of the mock-up shall be determined by the Owner / Architect in agreement with the Contractor and shall be located on site depending on sequencing of construction, contractors means and methods and scheduling. Proposed changes in location must be requested in writing to the Owner / Architect with a written acceptance of the proposed changes by the Owner / Architect. In any case, the mock-up must be located within a 5 mile radius of the project site.

B. The Mock-up review sequence is identified as distinct scheduled review of assemblies and does not preclude other quality control or verification measures identified in the Project Manual but is a supplement to those quality control measures.

1.05 QUALITY ASSURANCE

A. Fabricators and/or Installers Qualifications: Provide in accordance with the provisions of the specification sections for products and materials incorporated into the mock-ups.

B. In constructing mock-ups take measures to ensure the safety of Project personnel and the public.

1.06 SEQUENCE OF INSPECTION

A. The Architect shall be notified at the start of construction of the mock-ups and shall receive progress reports to schedule inspections during the course of construction.

B. Contractor shall request the Architects preliminary review at approximately 50 percent completion. Incorporate any requested changes prior to the mock-ups completion, insofar as possible.

C. Obtain the Architects and Owners acceptance of the mock-ups aesthetics, color, texture, sealant of joints, reveals, etc., before commencing the corresponding work of the Project. Revise the Construction Schedule to reflect required revisions /changes in design, ways or means necessary to achieve the approved results.

D. Should the mock-up fail to meet the Architects or Owners approval, the mock-up shall be taken down or dismantled and reconstructed to the extent necessary to obtain approval of that portion of work of the project.

E. Time the completion and reworking of mock-ups necessary to obtain acceptance to avoid delay in the project construction schedule.

F. Retain and maintain mock-ups during construction to serve as a performance standard for comparison of work to be incorporated into the project. Do not alter, remove or destroy mock-ups until removal has been authorized by the Architect.

1.07 INCORPORATION INTO THE WORK

A. Contractor shall review the type of mock-up to be fabricated, the sequence and scheduling of the mock-up with relation to the overall construction schedule with the Architect, to determine whether the mock-up can be incorporated into the project, as that portion of work for which it was constructed.

B. If the mock-up is approved by the Architect to be incorporated into the work, it is to remain in its approved condition throughout the course of construction to serve as a standard of quality for which the subsequent work to follow is to conform to.

2.00 PRODUCTS

2.01 MATERIALS

A. Materials shall comply with the requirements specified in the various applicable sections of the specifications, and shall match previously submitted and approved samples.

B. Mock-ups shall incorporate all related construction materials and components required to obtain the visual and performance standards required in the completed work.

3.00 EXECUTION

3.01 INSTALLATION

A. Construct mock-ups using the same construction personnel, means and methods as intended for use on the actual project.

B. Mock-ups shall be constructed in accordance with details indicated on the Contract Drawings and approved mock-up shop drawings.

C. Mock-ups shall be located where directed by the Architect and/or Owner, and shall not be built 'in place', for incorporation into the work (permanent construction), unless approved by the Architect.

3.02 MAINTENANCE

A. Maintain mock-ups during course of construction or until removal is directed by the Architect.

B. Repair damage to mock-ups immediately upon occurrence. Maintain mock-ups and surrounding site in a safe and clean condition.

3.03 REMOVAL

A. Completely remove mock-ups at the completion of the project, or as directed.

B. Complete site work at area of mock-up in accordance with Contract Drawings.

3.04 SCHEDULE

A. Mock-up assemblies described in respective sections shall include, but are not limited to the following:

1. Apply the selected graffiti resistant coating to use as example for the aesthetics / performance of the coating. Architect/Owner shall mark-up the panel and perform removal in conformance with the manufactures instructions.
2. Provide required infill stud and channel framing as required to support the finishes of the mock-up and as required in the project. Framing sizes and gages shall be as they are to be in the finished work.

END OF SECTION

SECTION 01 45 33 - CODE-REQUIRED SPECIAL INSPECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.2 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 40 00 - Quality Requirements.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.3 DEFINITIONS

A. Code or Building Code: City of Oceanside Amendments to the 2016 Edition of the California Building Code and, more specifically, Chapter 17 - Structural Test and Special Inspections, of same.

B. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

C. Special Inspection:

1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.4 REFERENCE STANDARDS

A. CBSC/ICC (CBC) - California Building Code; 2016.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency shall:

1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
2. Submit copy of report of testing agency facilities inspection made by NIST Construction Materials Reference testing agency during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Special Inspection Agency is acceptable to AHJ.

C. Testing Agency Qualifications: Prior to the start of work, the Testing Agency shall:

1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of testing agency facilities inspection made by NIST Construction Materials Reference testing agency during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Submit certification that Testing Agency is acceptable to AHJ.

D. Manufacturer's Qualification Statement: Manufacturer shall submit documentation of manufacturing capability and quality control procedures.

E. Fabricator's Qualification Statement: Fabricator shall submit documentation of fabrication facilities and methods as well as quality control procedures.

F. Special Inspection Reports: After each special inspection, Special Inspector shall promptly submit two copies of report; one to Architect and one to the AHJ.
   1. Include:
      a. Date issued.
      b. Project title and Cuningham Group Architecture, Inc. project number.
      c. AHJ Application number.
      d. Name of Special Inspector.
      e. Date and time of special inspection.
      f. Identification of product and Specifications section.
      g. Location in the Project.
      h. Type of special inspection.
      i. Date of special inspection.
      j. Results of special inspection.
      k. Conformance with Contract Documents.
   2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

G. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector shall promptly submit two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and Cuningham Group Architecture, Inc. project number.
      c. AHJ Application number.
      d. Name of Special Inspector.
      e. Date and time of special inspection.
      f. Identification of fabricated item and Specifications section.
      g. Location in the Project.
      h. Results of special inspection.
      i. Verification of fabrication and quality control procedures.
      j. Conformance with Contract Documents.
      k. Conformance to referenced standard(s).

H. Test Reports: After each test or inspection, promptly submit two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and Cuningham Group Architecture, Inc.'s project number.
      c. AHJ Application number.
      d. Name of inspector.
      e. Date and time of sampling or inspection.
      f. Method of obtaining sample.
      g. Identification of product and Specifications section.
      h. Location in the Project.
      i. Type of test or inspection.
      j. Date of test or inspection.
      k. Results of test or inspection.
      l. Conformance with Contract Documents.
      m. Indicate samples taken but not tested.
   2. When requested by Architect, provide interpretation of results.

I. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.

J. Manufacturer's Field Reports: Submit reports to Architect and AHJ.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

K. Fabricator's Field Reports: Submit reports to Architect and AHJ.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.6 SPECIAL INSPECTION AGENCY

A. Owner or Architect will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.
   1. Unless specified as the Owner's responsibility, all other testing, mix design preparation, and related quality control and certification requirements shall be paid for by the Contractor at no additional cost to the Owner.
   2. The Contractor shall reimburse the Owner, through Contract adjustment, for inspection and testing costs caused by the following Contractor actions:
      a. All testing costs incurred after initial test established non-conformance with contract requirements.
      b. Inspection costs caused by Contractor's scheduling of work requiring inspections of less than 4 hours duration.
      c. Inspection costs caused by Contractor's failure to complete work requiring inspection within the scheduled duration period shown on Contractor's initial construction schedule.
      d. Inspection costs caused by Contractor's failure to order sufficient or required quantity of material.
      e. Inspection costs of items repaired following damage caused by Contractor.
      f. Inspection costs caused by Contractor's substitution of material, system or process, where such inspection and testing is required by the Architect, Owner or jurisdictional authority to demonstrate compliance with specified criteria.
      g. Inspection costs caused by Contractor's use of batch plant that does not comply with criteria waiving batch plant inspection.
      h. Inspection costs caused by Contractor's use of a supplier or subcontractor requiring inspection services to be performed at a location exceeding a 100 mile radius of project site.
      i. Inspection costs caused by Contractor's failure to complete work within normal hours and days, requiring overtime costs.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

C. Only local legally constituted public AHJ and the Owner or Owner's Representative shall be authorized to direct testing and inspection to determine compliance or noncompliance with the requirements of the Work.

1.7 TESTING AND INSPECTION AGENCIES

A. Owner may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.8 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.

B. Testing Agency Qualifications:
   1. Independent firm specializing in performing testing and inspections of the type specified in this section.

C. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.2 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:
   1. Verify samples submitted by Contractor comply with the referenced standards and the approved contract documents.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified reference standards.
   4. Ascertain compliance of materials and products with requirements of Contract Documents.
   5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Submit reports of all tests or inspections specified.

B. Limits on Special Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.3 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
   1. Test samples submitted by Contractor.

2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-conformance of work or products.
6. Perform additional tests and inspections required by Architect.
7. Submit reports of all tests or inspections specified.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

3.4 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and testing agency personnel; provide access to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
a. To provide access to work to be tested or inspected.
b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
c. To facilitate tests or inspections.
d. To provide storage and curing of test samples.
4. Notify Architect and testing agency 24 hours prior to expected time for operations requiring testing or inspection services.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

B. Contractor Responsibilities, Seismic Force-Resisting Systems: Submit written statement of responsibility for each item listed to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

C. Contractor Responsibilities, Wind Force-Resisting Systems: Submit written statement of responsibility for each item listed to AHJ and Owner prior to starting work. Statement of responsibility shall acknowledge awareness of special construction requirements and other requirements listed.

3.5 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary utilities.
B. Temporary fire protection.
C. Temporary telecommunications services.
D. Temporary sanitary facilities.
E. Temporary Controls: Barriers, enclosures, and fencing.
F. Security requirements.
G. Vehicular access and parking.
H. Waste removal facilities and services.
I. Field offices.

1.2 RELATED REQUIREMENTS

A. Section 01 35 53 - Security Procedures

1.3 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power , consisting of connection to existing facilities.
      a. Exercise measures to conserve energy.
      b. Provide all required disconnects, overcurrent protection devices, branch circuits, power cords, and outlets as required for the Work.
      c. Where approved by Architect, permanent convenience outlets may be used during construction.
   2. Water supply, consisting of connection to existing facilities.
      a. Exercise measures to conserve water, including use of trigger-operated hoses.
      b. Use of on-site existing water service for potable drinking water is acceptable. Coordinate point of connection with Owner.
B. Provide and pay for all lighting, heating and cooling, and ventilation required for construction purposes.
   1. Provide all lighting required for safety and security of paths and areas affected by construction.
   2. Provide and maintain, at all times, temporary lighting and exit light/path devices in corridor areas as required by applicable codes.
   3. Maintain temperatures as required by occupational safety regulations.
   4. Owner will pay cost of energy used. Exercise measures to conserve energy.
C. Existing facilities may not be used.
D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.4 TEMPORARY FIRE PROTECTION

A. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241 and CFC Section 3311; manage fire-prevention program.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

1.5 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer/photocopier with the following capabilities and functions: copying/scanning up to 11 by 17 inch size paper; scanning up to 300 dpi; exporting scans to PDF and email.
   2. Internet Connections: Minimum of one; DSL modem or faster.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Provide two toilet facilities at site, one each for male and female employees, or as required for all Contractor and subcontractor forces on site, whichever is greater.

C. Locate toilet facilities as directed by Owner. Relocate when required.

D. Use of existing facilities is not permitted.

E. Maintain daily in clean and sanitary condition.

1.7 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
   1. When regulated by codes, such legal requirements for protection shall be considered as minimum requirements. Provide protective measures in excess of such minimum requirements as specified or required.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

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

1.8 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.9 SECURITY - SEE SECTION 01 35 53

1.10 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Maintain parking lots, drives and walkways free of dust, mud and debris when Owner takes beneficial occupancy of a portion of project prior to final completion.

F. Designated existing on-site roads may be used for construction traffic.

G. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

H. Existing parking areas designated by Owner may be used for construction parking.

I. Do not permit parking on adjacent public streets.

1.11 WASTE REMOVAL

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   1. Use cleaning materials which do not create hazards to health or property and which will not damage surfaces. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
   2. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
   3. Schedule operations so that dust and other contaminants resulting from cleaning procedures or construction operations will not fall on wet or newly-coated surfaces.
   4. Provide watering, dust palliative admixture or other methods as required to minimize dust generation during work. Where required by Owner, provide dust screen netting at property line temporary fencing.

C. Provide containers with lids. Remove trash from site weekly.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

F. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Furnish, install and maintain tool cribs, sheds and storage units for the Contractor's use as necessary for the proper execution of the work.
   1. Provide all necessary barricades, warning devices, and enclosures required to protect and direct visitors and staff around tool and equipment located in passageways and corridors.
   2. Return all small tools and secure in locked compartments or cribs at close of work day.
   3. Safe-off or lock all equipment and large tools. Disable from malicious or accidental start-up and operation.
   4. Storage facilities shall provide protection of all products from damage due to environmental conditions, abuse, or theft.

D. Comply with requirements of regulatory agencies having jurisdiction. Obtain and apply for permits required by governing authorities.

E. Locate offices as directed by Owner and as required to avoid interference with Work. Relocate temporary structures as required by job progress.

F. Maintain on site one copy of Project Record Documents, also called Record Job Set, as specified in Section 01 78 00 - Closeout Submittals. Stamp set "RECORD JOB SET - DO NOT REMOVE." During the course or construction, use this set to record actual revisions to the Work.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

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

D. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.
B. Re-use of existing products.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations.
F. Procedures for Owner-supplied products.
G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 01 25 00 - Substitution Procedures: Substitutions made during and after the Bidding/Negotiation Phase.
B. Section 01 40 00 - Quality Requirements: Product quality monitoring.
C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
D. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.3 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute; www.c2ccertified.org/products/registry.
C. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products; 2012.
D. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action; www.greenscreenchemicals.org.
E. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action; www.greenscreenchemicals.org.
F. HPDC (Tool) - Create an HPD On-Line Tool; Health Product Declaration Collaborative; http://www.hpd-collaborative.org/.
G. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures; 2006.
H. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework; 2006.
I. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines; 2006.
J. ISO 21930 - Sustainability in building construction -- Environmental declaration of building products; 2007.
K. NEMA MG 1 - Motors and Generators; 2014.
L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Notice to Proceed.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.5 QUALITY ASSURANCE

A. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).

B. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
   1. Good: Product-specific; compliant with ISO 14044.
   2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
   4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.

C. GreenScreen Chemical Hazard Analysis: All ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).
   1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
   2. Better: GreenScreen Full Assessment.
   3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
   4. Acceptable Evidence: GreenScreen report.

D. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using HPDC (Tool); HPD's with "unknown" listed for any hazard will not be considered acceptable.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is prohibited unless explicitly indicated on the drawings on in the specifications.

2.2 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.
   3. Containing lead, cadmium, asbestos.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of recycled materials.
   7. Are Cradle-to-Cradle Certified.
   8. Have a published Environmental Product Declaration (EPD).
   9. Have a published Health Product Declaration (HPD).
   10. Have a published GreenScreen Chemical Hazard Analysis.

2.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Equals: Submit a request for substitution for any manufacturer not named. It is the Contractor's responsibility to demonstrate proposed substitution is equal to that specified. Products that are not deemed equal by the Architect will be rejected.

D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site unless directed otherwise; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.2 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 61 16 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for VOC-Content-Restricted products.

1.2 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.

C. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.3 DEFINITIONS

A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Exterior paints and coatings.
   2. Exterior adhesives and sealants, including flooring adhesives.
   3. Wet-applied waterproofing.
   4. Other products when specifically stated in the specifications.

B. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

C. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

D. GreenSeal GS-36 - Commercial Adhesives; 2011.

E. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

G. County of San Diego Air Pollution Control District (SDAPCD) Rules and Regulations.

1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.6 QUALITY ASSURANCE

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Aerosol Adhesives: GreenSeal GS-36.
   3. Joint Sealants: SCAQMD 1168 Rule.
   4. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
   5. Wet-Applied Waterproofing: Comply with requirements for paints and coatings.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 50 00 - Temporary Facilities and Controls: Temporary exterior enclosures.

E. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions.

F. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

G. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

H. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

I. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

J. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.

2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
a. Identification of Project.
b. Location and description of affected work.
c. Necessity for cutting or alteration.
d. Description of proposed work and products to be used.
e. Alternatives to cutting and patching.
f. Effect on work of Owner or separate Contractor.
g. Written permission of affected separate Contractor.
h. Date and time work will be executed.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.
1. Minimum of two years of documented experience.

B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.6 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
1. Minimize amount of bare soil exposed at one time.
2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

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 that are indicated diagrammatically on drawings. Follow routing indicated 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.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
   1. All products shall be new, unless specifically noted otherwise.
   2. Do not use products containing asbestos or other hazardous materials.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

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.

1. Locate and identify existing utility, service and irrigation system components affected by work of this contract. Review existing record drawings, conduct site investigations, contact Underground Service Alert and other qualified on-site cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

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 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that established by Owner provided survey.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. 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.

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

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

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

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

3.6 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 indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 50 00 in locations indicated on drawings.
   2. Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Advise Architect of any rotted wood, corroded metals, deteriorated masonry and concrete, or other deficiencies, damage or degradation in existing structure, including in plumbing, heating, ventilating, air conditioning, and electrical systems, and obtain direction for further action.
   2. Remove items indicated on drawings.
   3. Relocate items indicated on drawings.
   4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to Plumbing and Electrical): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. 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.
      a. Prior to beginning any cutting or patching affecting identified utilities, properly disconnect all water, gas and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from serving utility companies.
      b. Prior to disconnect, obtain Owner's written acknowledgment that such system does not impact facilities or systems beyond the extent of this contract.
      c. Disable existing systems only to make switchovers and connections; minimize duration of outages.

d. See Section 01 10 00 for other limitations on outages and required notifications.
e. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
6. Mark location of disconnected systems. Identify and indicate stub-out locations on Project Record Documents.

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.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
3. Where a change of plane of 1/4 inch or more occurs in existing work along the indicated Path of Travel, submit recommendation for providing a smooth transition for Architect review and request instructions.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

I. Clean existing systems and equipment.

J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

K. Do not begin new construction in alterations areas before demolition is complete.

L. Comply with all other applicable requirements of this section.

3.7 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.9 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Take all means required to prevent damage to project resulting from inclement weather, water, wind or other environmental impacts. Provide temporary coverings or enclosures as required for all roof and wall penetrations. Where condensation moisture, rain, or high winds is forecast or present, Contractor shall take all means to eliminate or prevent damage to the Work and to adjacent property, including covering unprotected surfaces, making all openings weathertight, removing loose materials, tools, or equipment from exposed locations, and removing or securing scaffolding.

C. Provide special protection where specified in individual specification sections.

D. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

E. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

F. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

G. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

H. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

I. Prohibit traffic from landscaped areas.

J. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
B. Use only cleaning materials recommended by the manufacturers of the items being cleaned and comply with manufacturer's instructions for items being cleaned.
C. Use cleaning materials that are nonhazardous.
D. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
E. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
F. Wet wipe painted and prefinished surfaces. Do not leave residue or wipe marks.
G. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
H. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
I. Clean filters of operating equipment.
J. Clean debris from gutters, overflow drains, area drains, and drainage systems. Do not discharge volatile, harmful or dangerous materials into drainage systems.
K. Clean site; sweep paved areas, rake clean landscaped surfaces.
L. Clean all sealant joints and similar applications.
M. Remove asphalt and seal coat splatter from curb faces.
N. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.
B. Accompany Owner's Representative on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's comprehensive list of items to be completed or corrected.
C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection. Submit written notice containing Contractor's Correction Punch List.
D. The Architect and Architect's Consultants will then conduct an inspection in order to determine the acceptance of work and identify remaining items to complete. The Architect will prepare a Punch List of such items and transmit to Contractor.
E. If Architect determines that punch list items remaining are sufficiently minor and that Owner can occupy work and use it for its intended purpose, then Architect will prepare a Certificate of Substantial Completion for Owner's signature. Owner will occupy building as specified in Section 01 10 00.
   1. If work is not substantially complete, Contractor shall continue construction until such time as project status justifies subsequent inspection. Costs incurred from subsequent inspections by Architect and Architect's Consultants shall be paid by Contractor through Owner-Contractor contract adjustment.
F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's final inspection.
H. Upon receipt of request for final inspection, Architect will perform a Final Inspection and recommend actions as defined by the General Conditions.

I. If Architect determines work is acceptable under the Contract Documents, Contractor shall submit Final Application for Payment and closeout submittals in accordance with the General Conditions.
   1. Contractor shall submit Final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 71 23 – FIELD ENGINEERING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions, Special Conditions and Division 1 apply to the work of this Section.

B. This section sets forth miscellaneous provisions applicable to all work required and operations performed under this Contract.

C. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Land survey work, including layout of the building lines, grades and levels, for ancillary structures and other improvements on the site.
   2. Other engineering services (civil), as necessary to accomplish the Work.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 01 31 13: Coordination
B. Division 31: Earthwork
C. All other applicable and pertinent sections

1.03 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit the name, address, telephone and registration number of the land surveyor before starting survey work.

C. Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.

D. Project Record Documents: Submit a record of work performed and record survey data as required under provisions of Section 01 70 00, Execution and Closeout Requirements.

E. Survey reports, including signed field survey, that structure is to be constructed within legal property boundaries. Said report shall be submitted 24 hours prior to placing foundation concrete.

1.04 LAYOUT OF WORK

A. The Contractor shall coordinate with the engineer to provide and be responsible for accuracy of surveying needed to construct the project. The Contractor shall preserve construction survey stakes and marks for the duration of their usefulness. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be at the expense of the Contractor.

B. Contractor shall select and pay for the services of a surveyor, registered in the State of California, acceptable to the Owner & Civil Engineer, for layout and verification of building and site elements.

1.05 EXAMINATION

A. Verify locations of survey control points prior to starting work.

B. Promptly notify the Construction Manager of discrepancies discovered.

1.06 SURVEY REFERENCE POINTS

A. Contractor shall locate and protect survey control and reference points. Control datum for contractor's survey shall be the same as that established by Owner-provided survey. Contractor shall provide survey and establish control datum, as required to execute work of this contract. Protect survey control points prior to starting site work. Preserve permanent reference points during construction.

B. If any existing control / datum points are in areas to be demolished, Contractor shall be responsible for their relocation, prior to start of work in that area. Contractor shall distribute xerox copies of the civil drawings indicating the new location and respected reference elevation.

C. As the work proceeds, verify grades, lines, levels, and dimensions indicated on the drawings, and report errors or inconsistencies to the Architect in writing. Do not proceed until all errors and inconsistencies are corrected.

D. Establish and preserve control points and benchmarks adequate for the use of all trades for reference so that all parts of the Work will be within the tolerances specified, or standard with the industry when not specified.

E. Promptly report to the Architect the loss or destruction of a reference point or relocation required because of changes in grades or other reasons, and note location on progress plans. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the Architect.

1.07 SURVEY REQUIREMENTS

A. Surveying and Field Engineering: Provide surveying and field engineering services as necessary. Utilize recognized engineering practices.

B. Bench Marks: Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record drawings.

C. Site Grading Verification: Upon completion of grading survey areas, establish that elevations are correct and within acceptable tolerances for paving and finish grading.

D. Surveying for Layout and Control of the Work: Establish elevations, lines and levels for all other work under this Contract. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements, including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes and invert elevations.
   2. Grid or axis for structure.
   3. Building foundation, column locations and floor elevations.

E. Verification of Work: Periodically verify layout and completed conditions of the work by same means. The Contractor shall check all the dimensions as a whole and in detail and shall layout and become responsible for the exact position and elevation of all parts of the structure. Remove, re-establish and relocate control points and benchmarks as necessitated by the construction process.

2.00 PRODUCTS - Not Used

3.00 EXECUTION

3.01 EXAMINATION

A. Identification: Identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the work. Locate and protect existing benchmarks and control points. Preserve permanent points during construction.
1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

C. Establish and maintain a minimum of 2 construction benchmarks on each site, referenced to data established by survey control points and to that established by original construction benchmarks. Record benchmark locations, with horizontal and vertical data, on Project record documents.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water service piping.

3.02 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale drawings to determine dimensions.
1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level and plumb.

B. Surveyors Log: Maintain a surveyors log of control and other survey work. Make this log available for reference.
1. Record deviations from required lines and levels, and advice the Architect when deviations that exceed indicated or recognized tolerances are detected. On project Record Drawings, record deviations that are accepted and not corrected.
2. On completion of foundation walls, major site improvements, and other work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and site work.

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

D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical work.

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

F. Final Property Survey: Prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the surveyor, that principal metes and bounds, lines and levels of the Project are accurately positioned as shown on the survey.
   1. Recording: At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

F. The following sources may be useful in developing the Waste Management Plan:
1. State of California's Department of Resources Recycling and Recovery (CalRecycle), at www.calrecycle.ca.gov/condemo/.
2. The Whole Building Design Guide Construction Waste Management Database: https://www.wbdg.org/tools/cwm.php.
3. City of Oceanside: www.ci.oceanside.ca.us/gov/water/services_programs/recycling/

G. Methods of trash/waste disposal that are not acceptable are:
1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.
5. Incineration, either on- or off-site.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.

B. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

E. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

F. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit Waste Management Plan within 30 calendar days after receipt of Notice to Proceed, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

C. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
      a. List each material proposed to be salvaged, reused, or recycled.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.

3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
5. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.1 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 - Product Requirements for substitution submission procedures.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01 10 00 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

D. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

E. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.
   4. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. As a minimum, provide:
      a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
      b. Separate dumpsters for each category of recyclable.
      c. Recycling bins at worker lunch area.
   2. Provide containers as required.
   3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
   4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   5. Locate enclosures out of the way of construction traffic.
   6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
   8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Maintenance materials.

D. Warranties and bonds.

1.2 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 50 00 - Temporary Facilities and Controls: Record Job Set required to be maintained at field office.

C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit two copies of completed documents 15 days prior to final inspection. One copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 15 days after final inspection.

C. Maintenance Materials: Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Record Job Set: Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.

3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Neatly and accurately transfer data from Record Job Set specified above.
2. Measured depths of foundations in relation to finish first floor datum.
3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
5. Field changes of dimension and detail.
6. Details not on original Contract drawings.

G. Sign and date Record Job Sets and Record Drawings, certifying that the information and data added is accurate and complete.

H. Record Drawings not complying with specified criteria shall be rejected.

I. Prior to Final Application for Payment, review Record Set with Architect and obtain approval of the scope of transfer. Following approval, submit Record Job Set and Record Set to Architect with Final Application for Payment.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products.

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

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants,Contractorand subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.
   4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.6 MAINTENANCE MATERIALS

A. Package in clearly labeled containers; identify manufacturer, product, pattern, color, lot number, date of manufacture, date of installation, and locations used.

B. Deliver to Project site as directed by Owner; obtain receipt prior to Application for Final Payment.

3.7 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
   1. Obtain executed joint warranties as required, using form specified in Section 00 50 00 - Contracting Forms and Supplements.

B. Assemble all Manufacturer’s Warranties and Guarantees with the Owner named as the Beneficiary, including all extended Warranties.

C. Verify that documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Retain warranties and bonds until time specified for submittal.

F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

G. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. Electrical systems and equipment.
   2. Landscape irrigation.
   3. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.

8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 41 00 - DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of built site elements.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.3 REFERENCE STANDARDS

A. California Occupational Safety and Health Regulations (Cal/OSHA), Title 8, Chapter 3.2, California Code of Regulations; current edition; as a work place.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
   1. Minimum of three years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SCOPE

A. Remove items as indicated and as required to accomplish new work.

B. Remove other items indicated, for salvage.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 70 00.

B. 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. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. 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.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

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

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

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

F. 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.

G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. 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.

I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

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. Unused underground piping may be abandoned in place, provided it is completely drained and capped; 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 existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services (Including but not limited to Plumbing and Electrical): 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 10 00 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.

D. 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.

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; comply with requirements of Section 01 74 19 - Construction Waste Management and Disposal.

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

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

END OF SECTION

SECTION 03 11 13 – CONCRETE FORMWORK

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions Supplementary General Conditions and Division I apply to work of this Section.

B Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Design and construction of all building and site formwork.
2. Placing in forms all anchor bolts, inserts, sleeves, accessories, waterstops, etc., embedded in concrete as indicated or required herein.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 20 00: Reinforcing Steel
B. Section 03 30 00: Concrete and Concrete Finishes
C. Section 03 38 00: Post Tensioned Concrete
D. Section 31 20 00: Earthwork

1.03 REFERENCE STANDARDS

A. California Building Code (CBC), 2016 Edition Chapter 19A.

B. Standard Specifications for Public Works Construction (PWS) and supplements, and City amendments thereto.

C. American Concrete Institute (ACI).
ACI 117 "Standard Tolerances for Concrete Construction and Materials".
ACI 347 "Recommended Practice for Concrete Formwork."
ACI 223, 224 & 3.02 for Slip Dowel References
ACI 318-11 “Building Code Requirements for Structural Concrete”

D. American Plywood Association (APA)

E. U.S. Department of Commerce, PS1-95 or latest edition, Product Standard for Construction and Industrial Plywood

F. West Coast Lumber Inspection Bureau (WCLIB).

G. Submit any conflict between provisions of the various Contract Documents to the Architect for resolution prior to commencement of work.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Provide manufacturers product data sheets for all materials proposed for use.

C. Submit shop drawings for architectural concrete and all other site concrete formwork/ falsework for review, indicating form pattern, panel and construction joint locations, location of form ties, grooves, reveals and alignment bracings. Dimension locations of form joints, construction of control joints, reveals and inserts. Include dimensioned locations and types of form ties, cones, inserts and blockouts. Include detailed description of sealing forms between construction joints.

D. Submit form and shoring removal record.

1.05 REQUIREMENTS

A. Design of formwork, embedded pipes, construction joints, removal of forms, shores and reshoring shall conform to the requirements of ACI 318-11 Chapter 6.

B. Indicate where sleeves are required through concrete beam and/or girder locations for review and approval by the SEOR and Architect.

1.06 QUALITY ASSURANCE

A. Accomplish shoring and reshoring design, falsework, sequence, erection and removal so that construction loads do not exceed design loads. Submit procedures, details and calculations signed and approved by a Registered Civil Engineer in State of California per State Construction Safety Orders Title 8, Section 1717 to Architect for review prior to erecting formwork.

B. The Contractor shall be responsible for the adequacy of all work. Above specifications are only minimum standards. Adequate and safe support, bracing, shoring, reshoring, and stabilizing of all concrete forms is the sole responsibility of the Contractor. Adhere to all requirements of the Division of Industrial Safety, State of California.

C. Contractor shall be responsible for the accuracy of all formwork so that the end result of formed surfaces produces surface finishes conforming to reference standards.

D. Construction loads exceeding basis of design loading, consisting of superimposed dead load plus specified live load, shall not be supported on unshored portion of the structure.

2.00 PRODUCTS

2.01 MATERIALS

A. Lumber for Formwork: WCLIB "Construction" grade or better, Douglas Fir WWPA No 1 or better.

B. Lumber for Rough Carpentry: Standard common, Douglas Fir.

C. Plywood Forms: New; reused or reconditioned forms are permitted, upon Architects concurrance. Fir plywood with phenolic resin-impregnated cellulose fiber bonded on face in contact with concrete, with back and all edges sealed. 5-ply, 3/4" thick minimum, medium (MDO) or high (HDO) density overlay finish, moisture resistant, WPA

"Plywood", except any thickness may be used when used as a liner for board formwork. Provide smooth overlay finished plywood forms for all exposed concrete surfaces, except where otherwise specified for beams and girders. Similar to "Multi-Pour HDO", by Simpson Timber Co. or equal.

1. Medium Density Overlay Plywood (MDO) - (soffit deck forms only): "B" face, "C" back, "C" inner plies, 100% Douglas Fir, exterior glue. Overlay 64#/MSF phenolic impregnated paper with 35% resin content and meet Structural 1 Specification for U.S. Product Standard PS 1-83.
2. High Density Overlay Plywood (HDO)(wall, column, beam, girder and soffit): "B" face, "C" back, C" inner plies, 100% Douglas Fir, exterior glue. Overlay: 100/30 HDO consisting of minimum of 1 layer of 64#/MSF MDO phenolic paper overlaid with 1 layer of HDO 100#/MSF phenolic paper on the face and 1 layer of 30#/MSF HDO phenolic paper on back and meet Structural 1 Specification per U.S. Product Standard PS 1-83.
3. Coated Form Plywood (HDPE): Plastic overlaid plywood factory coated with a form coating and release agent is acceptable in lieu of the HDO plywood specified above. Product as manufactured by Sylvan Industries Inc. 'Dura-Pour' (800) 842-1990, or equal.

D. Forms for PT Beams: Only steel or aluminum forms shall be used.

E. Forms for Transfer Girders: Steel, aluminum or HDO plywood as defined above may be used.

F. Tempered Hardboard: Conform to F.S. LLL-H-35.

G. Form Ties: Adjustable prefabricated rod, flat band, wire, internally threaded disconnecting, removable or snap-off type. Use a working strength of not less than 3,000 lbs. (13.3 KN), when fully assembled. Provide external holding devices to support form loads. “Burke Snap” or “Penta-Ties”, “Concrete Tie Stay-Form” or equal.
1. Form ties for exposed concrete surfaces shall be manufactured to allow a positive break-back of no less than one inch (1") inside concrete surfaces. Ties shall be equipped with a plastic cone of not less than five-eighths (5/8") diameter and one inch (1") long which will completely cover hole and prevent leakage of mortar.
2. Form ties for unexposed surfaces shall be bolt rods or other devices, adjustable in length and free of lugs, cones, washers or other features which would leave a hole not larger than seven-eighths inch (7/8") in diameter, or depressions back of exposed surface of concrete. Ties shall be of such construction that, when forms are removed there will be no metal remaining within one inch (1") of finished surface of concrete.
3. Form ties fabricated on project site and wire ties are not acceptable.

H. Corner Chamfers: “Burke Concrete Accessories, Inc.”, "CSF" Type, “Sylvan Industries Inc.” 'Poly-Comp' (800) 842-1990, or equal, 3/4 inch corner strip chamfer.

I. Stripping Gaskets: Resilient, rectangular material, non-absorbent and non-staining at junctions of formwork as required to permit their removal without damage to concrete surfaces and demonstrated successfully on the sample panel.

J. Compressible Filler: Where indicated on structural drawings provide a Styrofoam or closed cell polystyrene foam. Install at locations and required thickness as indicated.

K. Through Joints (Typical Non-Metallic Expansion at grade): Preformed expansion joint fillers of type, size and thickness required or noted on Drawings. Materials shall be of such character as not to be deformed or broken by ordinary handling when exposed to atmospheric conditions. Pieces of the joint filler which have been damaged shall be rejected.
1. Fiber expansion joint fillers conforming to ASTM D1751.
2. Flexible isomeric polymer foam expansion joint filler, ASTM D1752 Modified, vinyl and polyethylene foams are acceptable. “Ceramar” by W.R. Meadows or equal, joint filler and back-up material for use in either horizontal or vertical applications. Approved for joints in sidewalks, driveways and slabs on grade.
3. Expansion joints to be W.R.Meadows "Sealtight" control joints or equal.

4. Sealant materials in accordance with Section 07 92 00, Sealants and Caulking.

K. Reglets: 24 gage galvanized steel for concealed locations and 0.020 in. stainless steel for exposed locations, by “Fry Reglets Corp.”, “Pittcom”, or equal.

L. Form Coating Materials:
1. Form coating shall be applied to steel, aluminum and wood forms and plastic or urethane formliners. Form coating shall be formulated with a rust inhibitor for use on steel forms and a wood preservative for use on wood forms.
2. Form coating shall be commercially formulated, VOC compliant, chemically reactive and will not bond with or stain concrete surfaces. Form coating must not leave any residue on the concrete surface nor adversely affect the bond or performance of curing compounds, paints, waterproofing, sealers, or any other subsequent treatments that are to be applied to the concrete surface. The form coating must not contain any diesel distillates, waxes, silicones or carcinogens.
3. Acceptable Products:
“Atlas Release” by Atlas Tech Products, (858) 277-2100.
"Clean Strip J-2 Gold VOC" by Dayton Superior Chemicals
"Crete-Lease 727 VOC" by Cresset Chemical Co., Inc.
"Ultra" by Conspec Marketing & Manufacturing

M. Waterstops: To be used where indicated on the drawings and as required to completely seal all cold joints below grade. Refer to the joint between the foundation retaining wall and grade slab around entire perimeter. Provide waterstop as manufactured by Adeka Ultra Seal MC-2010M, distributed by Camp Sales & Consulting (562) 438-4343, or equal.

N. Vapor Barrier: 15 mil. Stego Wrap per ASTM E 1643 over aggregate base below slab-on-grade at rooms where shown in drawings.

3.00 EXECUTION

3.01 QUALITY OF WORK

A. Design and Engineering: Formwork construction and removal shall be the responsibility of the Contractor. Formwork tolerances shall conform to ACI 301.
1. Necessary forms, centering, shores and molds shall be built to conform to shapes, lines and dimensions of various members of concrete construction, as shown or scheduled on the drawings.
2. Concrete members shall be adequately shored to safely support loads and lateral pressures outlined in "Recommended Practice for Concrete Formwork" (ACI 347) without distortion, excessive deflection or other damage.
3. Design forms in accordance with the recommendations of the American Concrete Institute for rate of placement, lateral pressure, temperature of concrete and height of pour and erected with all members adequate in strength, spaced to sustain the concrete loads without deflection.
4. All exterior concrete surfaces of the structure shall comply to ACI 301, Chapter 13 - Architectural Concrete in regards to forming and form surface finish.
5. All other concrete forming shall comply as a minimum standard with Class "A" forming as defined by ACI 347 for all other exposed concrete surfaces except where more stringent is specified.
6. Design shoring sufficient to support construction dead and live loads.
7. Design wall forming consistent with wall dimensions and maximum expected rate of pouring.
8. Check forms before and during placement of concrete and make corrections as work proceeds.

B. Construction: Use/reuse clean, sound, approved form material, coated with specified materials only, no petroleum products. Provide backing on all plywood joints. Sides of all footings shall be

formed, unless permission is obtained to place concrete directly against earth. When footings are placed against earth, add concrete to provide 3" clear cover in lieu of what is indicated on drawings. When formwork is used, remove prior to backfilling operations. Forms shall be assembled to facilitate their removal without damage to the concrete.

1. Contact form materials for all concrete shall be MDO/HDO plywood as specified, metal or fiberglass which give uniform surface, free from excessive variations and irregularities. Reuse of any form material to be contingent upon condition after stripping in ability to produce required finishes. Clean, repair and reseal forms before reuse.
2. Tie, clamp and brace all forms against all possible spreading, bulging shifting, or other movement. Make tight to prevent leakage of mortar. Use metal form ties and spreaders, designed to hold the forms securely and uniformly to required dimensions and without any off-sets in joints and shall be true to line. Use only ties with break-backs that remove l" or more from surfaces. Assemble in a manner that permits forms for walls, columns and beam sides to be stripped without disturbing the soffits or shoring of beams and/or girders.
3. Camber formwork to attain true and level surfaces under construction loads, full dead and live loads and as specified on Drawings.
4. Fabricate deck formwork so that joints are true and level for elevation and alignment. Do not over drive nails or screws which dimple surface. Finished soffit surfaces shall be free of ridge projections between panel joints and free of buttons caused by panel dimples. Surfaces shall be free of unsightly or objectionable form marks.
5. All perimeter soffits / slab edges above grade exposed to the exterior shall be required to have a continuous uniform drip line 4" from edge or as detailed on the Drawings.

3.02 PREPARATION OF FORM SURFACES

A. Form surfaces must be clean, dry and free of contaminants. Clean form surfaces to remove all dirt, rust, any concrete build-up and existing form oils from forms prior to each use.

B. Prior to each use, forms shall be coated with form coating in accordance with manufacturer’s written instructions.

C. Apply form coating in a uniform manner by low pressure spray, roller or clean cloth before concrete reinforcement is placed.

D. Prior to coating new wood forms, apply one or two heavy coats to edges for waterproofing protection.

E. Do not allow excess form coating to accumulate on forms or come in contact with existing concrete surfaces against which fresh concrete will be placed.

F. Do not apply form coating to reinforcing steel. Do not apply to surfaces that form construction joints.

G. Coat PVC "Snaptie Cone", or equal, form plugs for easy removal without causing damage to edges during form stripping.

H. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes or applied coverings which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.03 FORM ERECTION

A. Construct forms to exact shapes, sizes, lines, and dimensions required to obtain level, plumb, and straight surfaces. Provide openings, offsets, keys, reglets, anchorages, recesses, moldings, chamfers, blocking, screeds, drips, bulkheads, and all other required features. Make forms easily removable without hammering or prying against concrete. Space forms apart with metal spreaders. Construct forms to accurate alignment, location and grades, and provide against sagging, leakage of concrete mortar, or displacement occurring during and after placing

of concrete. Coordinate installation of inserts and anchors in forms according to Shop Drawings and requirements for work of other sections.

B. Place form ties equal distant from panel edges and equally spaced symmetrically, accurately in line horizontally and vertically for precise pattern, in the panel field. Snap ties left in the concrete shall be a minimum of 1-1/2" back from the concrete surface. Tie system shall not leak. Grease tie bolts with a silicone grease to facilitate removal without spalling of the concrete. Remove ties with a special tool recommended by the manufacturer. Fill and patch all form ties to match surrounding concrete, where indicated or required.

C. Seat shoring on solid bearing. Design and place shoring so that loads from successive parts of the structure will be transmitted directly through the false-work without creating bending or shearing stresses in the concrete. Construct shoring so that it can be taken down without vibration to the structure.

D. Earth forms may be used for footings and below grade concrete, provided such banks stand firm with no evidence of sloughing which may dilute the concrete, if approved by Architect. Footings and sections having double steel reinforcement curtains or other restricting dimensions of steel location shall be increased in width to obtain required minimum 3" clear coverage of reinforcing.

E. Complete form construction, tying and shoring prior to pouring concrete. Wet all forms and allow time to expand. Install outlets, anchors, inserts, dowels, sleeves and other necessary work of other sections. Forms shall be free of all corrosion, wood chips, shavings, tie wires and other debris. Notify Architect 48 hours in advance of concrete placement to allow for review of forms and reinforcing steel placement. Architect's review will in no way relieve the Contractor of its responsibility for the safety of the forms and shoring.

F. Place sheathing with end joints over bearings and all joints driven close and flush without producing any off-sets, unless otherwise indicated. Make sections of forms at bottoms of walls and columns removable to facilitate inspection and cleaning immediately before depositing concrete.

G. Camber: Place suitable jacks, wedges, or similar means to induce camber and to correct settlement in forms before and during concrete placing. Induce camber of 1/8 inch per 10 feet of span plus 1/4 inch for beams, and 1/8 inch for slabs, or as shown on the drawings.

H. Chamfers or Bevels: Provide 3/4" x 3/4" chamfers on all exposed external form corners of beams, girders, spandrels, columns, pilasters and slabs to relieve angles, unless otherwise indicated. Form concealed concrete corners and angles square unless otherwise indicated on Drawings.

I. Reglets and Rebates: Form required reglets and rebates to receive frames, flashing, and other equipment. Obtain required dimensions, details, and precise positions for work to be installed under other sections.

J. Recesses, Drips, Reveals and Openings In Concrete: Install as shown on the Drawings and as acceptable by the Architect. Provide smooth milled wood or preformed rubber or plastic shapes or types shown.

K. Nailing Blocks, Bucks and Backing: Install in forms accurately as required and as shown on detail drawings.

L. Set in forms anchor bolts, anchor slots, hangers, inserts and reglets for securing masonry, miscellaneous metal, sleeves for embedding in or passing through plumbing pipes, mechanical, electrical, carpentry or other work.

M. Provide slab on grade joints as required by the structural drawings.

N. Screeds over Vapor Barrier: Use weighted pad or cradle type screeds and do not drive stakes through the vapor barrier.

3.04 EMBEDDED PIPING AND ROUGH HARDWARE

A. Where work of other sections require openings for passage of pipes, conduits, j-boxes, ducts, and other inserts in the concrete, obtain all dimensions and other information. All necessary pipe sleeves, anchors, or other required inserts shall be accurately installed as part of the work of other sections, according to following requirements.

B. Conduits or Pipes may be embeded in slabs only as allowed by the provisions outlined on the structural drawings.

C. Sleeves: Pipe sleeves may pass through beams, slabs or walls only as outlined on the structural drawings. Sleeve material shall be non-corrosive or shall be coated or galvanized steel. Provide sleeves of diameter large enough to pass any hub or coupling on pipe, including but not limited to any insulation.

D. Miscellaneous Hardware: Hardware shall have an approval by ICBO Research Report which shall be submitted to the Architect and Inspector.

3.05 FORMWORK TOLERANCES

A. Deflection: Limit deflection of forming surfaces from concrete pressure to L/240 maximum.

B. Finish Lines: Position formwork to maintain hardened concrete finish lines within following permissible deviations.

1. Variation from plumb:
   - In 10' - 0" 1/4 inch
2. Variation from Level or Grades Indicated
   - In 10' - 0" 1/4 inch
   - In any bay or 20' - 0" 3/8 inch
   - In 30' - 0" 5/8 inch
3. Cross-Sectional Dimensions
   - Minus 1/4 inch
   - Plus 1/2 inch
4. Irregularity
   - Gradual 1/8 inch maximum
   - Abrupt Offsets 1/8 inch maximum

C. Building Lines: Variation of linear building lines from established position in plan and related position of walls:
In any bay or 10' - 0" maximum 1/2 inch

3.06 WATERSTOP INSTALLATION

A. Remove dust, dirt loose particles or any other materials which might cause areas of poor adhesion. Apply minimum of one coat of primer if required as recommended by the manufacturer. Apply waterstop the same day as the primer.

B. Press waterstop firmly and continuously in place over the (primed) substrate. Press and butt ends together to ensure no separation or air pockets. Place in maximum practical lengths. Square cut ends to fit splices together without overlaps.

C. Where achieving adhesion is difficult, mechanically fasten (if not required), starting 1" from the end of the coil and proceeding every 10" on center. Remove release papers (if applicable) immediately prior to second pour.

3.07 FORM REMOVAL

A. Remove forms in compliance with ACI 318 Section 6.2 and in a manner to ensure safety of workers and of structure.

B. Exercise care in removing formwork to prevent damage to concrete. Surfaces shall not be marred, gouged or otherwise damaged. Do not pry against exposed concrete surfaces when removing the forms. Corners shall be true and unbroken.

C. Coordinate timing of form removal with curing requirements for concrete with architectural finishes. Strip entire surface without break to ensure uniform curing.

D. Remove forms for poured-in-place concrete only when concrete has developed sufficient strength to safely sustain its own weight and the superimposed loads. After concrete is placed, allow the following minimum time period before the removal of forms unless approved by the Architect.
   1. Forms for non-prestressed concrete members may be removed when concrete has reached 80% design strength or minimum 3000 psi, when sufficient to enable them to carry their dead loads and anticipated construction loads. Forms for prestressed concrete members may be removed after stressing tendons. Immediately reshore all horizontal members unless approved otherwise by Architect.
   2. Where the structure as a whole is adequately supported on shores, the removable wall vertical forms may be removed after 24 hours provided the concrete is sufficiently strong not to be injured and liquid curing compound is applied to all exposed surfaces.
   3. Reshore immediately after stripping to distribute construction loads to elements capable of safe resistance.
   4. Remove formwork in a manner such that members are not subjected to stress reversal.

3.07 REUSE

Clean form materials of loose materials with compressed air and wipe with wet rags to make suitable for reuse before erection. Form material will be unacceptable for reuse, if in the opinion of the Architect, required finished surface can not be achieved.

3.08 FIELD QUALITY CONTROL

Inspection: Obtain inspection and approval of forms before placing structural concrete.

END OF SECTION

SECTION 03 20 00 – REINFORCING STEEL

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Mild steel reinforcing for poured-in-place concrete work.
   2. Provide allowance for five (5) tons of reinforcing rods fabricated and installed over and above the requirements shown on drawings. This extra steel shall be installed during course of construction at locations and to fabrication shapes and sizes, as directed by the Architect. Credit shall be given the Owner for any such steel not actually used.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 03 38 00: Post Tensioned Concrete
C. Section 04 22 00: Concrete Masonry Unit

1.03 CONDITIONS

The "General Notes" on the structural drawings are part of these specifications.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI):
ACI 301 Specifications for Structural Concrete for Buildings
ACI 315 Details and Detailing of Concrete Reinforcement
ACI 318 Building Code Requirements for Reinforced Concrete

B. American Welding Society (AWS): AWS D1.4

C. American National Standards Institute/American Welding Society (ANSI/AWS):
ANSI/AWS D1.1

D. Concrete Reinforcing Steel Institute (CRSI):
CRSI - MSP-1, Manual of Standard Practice

E. American Society of Testing and Materials (ASTM)

F. International Conference of Building Officials (ICBO)

G. California Building Code (CBC), Chapter 19A.

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 33 00.

B. Shop Drawings:
   1. Submit shop and installation drawings of reinforcement and related accessories of arrangements and assemblies, as required for fabrication and placement.

2. Fabricator shall produce sufficient diagrams, notes etc., to show plan layout, plans of combined footings, elevations of walls, shear wall chord details, deck plans, bar placement, bending diagrams, bar schedules, bar sizes, bar grades, stirrup placement and spacing, offsets, splicing, lapping of bars and proposed welding. Include layout dimensions, size and location of splices including dowel bar splices), size and location of accessories.
3. Include special reinforcing required for openings through concrete structures.
4. Indicate complete layout, sections, details, placement plans and elevations of walls.
5. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures"
6. Shop drawings shall not be made by using reproductions of Contract Drawings.
7. Obtain the review of the structural engineer for construction joint locations and shall coordinate same with reinforcing and tendon supplier/placer before submittal of shop drawings.
8. Review of shop drawings does not consider changes or deviations to the contract documents and should not be construed as approval of any such item.

C. Mill Certificates:
1. Reinforcing steel identified as being purchased direct from a United States mill, manufacturers approved test sheets will suffice. Steel supplier shall furnish steel producer's certificate reports of mill analysis, tensile and bend tests.
2. Reinforcing steel from dealers stock not identified as being purchased direct from a United States mill, shall have tension and bending tests on three separate samples for each size of bar in every 10 tons of each type of steel as specified in the appropriate ASTM specification. Contractor shall furnish material for testing and pay for such tests.

D. Welding Certificates: Provide AWS D1.4 certificates for all field welders and/or shop welders of certified fabrication shops performing work on this Contract.

E. Product Data: Provide manufacturers data sheets and current ICBO reports for the proposed mechanical / adhesive anchoring systems proposed.

1.06 QUALITY ASSURANCE

A. Source Quality Control: Deliver bars in bundles as delivered from the mill, identified to heat number, accompanied by mill analysis and test reports, and tagged with identification certificate. Unidentified steel is not to be used for this project.

B. Inspection: Inspector from Owner's testing laboratory shall inspect placement of reinforcing steel for conformance with approved plans, prior to closing of forms or delivery of concrete.

C. Welding Qualifications: Employ welders qualified in accordance with CBC Standard Section 1903.10 and AWS D1.4 certified. Shop welding by an approved fabricator. Continuously inspect all field welding.

1.07 REQUIREMENTS

A. Conform to the requirements of ACI 318-14, regarding details of reinforcement, for hooks, bend diameters bending, surface conditions, placement, spacing, etc.

B. Reinforce all concrete. Provide framing and reinforcement, for conditions not specifically shown or detailed, in a manner consistent with other similar details or conditions shown on Drawings.

C. Post-installed mechanical/adhesive anchoring systems are not to be used unless specifically reviewed by the Engineer. Fasteners are not to be used before the concrete substrate has obtained the minimum 28 day compressive design strength. Selection of fastener or system is to be based on ICBO approved values of the proposed fasteners and its intended usage. Post-installed anchors will not be permitted in post-tensioned concrete without prior review of the SEOR.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcing materials in bundles marked with metal tags indicating bar size and length. Maintain access for inspection and identification after bundles are broken.

B. Store and handle materials to prevent damage, contamination by accumulation of dirt, mud, rust, grease, paint or other bond-breaking coatings.

C. Deliver and store welding electrodes in accordance with AWS D1.4.

2.00 PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: Clean, new stock, conforming to ASTM designations as shown on the structural drawings. Bars larger than 1/4" in diameter shall be deformed. Location of types and grades shall be as indicated on Drawings.

B. Tie Wire: Annealed black 16 gage steel, minimum conforming to ASTM A82 and Fed Spec QQ-W-461.

C. Fabricated Bar Mats: Deformed steel bar mats, ASTM A184, using ASTM A615, Grade 60 steel bars.

D. Welded Wire Mesh (Fabric): Welded smooth wire mesh shall be clean, free from oil and rust. Wire size and gage as shown, 60 ksi minimum yield strength, conforming to ASTM A185.

E. Welding Electrodes: Comply with AWS D1.4, Table 5.1, low hydrogen electrodes, E80XX series.

F. Accessories: Bar supports, chairs, bolsters, spacers, etc., shall be cold-drawn wire and shall be fabricated in accordance with ACI Detailing Manual, SP-66, with heights as required, unless noted otherwise on the drawings. Products by “C.P. Concrete Equipment Company”, “W.J. Burke Company”, “Hohmann & Bernard”, or equal.
   1. Standard manufacturer conforming to ACI 315 approved steel types and sizes. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.
      a. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either non ferrous or plastic-protected legs.
   2. Do not use plastic, wood, brick, or aluminum or other non-complying material. Precast concrete block / dobies are not to be used for elevated decks.
   3. For slabs on grade and foundation elements precast concrete block / dobies, may be used.
   4. Metal accessories are to be galvanized or have other corrosion resistant coating when any part of accessory is placed within 3/4 inch of exposed concrete surface.
   5. Special conditions where there are multiple layers of rebar are to be supported by bolsters, I - bars etc. no stacking of precast concrete block is allowed.

6. Over vapor-barrier, use sand plate bar supports.

G. Mechanical Splice/Coupler Systems: Mechanical connections of splices of deformed bars in tension shall be in conformance with ACI 318-14 sections25.5.7 and 18.2.7 Type 2 splice, with fasteners developing the specified tensile strength of the spliced bars. Welded mechanical splices are not permitted without written acceptance of the Structural Engineer.

H. Post-Installed Mechanical / Adhesive Fastener Systems: Provide ICBO approved mechanical fasteners, such as sleeve anchors, kwik bolt expansion anchors, drive/impact anchors, etc. and adhesive, injection and epoxy chemical anchoring systems as manufactured by ”Hilti”, “Covert Operations Inc.”, “ITW Ramset/Red Head”, “Simpson Strong Tie Company Inc.”, or equal. Each mechanical or chemical fastening system to be evaluated by the Engineer on a case by case basis, based on application, ultimate load, shear and tension values. Post-installed anchors will not be permitted in post-tensioned concrete.

2.02 TESTING OF MATERIALS

A. Test and inspect all materials as herein specified unless test and inspections are specifically waived by the Architect.

B. Test and inspect all materials as herein specified and as required by CBC Chapter 17A.

C. Reinforcing steel must be sampled and tested for compliance with ASTM requirements, at the place of distribution prior to shipment. Place of distribution shall mean the mill for non-fabricated (straight) bars and fabrication shop for bent bars. Make one tensile test and one bending test from specimens of each 10 tons, or fraction thereof, from each size, type or grade of reinforcing steel when taken from bundles as delivered from the mill and properly identified as to heat number. Mill analysis shall accompany report.

D. Samples shall be taken by the testing laboratory representative consisting of not fewer than 2 pieces, each 18" long of each size and kind of reinforcing steel out and prepared for testing by the Contractor.

E. Testing of welds as required per Article 3.04.F, hereinafter.

2.03 FABRICATION

A. Do not start fabrication before steel has been sampled nor before shop drawings have been reviewed.

B. Fabricate reinforcing steel of the indicated sizes, shapes, lengths, spacing and other dimensions as shown on the Drawings. Accurately form bars to details, shapes and lengths as indicated.
1. Fabricate reinforcing bars to details conforming to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.
2. Shop fabricate or site fabricate where equipment is capable of bending the steel in strict accord with the reviewed shop drawings and structural drawings.

C. In case of fabricating errors, do not straighten or rebend reinforcement in a manner that will weaken or injure the material. Heating of reinforcement for bending will not be allowed.
1. Do not weld or field bend ASTM A615 Grade 60 steel, unless accepted in writing by Structural Engineer.
2. Bend No. 5 size bars and larger in shop only.

D. Do not flame cut rebar of any kind without the express acceptance of the Engineer.

E. Reinforcement with any of the following defects are not acceptable.
1. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances;
2. Bends or kinks not shown on the Drawings;
3. Bars with reduced cross section due to excessive rusting or other cause.

F. Marking and Shipment of Reinforcement: Bundle reinforcement and tag with suitable identification (mill analysis & heat number), from the mill and from the fabricators shop to facilitate sorting and placing, and transport to and store at the site in such a way as to not damage the material. Keep a sufficient supply of tested, approved and proper reinforcement on the site to avoid delays in the work.

3.00 EXECUTION

3.01 SURFACE CONDITIONS

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work.

3.02 INSTALLATION

A. Comply with the specified standards for detail and method of placing reinforcement, clearances and supports, except as may be modified herein.
B. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations. Repair damages before placing concrete.

C. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

D. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers.

E. Place reinforcement to obtain minimum coverages for concrete protection.

F. Accurately place reinforcement and securely tie in precise position with specified annealed steel tie wire at points where bars cross and in such a way as to hold them against displacement during the placing of concrete.
1. Tie stirrups to bars at both top and bottom.
2. Tie all accessories.
3. Set wire ties so twisted ends are directed inward away from exposed concrete surfaces.

G. Do not use reinforcement supports as bases for runways for concrete conveying equipment or similar construction loads.

H. Floor System Reinforcement: Do not place until the concrete in walls and columns below has been placed and forms and projecting steel has been thoroughly cleaned, except where otherwise required due to construction sequencing.

3.03 SPLICES

A. Provide reinforcement splices as shown on the structural drawings, by placing bars, lapping ends and tying tightly with wire. Comply with the requirements of reference

standards, and in conformance with ACI 318 for minimum lap of spliced bars, or mechanically coupled or welded compression splices. Do not splice bars except as specifically shown on Drawings or as specifically accepted by the Architect.

C. Mechanical tension splices where specifically detailed on the drawings or as accepted by the Engineer, in strict accordance with manufacturer's requirements and instructions.

D. Place dowels and bars in the forms and secure against displacement during the placing of concrete.

E. Thoroughly clean steel and dowels extending through construction joints in walls, from adhering particles of concrete, before continuing the placing of any subsequent concrete.

3.04 WELDING

A. Provide for welded or mechanical tension splices of reinforcing steel only where specifically detailed on the drawings or as accepted by the Engineer, in compliance with code requirements for relational location to structural members. No cutting, burning or welding of tendons or rebar in the field is permitted without the specific acceptance of the Structural Engineer before such activity. Prepare ends of bars in compliance with AWS D 1.4.

B. Perform welding, where shown or accepted, by using a prequalified process in accordance with AWS D1.4 and CBC, using the specified low-hydrogen electrodes. Employ only experienced welding operators certified for the types of welds specified. Prequalification of welds shall be in accordance with CBC. Preheat bars before welding if required by the process. Protect joints from drafts during the cooling process; accelerated cooling is prohibited. Do not tack weld bars.

C. Clean metal surfaces to be welded of all oil, grease, dirt, loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. Flame dry before welding.

D. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds found defective with chisel and replace with proper welding. Reinforcing bars to be welded (ASTM A706) shall have a maximum of 0.55 carbon equivalent. Carbon equivalent for each bar shall be known prior to welding such that preheat and interpass temperatures may be determined.

E. Weld using full penetration butt welds by the electric-arc method. Weld splices to develop 125% of the specified yield strength of the bars, or of the smaller bar in transition. Exercise care to assure that no reduction of the cross sectional area of the steel reinforcement occurs.

F. Perform nondestructive radiographic or ultrasonic testing on 100% of all welds.

3.05 SETTING MISCELLANEOUS ITEMS

A. Allow for the setting of miscellaneous items of reinforcing steel, as specified in "Concrete and Concrete Finish".

B. Reinforce openings in the floors and walls required by work of other sections.

C. Provide dowels, etc. the sizes and shapes as shown or as required.

D. Provide accessories to maintain vertical wall bars in place during pouring. Single curtain vertical bars shall be secured within 1/4 inch of the specified location. Support spacing of vertical bars shall not exceed 100 bar diameters.

E. Support slab reinforcing at maximum 42", support top reinforcing at faces of supporting walls, columns, beams, or capitals.

F. Tie all splices and accessories.

3.07 ANCHORING SYSTEMS

A. Post-installed anchors will not be permitted in post-tensioned concrete unless specifically accepted by the structural engineer prior to use. Submit all requests for use to Architect for review prior to starting work.

B. Adhesive / Injection / Epoxy Systems: Installation to be as instructed by the manufacturer based on type of insert to be used as accepted by the structural engineer.

C. Provide special inspection.

3.08 FIELD QUALITY CONTROL

A. The Owner will employ and pay a qualified independent testing agency to perform the following testing for field quality control and inspections. Retesting of materials failing to meet specified requirements shall be done at Contractors expense.
   1. Perform visual inspection prior to concrete placement for size, type and quality of materials.
   2. Observe placement of reinforcement, including size, vertical location, horizontal spacing, correctness of bends, splices, clearance between bars and forms, firmness of installation and security of supports and ties immediately prior to concreting.
   3. Observe placement of embedded items, including size, vertical location, horizontal spacing and correctness of fabrication.

END OF SECTION

SECTION 03 30 00 – CONCRETE AND CONCRETE FINSHES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions Supplementary General Conditions and Division I apply to work of this Section.

B Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:

1. Cast-in-place reinforced concrete
2. Concrete finishing and curing
3. Poured concrete stairs / pan filled concrete stairs.
4. Grouting of post-tensioning anchors
5. Equipment and light standard bases.
6. Concrete encasement for pipes.

1.02 RELATED WORK IN OTHER SECTIONS

A.	Section 03 11 13:	Concrete Formwork
B.	Section 03 20 00:	Reinforcing Steel
C.	Section 03 38 00:	Post Tensioned Concrete
D.	Section 04 22 00:	Concrete Masonry Unit
E.	Section 07 18 00:	Elastomeric Deck Coatings
F.	Section 09 90 00:	Painting

1.03 CONDITIONS

The "General Notes" on the structural drawings are part of these specifications.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

ACI 117	"Standard Tolerances for Concrete Construction and Materials"
ACI 301	"Specifications for Structural Concrete for Buildings".
ACI 304	"Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
ACI 305	"Report on Hot Weather Concreting"
ACI 311	"Recommended Practice for Concrete Inspection".
ACI 318	"Building Code Requirements for Reinforced Concrete".

B. American Society for Testing and Materials (ASTM).

C. Comply with California Building Code (CBC) 2016 Edition.

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Materials list of items proposed to be provided under this Section.

C. Manufacturer's specifications, certificates, and other data needed to prove compliance with the specified requirements.

D. Concrete Mix Design: Contractor shall submit mix design, prepared, stamped and signed by a California registered engineer of the approved independent testing laboratory, for each type and strength of concrete a minimum of three weeks prior to start of concrete work. Do not begin concrete production until mixes have been reviewed by SEOR.

E. Material Certificates: Provide in lieu of materials laboratory tests reports only when permitted by the Architect. Material certificates shall be signed by the material manufacturer and the Contractor certifying that each material item complies with, or exceeds, the specified requirements.

F. Shop Drawings: Submit for structural concrete and concrete slabs showing dimensioned locations, types of construction and expansion joints, and method of keying, location of openings, inserts and sleeves.

G. Delivery Tickets: Provide delivery ticket with each transit truck, signed by an authorized representative of the batch plant, containing all information required by ASTM C94, as well as time batched, type and brand of cement, cement content, maximum size of aggregate and total water content. Loads delivered without ticket will be rejected.

H. Inspection Reports: Owner's testing lab shall submit electronic copies of reports to everyone listed on the distribution list. Contractor shall submit electronic copies of reports of all testing and inspection, furnished by Owner's Testing Lab.

I. Samples: Provide minimum of two (2) 2’-0” square samples of the heavy sweated swirled patterned concrete, demonstrating variations for review and acceptance and acceptability prior to execution of floor slab finishes throughout the structure.

1.06 QUALITY ASSURANCE

A. Do not commence placement of concrete until mix designs have been reviewed by the Architect and by all governmental agencies having jurisdiction, and until reviewed copies are on file at the job site, the batch plant, and the Building Department.

B. If, in the opinion of the Inspector or Architect the cement has been damaged in storage or transit or has been in storage at mixing plant for over 30 days, testing may be ordered. Also aggregate shall be tested and every item where the source or character has changed for conformity to relevant ASTM Specifications. Payment for such tests of cement and aggregates to the testing laboratory shall be made by the Contractor.

C. See other requirements for testing in Part 2 of this Section.

D. Schedule construction loads so as to not impose overloading of slabs. Repair any damage resulting from overloading with construction loads at no additional cost to Owner, to the Architects satisfaction.

E. Protect trowel finished slabs from subsequent construction damage, including staining concrete slurry build-ups from form leaks of overhead concrete pours and defacing of concrete deck surface finish from construction operations. Remove concrete slurry build-ups on slabs by wet blast cleaning prior to hardening or cure, where it occurs.

F. Provide concrete finishes as specified herein and as approved by the Architect. Contractor shall make allowances to provide the required formwork, striping, cleaning and patching required to provide the types of finished surfaces approved by the Architect.
   1 Deck surfaces are to be reviewed by the Contractor and the Architect at finishing of the first slab on grade pour to approve the acceptable heavy sweated swirl finish as compared to the approved sample, required as a standard quality expected on all deck pours.

2 Interior surfaces, (soffits, beams, columns and shearwalls) shall be reviewed by the Contractor and the Architect, at the end of the first elevated deck pour to approve a representative area to establish a standard of quality to maintain throughout the interior of the structure.

3 Exterior surfaces of spandrel panels, shear walls and columns shall be reviewed prior to painting. Coordinate with Architect to review surface finishes to determine production standards and acceptable patching. Exterior surfaces shall be considered "Architectural Concrete", and shall be rendered without visible defect.

4. Contractor shall be responsible for coordinating concrete finishes, release and curing compounds with architectural finishes selected.

G. Deck Guarantee

1. All decks shall be guaranteed by the Contractor to be leakproof (watertight), for a minimum period of two (2) years after substantial completion of all work under this Contract. Contractor shall at its own discretion and expense, incorporate whatever Architect approved means, methods and materials as required for sealing of cracks, if any. This requirement is in addition to the caulking and sealant indicated and called for in the Contract Documents.

2.00 PRODUCTS

2.01 MATERIALS

A. Portland Cement: A standard domestic brand conforming to requirements of "Standard Specifications for Portland Cement," ASTM C 150, Type II, mill tested, per CBC Section 1903A.1. When concrete is mixed at the site of the work, deliver cement in sacks with the brand and name of the manufacturer clearly marked. Use only one brand of cement throughout the project unless otherwise required and approved in writing by the Architect.

B. Water for Concrete: Clean, free from deleterious substances, and potable.

C. All regular weight aggregates shall conform to carbonate classification and gradation per CBC Section 1903A.3. Siliceous alluvial deposits, may be acceptable after Engineers review of property and shrinkage data. Provide lightweight aggregates where indicated for lightweight concrete on the structural drawings.

D. Rock Concrete Aggregates: Conform to ASTM C 33, except as hereinafter provided. Reactive aggregate may not be used without prior permission from the SEOR. Request must show proof of cement alkali content, percentage aggregate reactivity and balance with statement from a testing laboratory having prior successful experience with aggregate from the same source as proposed in the request. Hardrock as specified herein shall be deemed to mean normal weight aggregate. Aggregates dredged from salt water sources are not permitted.

1. Coarse Aggregates: Natural gravel or crushed rock, uniformly graded from materials such that 100 percent (100%) passes 1 inch screen and 100 percent (100%) is retained on a #4 mesh screen. Select size 5
2. Fine Aggregates: Conform to ASTM C 33, consisting of clean, natural sand having hard, strong, durable particles, graded to not more than eight percent (8%) passing a #100 sieve, and not more than three percent (3%) passing a #200 sieve.

E. Admixtures: Conform to CBC Section 1903.A
1. Pozzolan: ASTM C618, Class N.
2. Fly Ash: Fly Ash may be used as indicated on the structural drawings.
3.
4. Water Reducing Admixture: ASTM C 494, Type A, D, or E, use only one brand. Admixtures when used are subject to approval of the SEOR, and must reduce the mixing water at least 5 percent without entraining air in excess of 2 percent by volume.
5. Super-Plasticizers (High Range Water Reducers): ASTM C494, Type F or G. Master Builders Solutions "MasterRheobuild 100", Euclid "Eucon 37", capable of producing concrete which can be placed at 8-11 inch slump within 2 inches of that initially mixed for 2 hours, and of maintaining concrete temperature within 2 degrees F from time of batching for 2 hours minimum. If the water reducing agent requires more than 2 percent air, the water reduction shall be not less than 12 percent, but in no case shall the water reducing agent entrain air in excess of 4 percent.
6. Water Resistant Admixture: Integrally batched water repellant admixture for redi-mix concrete used for pan filled steel stairs to be Master Builders Solutions “MasterPel 235”, Concrete Moisture Solutions “Hydra-Guard’, (562) 438-4343, Sika 'Red-Label' or equal.
7. Admixtures containing chloride, fluoride, sulphide, nitrate ions, or other substances detrimental to the reinforcing steel, are not permitted in concrete.

F. Grout
1. A non-shrink, non-metallic, cement-based, premixed grout that meets CRD C-621 and ASTM C-1107, Grades A, B & C. Grout shall be non-corrosive, non-staining and contain no calcium chloride. Compressive strength shall reach a minimum of 3,500 psi (24 MPa) in 1 day and 8,000 psi (55 MPa) in 28 days at a flowable consistency when tested in accordance with ASTM C-109. Grout shall exhibit positive expansion when tested in accordance with ASTM C-827.
2. Acceptable Products:
“Atlas Hi Flow Grout” by Atlas Tech Products, (858) 277-2100
"Conspec 100" by Conspec Marketing & Manufacturing
"Sure Grip High Performance Grout" by Dayton Superior Chemicals
"MasterFlow 100" Master Builders Solutions
"Sika Grout 212" Sika
"Sealtight 588" W.R.Meadows
Or equal

G. Drypack
1. Field mixture of one part Portland cement to two parts fine aggregate mixed to a damp consistency such that a ball molded in the hands will stick together and hold its shape. At contractor's option, the specified admixture may be added for increased workability at lower water/cement ratio. In lieu of field mixing, contractor may use a factory mixed drypack grout.
2. Acceptable Products:
“Atlas Construction Grout” by Atlas Tech Products, (858) 277-2100
"Enduro 50" by Conspec Marketing & Manufacturing
"1107 Advantage Grout" by Dayton Superior Chemicals
"MasterFlow 100" Master Builders Solutions
"Euco Dry Pack Grout" Euclid
Or equal

H. Evaporation Retarder
a. A VOC compliant, water-based, pigmented, monomolecular film-forming compound that reduces evaporation of moisture in fresh concrete to help prevent shrinkage cracks and facilitate finishing.
b. Acceptable Products:

"Atlas Finishing Aid" by Atlas Tech Products, (858) 277-2100
"Aquafilm" by Conspec Marketing & Manufacturing
"Sure-Film J-74" by Dayton Superior Chemicals
Or equal

I. Curing Compound: Comply with ACI 301 Sec.2.1 and
1. For Vertical Concrete Surfaces:
a. A VOC compliant, liquid membrane-forming, water-based, non-staining compound that will not affect the appearance of the concrete, nor adversely affect the bond or effectiveness of subsequent treatments to be applied to the concrete surface.
b. Curing compound to be applied to concrete surfaces that are to receive subsequent coatings or treatments, such as paint, waterproofing, sealers, etc. shall be specially formulated for such use and shall be certified by the manufacturer not to inhibit the bonding qualities of the treatments.
c. Acceptable Product:
"Atlas Quantum-Cure" by Atlas Tech Products, (858) 277-2100, or equal.
2. For Horizontal Concrete Surfaces:
a. A VOC compliant, liquid membrane-forming, resin-based emulsion curing compound conforming to ASTM C-309, Type 1, Class A & B.
b. Curing compound shall dissipate from concrete surface within 40 days of application when exposed to sunlight and construction traffic. Once dissipated, curing compound shall not discolor concrete, nor affect the bond or effectiveness of subsequent treatments to be applied to the concrete surface.
c. Acceptable Products:
"Atlas Res-Cure" by Atlas Tech Products, (858) 277-2100
"W.B. Resin Cure" by Conspec Marketing and Manufacturing
"Day-Chem Rez-Cure J-11" by Dayton Superior Chemicals
"Aqua Resin Cure' by Burke
"Pentra-Cure" by Convergent
"Kurez-DR" by Euclid
" MasterKure CC 200WB" by Master Builders Solutions
" Resin Cure E" by Noxcrete
"1200" by W.R. Meadows
Or equal

J. Curing Paper: Comply with ASTM C 171, Type I and ASTM D2103 Type 00001, regular or polyethylene sheet complying with ASTM D 2103, 5 mil minimum thickness.
1. Curing Paper: Fortifiber Corp. "Orange-Label" Sisalkraft curing paper.
2. Blankets: 5 mil opaque polyethelene extruded onto 10 oz. burlap, JPS Specialties Inc., (800) 821-3859, Cure Lap or Summer Cure 9 mil aluminized coating, or approved equal, 12' x 100'.
3. Polyethylene Sheeting: TRM Manufacturing (213) 921-3458, Weather-All Film, or approved equal, 4 mil white polyethylene sheeting.

K. Under-Slab Vapor Barrier: Provide moisture vapor retardant membrane 15 mil. virgin plastic over 4" aggregate base below slab-on-grade or equal per Soils Report at Electrical and Storage Rooms.

L. Expansion Joint Filler: Refer to Section 03 11 13 - "Concrete Formwork".

M. Non-slip Abrasive Aggregate – Cast-in-Place Stairs: Shall be vitreous ceramic bonded aluminum oxide granules or silicon carbide, well graded from particles passing a No. 8 sieve to particles retained on a No. 50 sieve, split grades 16/36 and shall be non-glazing, rust-proof, moisture-proof and resistant to cleaning compounds. Sonneborn "Frictex", L & M Construction Chemicals "Grip It AO", Concrete Tie "Aluminum Oxide", Norton

"Alundum", Union Carbide "Carborundum" or equal. Color shall be as selected by Architect.

N. Bonding Agent
1. A VOC compliant, water-based, non-reemulsifiable, acrylic latex bonding agent that meets ASTM C-1059, Type II.
2. Acceptable Products:
"Atlas Acrylic Bonder" by Atlas Tech Products, (858) 277-2100
"Strong Bond" by Conspec Marketing & Manufacturing
"Day-Chem Ad Bond J-40" by Dayton Superior Chemicals
Or equal
3. Provide a high strength polymer modified or epoxy bonding slurry to increase adhesion between fill material and existing concrete surfaces. Master Builders Solutions "MasterEmaco ADH 326/327", Sika "32 Hi-Mod", Euclid Chemical "Euco-Bond 452", W.R. Meadows "Rezi-Weld 1000", or equal.

O. Repair Materials
1. For Horizontal Concrete Surfaces:
a. A one-component, polymer modified, cement-based, traffic-bearing concrete repair mortar that meets ASTM C-928.
b. Compressive strength: 3,200 psi (22.1 MPa) in 1 day; 6,800 psi (46.9 MPa) in 28 days, per guidelines of ASTM C-109.
c. Acceptable Products:
"Atlas Pro-Top" by Atlas Tech Products, (858) 277-2100
"Pavepatch 3000" by Conspec Marketing and Manufacturing
"HD-50" by Dayton Superior Chemicals
Or equal
2. For Vertical or Overhead Concrete Surfaces:
a. A non-sag, polymer modified, rapid-setting concrete repair mortar for vertical and overhead applications.
b. Repair mortar shall meet ASTM C-928.
c. Compressive strength: 2,500 psi (17.2 MPa) in 1 day; 6,500 psi (44.8 MPa) in 28 days, per guidelines of ASTM C-109.
d. Bond strength: 1,000 psi (6.9 MPa) in 1 day; 2,000 psi (13.8 MPa) in 14 days, per guidelines of ASTM C-1042.
e. Acceptable Products:
"Atlas Structural Repair Mortar - V & O" by Atlas Tech Products
"Conpatch V/O" by Conspec Marketing and Manufacturing
"HD-25" by Dayton Superior Chemicals
Or equal

P. Resurfacing 'Sacking' Material; for rubbing, smoothing, restoration, resurfacing, and repairing of concrete surfaces with thin coat patching: Provide a Portland cement based product with graded silica aggregate and special chemical additives for bonding, hardening and moisture retention. Provide 'Pavecrete', as manufactured by Lyons Manufacturing, Inc. (214) 381-8100, or approved equal. For surfaces which are slick due to steel or overlay forming, replace percentage of the mixing water with an acrylic polymer, quantity as recommended by the manufacturer.

2.02 PROPORTIONING AND DESIGN OF MIXES BY THE CONTRACTORS TESTING LABORATORY

A. The Contractor shall use an independent testing laboratory acceptable to the Architect and Owner for preparing and reporting proposed mix design. Testing laboratory shall not be associated with the materials supplier. Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ASTM C 94.

B. Prepare all mix designs in accord with ACI 301. The required average strength used as a basis for selecting proportions for each mix to be minimum 15% higher than the specified 28 day design strength. For design strength of concrete at 28 days see Structural Drawings.

C. Durability requirements for exposed concrete to weather (roof, ground level, exterior walls and columns, slab on grade) shall be included in all mix design. Concrete shall have maximum water/Portland cement ratios as shown on the Structural Drawings.

D. Mix design shall provide for an average "drying shrinkage" of concrete after 35 days of total curing not to exceed values as noted on Structural Drawings.

E. Admixtures:
1. Include admixtures, if used, in design mix only as accepted by the Architect and Engineer. Not more than one admixture is acceptable unless specifically permitted in writing by the Architect. Comply with Section 2.01 Item E above.
   a. Use admixtures in strict compliance with the manufacturer's directions. Admixtures to increase cement dispersion or provide increased workability for low-slump concrete may be used subject to the Architect's acceptance.
   b. Use amounts of admixtures as recommended by the admixture manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities of admixtures as required to maintain quality control and provide revised mix designs for review.
   c. Do not use admixtures containing chloride ions.

F. Design strengths of concrete shall attain minimum specified values as noted on the structural drawings. Slump to be as determined by ASTM C 143 and as indicated on the structural drawings.

Note: Specified concrete strengths are minimums. A higher strength of concrete may be substituted to those indicated.

G. Proportion the amount of fine and coarse aggregates with respect to each other, and respect to the water content so that the concrete can be placed without segregation, and produce proper strength. Water quantity, including any moisture in aggregate, to conform to all Code provisions.

H. Submit mix design to the Architect at least 3 weeks prior to start of work and shall include proportions of each material, admixtures if any, water-cement ratio, maximum allowable water content, slump and for each material manufacturer's name and brand, type designation source, aggregates sieve sizes and gradations, 7 and 28 day compressions test results and other pertinent data.

I. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as acceptable by SEOR. Laboratory data for revised mix design and strength results shall be submitted to and accepted by Architect and SEOR, before using in the work.

2.03 FIELD TESTS OF CONCRETE BY OWNER'S TESTING LABORATORY

Evaluation and Acceptance of concrete in conformance with ACI 318-11, except where more stringent specified:

A. Test Cylinders: Perform sampling for test cylinders as the concrete is delivered from the mixer to the concrete pump hopper, unless required at the point of discharge by, code or agency of jurisdiction, testing laboratory or structural engineer. Make from full size

batches of concrete taken from each pour or day's operation so as to represent 50 cubic yards of concrete. Each sample for test to consist of a set of four (4) cylinders sampled in conformance with ASTM C172, 'Sampling Freshly Mixed Concrete' and made and cured in accordance with ASTM C 31, "Curing Test Specimens in the Field". Place in protected area and moist cure as required. Provide test cylinders, number, and indicate point from which sample was taken, and project location for where mix was placed. Indicate slump test results of sample, air content, if any, temperature of air and concrete at project site.

B. Test Cylinders for compressive strength, in accordance with ASTM C 39. One cylinder shall be tested at seven (7) days or 3 to 4 days for post-tensioned concrete, and two tested at 28-days. One cylinder shall be kept as a spare and is to be tested if previous cylinders fail to meet strength requirements. Make frequent slump tests in the field to control consistency of concrete, minimum one slump test at beginning of placement and at the same time test cylinders are made. Conform to ASTM C 143 for slump test methods. Take at least one additional cylinder for testing at 7 days for each class of concrete at the beginning of concrete work and whenever the mix or aggregates is changed.

C. The Contractor may request and pay for additional cylinders, for other than above stated purposes.

D. If the above 28 day tests fail to meet minimum ultimate compressive design strength, concrete will be considered defective and cores from selected areas may be taken as directed by the Architect and in accordance with ASTM C 42.

E. If compressive tests of core specimens fail to meet desired design strength, concrete work shall be assumed to be defective and shall be further tested and, if required, adequately strengthened or removed and replaced by Contractor at no cost to Owner in a manner acceptable to the Architect.

F. Repair concrete work to match existing when coring or other testing is done.

G. Costs of coring, testing of work-in-place cores, and all necessary repairs pertaining thereto, to be at Contractor's expense.

H. Contractor shall provide at no additional cost to Owner, such incidental labor, materials and/or equipment as may be necessary in order to assist the deputy inspection firm with the temporary and secure handling and storage-on-site of test cylinder specimens.

2.04 CONCRETE INSPECTION BY OWNER'S TESTING LABORATORY

A. Comply with 2013 CBC

B. Inspector shall visit each batch plant prior to commencement of concrete work and thereafter only if directed by Architect to perform the following:
   1. Inspection of batch plant operation and equipment (i.e., truck mixer, scales, bunker loading, stock-piles, admixture dispensers, etc.).
   2. Visual inspection of aggregates to determine uniformity of grading, cleanliness, moisture variation, etc.
   3. Check size of batch for rated capacity of truck.
   4. Check of proportioning and adjustment of mix for "free" moisture of variation in gradation.
   5. Visual inspection of batched loads after reasonable mixing time to determine the consistency and workability before releasing concrete for delivery.
   6. Inspection of conveying system to help prevent segregation.

C. Inspector shall be on project site to perform inspection for concrete over 2,000 psi (f'c), to verify placing techniques to determine that concrete deposited is uniform, vertical drop is

not excessive, check depth of layers and for proper steel reinforcing placement and coverages.

2.05 ADDITIONAL TESTS BY OWNER"S TESTING LABORATORY

A. During the progress of the work make a reasonable number of tests as hereinafter specified and when instructed by the Architect. Architect shall not be responsible to search reports to verify the results of the test. Testing lab shall clearly underline and bold the results of the tests for easy review. Make tests for the following in accordance with ASTM Standards:
   1. Reactivity of Aggregate: C 289 / C 227
   2. Organic Impurities: C 40
   3. Fineness Tests: C 117
   4. Soundness of Aggregates: C 131
   5. Weight, Air Content: C 138
   6. Shrinkage Tests: C 157

B. Concrete Shrinkages Tests:
   1. Before placing any concrete deck slabs, prepare a trial batch of the mix design, using the same aggregates, cement and admixtures (if any) proposed for use on the Project. Prepare at least 3 specimens for determining the "drying shrinkage" of the mix design.
   2. The "drying shrinkage" specimens shall be 4" x 4" x 11" prisms, made, cured, dried and measured as specified in ASTM C 157. Measure and report separately for 7, 14, and 28 days of drying, after 7 days of moist curing. The effective gauge length of the specimens shall be 10".
   3. Take "drying shrinkage" specimens of each class of concrete (elevated slabs and slabs on grade) during construction to insure continued compliance with these Specifications. Take at least one set of 3 specimens from each 1,000 cubic yards of concrete placed, a minimum of one set per pour. Take "drying shrinkage" specimens from the same concrete used for preparing compression test specimens.
   4. The average "drying shrinkage" of the test specimens at 35 days of total curing shall not exceed the lesser of value indicated on the structural drawings or 0.050% for hardrock (normal-weight) concrete.

2.06 INSPECTION REPORTS

The Owner will pay for services of testing laboratory test samples only to extent shown on Drawings or specified and for continuous inspection of the depositing of structural concrete. Electronic copies of reports of all testing and inspection of concrete placing shall be furnished by Owner's testing lab, and kept by the Architect, Contractor, Engineer, Owner and SEOR. Make all log entries available at all times. Conform to the requirements of the CBC for the following:

- Selection of Concrete Proportions
- Batch Plant Inspection Waiver
- Batch Plant Inspection

3.00 EXECUTION

3.01 SURFACE CONDITIONS

Examine the areas and conditions under which work will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 CONCRETE MIXING - Refer to CBC

A. Concrete for minor work, when approved by the Architect, may be mixed at the site in a power mixer when the mixer has a capacity not less than one full sack batch. Split batches are not permitted.

B. Mixing of Concrete: Use a machine batch mixer with a peripheral speed of 200 feet per minute for at least three minutes and until mass is uniform and homogenous. Mixers shall not be operated beyond rated capacity as given in manufacturer's catalog and shall be thoroughly cleaned between batches.

C. Transit Mixed Concrete: From an approved plant and conforming to the latest issue of ASTM C 94. Quality and quantity of materials used in batched aggregate shall be subject to inspection at locations where materials are measured. At time of delivery of each load of concrete, manufacturer of transit mixed concrete shall furnish certified statement stating quantity of cement, water and aggregate contained in the load, as well as time of first adding water to mixture, brand and quantity of admixture, if any.
   1. Mix each batch of concrete not less than fifteen minutes, five minutes of which shall be at the site.
   2. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed".
   3. Whenever there is a delay in unloading, rotate the drum slowly at intervals to prevent incipient set of concrete.
   4. Discharge concrete under observation of a designated deputy inspector.
   5. Concrete will be rejected if not placed in final position within l-1/2 hours after water is first added to the batch.
      a. When the air temperature is between 85 deg. F and 90 deg. F, reduce the mixing and delivery time from 1-1/2 hours to 75 minutes, and when the air temperature is above 90 deg. F, reduce the mixing and delivery time to 60 minutes maximum.
      b. When the air temperature has fallen to or is expected to fall below 40 deg. F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 deg. F or more than 80 deg. F at any time during mixing, transporting, or at point of placement.
      c. Do not use materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix design by Architect in writing.
      d. Loads received after the 90 minute time that do not exceed 90 degree temperature and is still workable is acceptable if no additional water is added past the 90 minutes.
   6. Concrete at time of placing shall be in such condition that it can be placed properly.
   7. Discharge all wash water from the mixing drum before the truck reloads at the batching plant.

D. Store aggregate materials at batching site on tightly floored space and shall be protected against mixing with the ground or with other types or sizes of aggregate.

E. Deliver cement to batching site in original, unbroken sacks, or other suitable method acceptable by the Architect to guarantee that only the specified manufacturer's product covered under requested mill reports will be used in the work. Store cement in a weather-protected, well-ventilated place, having a floor clear off the ground. All cement shall come from the same supplier and be of same brand.

F. Control of poured concrete mix requires all aggregates shall be measured by weight or by an equivalent approved method. Accurately control proportions of water-to-cement.

G. Use concrete mixers equipped with automatic apparatus for timing and for metering or measuring water and liquid admixtures. Apparatus shall have locks that will prevent unauthorized changing of the adjustments.

H. Concrete Consistency:
1. Use the amount of water established by the approved mix design.
a. Do not exceed the maximum quantity specified for the grade of concrete.
b. Use the minimum amount of water necessary to produce concrete of the workability required by the Architect
c. Do not supplement the predetermined amount of water with additional water for any reason.
2. Measure concrete consistency by ASTM C143 method.
a. As part of the routine testing and inspecting, test twice each day or partial day's run of the mixer.
b. Maintain a complete and accurate record of tests.

3.03 PREPARATION FOR CONCRETE PLACEMENT

A. Remove all free water from forms before concrete is deposited. Remove hardened concrete debris, and foreign materials from interior surfaces of forms, exposed reinforcing and from surfaces of mixing and conveying equipment.

B. Wetting: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce absorption and to help maintain concrete workability.

C. Earth Subgrade: Dampen 24 hours before placing concrete; do not muddy. Re-roll where necessary for smoothness; remove loose material.

D. Sand Beds: Recompact disturbed material and bring to correct elevation. Sprinkle damp without flooding.

E. Vapor Barrier: Install per "Earthwork" and "Concrete Formwork" Sections.

F. Screeds: Set screeds at walls and at a maximum of 8 foot between centers. Set to provide level floor. Check with instrument level, transit or laser during placing operations to maintain level floor.

G. Screeds over Vapor Barrier: Use weighted pad or cradle type screeds and do not drive stakes through the vapor barrier.

H. Expansion Joint Filler: Install where slabs abut building, or as indicated. Install full depth of concrete with top level with finished surface of concrete.

3.04 DEPOSITING

A. Comply with CBC 19 and ACI 318 Section 26.5.2.

B. Convey concrete from the mixer and deposit within thirty minutes after discharge from the mixer, but in no case more than 1-1/2 hours from the time of first adding water.

C. Place each unit of a structure, whenever possible, in one continuous operation. Place required vertical and horizontal construction joints in approved locations. Make all construction joints straight, horizontal or vertical, coinciding with reveals or top of forms, as applicable. Make surfaces of the concrete level where ever a run is stopped. Place reinforcing steel at construction joints as detailed on the Drawings. Prepare joints as shown, sandblasting with wet sand, if required, to expose aggregate of previous pour, then wash thoroughly with water jet.

D. When placing slabs that are inclined uphill, i.e. sloped post tensioned slabs, deposit concrete uphill to minimize tension cracking.

E. Pour all walls and columns full story height. No horizontal joint will be allowed between floor line and top of wall, except as otherwise shown on Drawings or approved by Architect. Do not allow concrete to drop freely more than six feet, for concealed concrete and three feet for exposed concrete. Where deeper sections are being poured use tremies or metal chutes to limit the free fall. Place concrete by methods that prevent segregation of materials.

F. Construction Joint Key: Finished smooth and straight, with proper forming strip allowing for easy removal. Tool top edges of slab construction joints to provide seat for caulking; v-groove bottom as detailed.

G. Deposit concrete on forms as nearly as practicable at its final position. Deposit concrete into forms in horizontal layers around the building, proceeding along the forms at a uniform rate pouring concrete into edge of the concrete last poured. Do not pour concrete into an accumulation of water ahead of the pour. Do not flow concrete along the forms to its place of final deposit. Do not cause concrete to flow such that the lateral movement will cause segregation of the coarse aggregate mortar or water from the concrete mass.
   1. Do not place any subsequent pour without a construction joint against a previous pour which has set or been in place more than one hour.
   2. Construction joint surfaces in walls are to be raked to produce a rough, ridged surface of 1/4" amplitude; also refer to structural details.

H. Do not retemper mix which has partially set. Place concrete in forms not more than 12 hours after water is added to the mix. Place no concrete when such wind, heat or limitations of provided facilities will prevent proper and uniform curing.

I. Pour only one grade of concrete on the job at one time.

J. Place vibrators in the concrete rapidly to minimize entrapped air between concrete and forms. Consolidate concrete and work to all points to provide solid, continuous contact with forms. Use power vibrators immediately during pour. Vibrating through the forms from the outside will not be permitted. Vibrate for sufficient time and supplement by rodding or spading by hand, to accomplish thorough compaction and complete embedment of reinforcement and fixtures, but not cause segregation of ingredients. Remove vibrator slowly from concrete to break up and release air entrapped between concrete and forms. Insure smooth surfaces free from voids, aggregate pockets or honeycombs, supplement mechanical vibration as necessary.

K. Pour floor slabs, concrete pavements and walks, compacted and rodded accurately to the level and thickness as shown on the Drawings within a tolerance of 1/4" when tested with a 10 foot straightedge. Slope deck surface to elevations indicated, to drains wherever they occur. Where mesh reinforcement was not installed in a manner to support weight of workers during depositing, lift and recheck behind placing, for proper depth as indicated on Drawings.

L. Set top of floor drains a minimum of 1/2" lower than surrounding concrete finish surface. Dish concrete within a three (3) foot radius to drain, to provide positive drainage to drain. Coordinate with plumbing work and verify before placing concrete. Where no such positive drainage is accomplished, remove drain and rework concrete. Reinstall drain to achieve drainage as stated above.

M. Inserts, Anchors, and Embedded Items: Use cast-in fasteners wherever practicable. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting drawings,

diagrams, instructions, and directions provided by suppliers of the items to be attached thereto. Coordinate with other trades for proper location.

1. Powder driven or drilled concrete fasteners may be used in flat slab areas and columns only when accepted by the Architect, said fasteners may be used in tension only for support of light loads such as acoustical ceilings, duct work, conduits, pipes, and similar items when such loads are limited to less than 75 lbs. Submit load, location and hardware data for review to Architect. Fasteners to be located 8" minimum from P.T. tendons and penetration limited to 7/8".
2. Where "Red Head" or similar types of concrete anchor bolts are used for significant gravity loads or seismic anchorage furnish data and proposed locations for review to Architect. Do not use in post tensioned members or slabs without the specific acceptance of the Engineer in writing.
3. Where hanger rods, bolts, wire, coil inserts or similar items are used to suspend construction items, place in the concrete as required and/or indicated.

N. Conduits and Sleeves:
1. Locate so as not to reduce the strength of construction.
2. Provide layout drawings showing exact conduit path and spacings in all concrete members.
3. Conduit up to 1-1/2 inch nominal outside diameter may be embedded in the central one third thickness of slabs when layouts are submitted and approved by the Structural Engineer. In no case may conduits displace reinforcing.
4. Conduit shall not be placed beneath the bottom reinforcing steel nor over top of top reinforcing bars.
5. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 3" of concrete around the conduit on all sides.

O. Coring of columns, beams and post-tensioned members is not permitted unless specifically accepted by Architect in writing.

P. Where openings in floors and walls are required by the work of other sections, but are not detailed on the Drawings, reinforce as required and directed by the Architect.

Q. Concrete shall not be placed until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts and other embedded materials are securely and properly fastened in their correct positions.

R. Where concrete equipment pads are required by electrical, plumbing and mechanical trades or for raised curbs, but are not detailed, reinforce as directed by Architect, but shall have a minimum reinforcing of #4 at 18" o.c. each way including dowels to structural slab.
1. Concrete pads shall be installed horizontally, level, at typical floors and sloped to provide positive drainage at roofs, unless detailed otherwise or required by equipment manufacturer.
2. Concrete raised curbs shall be installed horizontally, level at both the typical and roof levels, unless detailed otherwise or required by equipment manufacturer.

S. Concrete slab on-grade paving for all miscellaneous walks, driveways, etc. shall be reinforced with 6"x 6"/W1.4 x W1.4 middepth, unless otherwise indicated on the Drawings.

3.05 PATCHING AND FINISHING OF FORMED CONCRETE SURFACES

A. Patching Concrete: Fill all rock pockets, "honeycombs" and holes in excess of 3/16", or heavy concentrations of air holes in the opinion of the Architect, removal of nails, rod and cone ties, separators and core samples, etc. unless indicated otherwise. Chip away defective areas to solid concrete, forming perpendicular edges or slightly undercut edges. Drench area of patch and surrounding area with water. Pack full with mortar (sacking

slurry) mix. Match surrounding concrete surfaces in color and texture using part white Portland cement, if necessary. Remove fins and irregularities in exposed concrete surfaces while concrete is green. Neatly patch exposed exterior surfaces of concrete, as required; irregularities ground smooth.

B. Finishing Formed Surfaces: Immediately after forms have been removed, examine all surfaces. Exposed surfaces to have a smooth finish. Repair surfaces having bulges, honeycomb, voids, gravel pockets or other defects with dry pack or cement grout, as directed, and finish flush with adjoining concrete surfaces. Concrete surfaces that will remain exposed in the finished work shall have all traces of pointing, patching and surface irregularities removed by rubbing and honing with carborundum stones to produce uniformly smooth finish.

3.06 CONCRETE FINISHING

A. Concrete Finishing: Bring the concrete slabs, using screed, to the required floor level and strike off true with a straightedge. Remove excess water and laitance. Compact with a grid tamper, if desired, then float and trowel finish as specified. Test the surface with a straightedge to detect high and low spots and eliminate any which may exist. Tolerance not to exceed 1/4" along a 10 foot straightedge in the final concrete finish surface. Floor flatness shall be F_F 10 min, when measured according to ASTM E1155, modified as follows:
1. Measurement lines shall not cross joints or grade breaks.
2. F_L numbers do not apply in areas where warps, slopes and cambers are intended by design.

B. Troweled finish for slabs in general which are to remain exposed or receive non-bonded finish (Storage, etc.): Unless otherwise indicated or specified, all slabs to receive a simple steel trowel finish in two troweling operations.
1. When the concrete has hardened sufficiently after floating, so that the fine particles do not work to the surface, hand or machine trowel and bring to a smooth surface, free from defects and blemishes. Do not sprinkle dry cement, or a mixture of cement and sand directly on the surface to absorb moisture or stiffen the mix.
2. After the concrete has hardened sufficiently to prevent mortar from collecting on the trowel, trowel to a hard burnished surface, free from trowel marks. Continue troweling until there is a distinct ring under the trowel, but avoid excessive troweling.

C. Raised Cast-In-Place Curbs, Stairs, and Concrete Landings: Trowel finish with final finish to be a medium sweated finish. At exposed concrete stairs and landing walking surfaces render non-slip by uniformly sprinklering wetted non-slip abrasive grit evenly over finish concrete to exhibit 65-75 percent, or roughly 1/4 pound per square foot minimum of abrasive aggregate. Just before performing retroweling, lightly rub the hardened green concrete to expose grains and expose cement film. Refer to paragraph 3.13B of this section for finish on steel pan stairs.

D. Float Finish For Slabs Scheduled To Receive Other Bonded Finish Materials: Finish with wood floats and lightly broom and brush clean to provide proper bond for finished materials. Verify finish requirements for surfaces to receive elastomeric coating with coating manufacturer.

E. Trowel Finish For Garage Floors, Driveways, Ramps: Provide a trowel finish by hand trowel to produce a uniform coarse/heavy "sweated" swirl pattern. Finish is subject to Architects approval.

F. Sidewalks: Provide a medium broom finish

G. Handicap Ramps- Accessibility Compliance: At 'Path of Travel' (ramps), concrete surfaces shall be finished with a heavy broom finish at slopes exceeding 6%, and medium broom finish at slopes up to 6%. Surface finish may be either a broom or sweated rotary finish. Provide with a tactile warning of 1/4" wide x 1/4" deep grooves at 3/4" o.c. with configurations as shown on the drawings, or as required for handicap accessibility in accordance with California Building Code with Title 24 CCR amendments.

H. Finish on all exterior exposed poured-in-place concrete walls, all surfaces of beams, spandrel and all four sides of perimeter column surfaces, to be "sack" finished and when completed, shall be smooth, free from air, pin or rock pockets and/or discoloration or defects; uniform color and texture, free of dust and ready to paint. All score joints and grooves shall be straight, true and uniform.

I. Interior Beams: Finish to a smooth natural form finish with steel forms to exhibiting a dense, smooth surface which is free of rock pockets, air and pin holes, and which shall not exceed 3/16" diameter in sparse areas, and shall be free of other defects. Junctures of beams to girders and beams/girders with columns and slab soffits shall be uniform in detail and true to line. Sack all beams and girders to achieve the specified steel form finish.

J. Poured Interior Columns: Have all projections removed and voids filled and ground smooth and left dust-free to receive paint. All column chamfers shall be ground, smooth, consistent from floor slab to soffit, producing clean edges and be smooth as required.

K. Radius-tooled Edges: 1/4" radius typical for all slabs not metal edged unless noted otherwise, and the tops of walls and beams where indicated.

L. Interior Soffit Treatment: Underside of slabs and beams to have fins, projections including any deck panel buttons removed including all nails, staples, bolts, wood form chips and other protrusions and have all voids filled. Fill all threaded deck panel inserts; remove grease prior to filling. Mortar used for filling shall match adjacent concrete in color and texture.

M. Pan Filled Stairs and Landings: Provide a water resistant concrete mix that is finished with a medium broom finish.

3.07 CONTROL JOINTS

A. Locate control joints on grade slabs as indicated on the structural drawings.

B. Approved method for saw cutting is to be by wet, soft cut, within 6 hours of pour following final troweling/finishing, 1/4 the depth of the slab, (1" minimum) unless indicated otherwise on Drawings.

3.08 SACKED FINISH WHERE SPECIFIED SHALL BE AS FOLLOWS

A. Remove all fins and projections from concrete surfaces.

B. Apply the pre-packaged slurry specified hereinbefore. Only upon special approval of the Architect may the Contractor proportion the slurry from one part cement to 1-1/2 parts sand, passing a No. 16 sieve, by damp loose volume, mixed with sufficient water and bond enhancing acrylic admixture to form a grout having the consistency of thick paint.

C. Prior to applying slurry to surfaces, dampen concrete sufficiently to prevent water absorption. Spread slurry over surfaces with a clean sponge rubber float or burlap pads to completely fill all holes and imperfections. Float surface vigorously, and while slurry is still plastic remove excess grout.

D. Allow to dry, then rub with burlap to completely remove dry grout so that no visible grout film remains. The entire sacking operation for any area must be completed the day it is started. Surface when completed shall be smooth, free from air, pin or rock pockets and/or discoloration or defects, uniform in color and texture, free of dust and ready to paint.

3.09 DEFECTIVE CONCRETE

Work that is not formed or is not true to alignment, not plumb or level or is not true to grades and levels, or has voids, rock pockets, sawdust, wood or debris embedded in it, or does not fully conform to the Contract Documents for required strength, will be considered as defective material and/or faulty workmanship, and when directed, shall be removed and replaced with work that conforms to the indicated requirements.

3.10 CURING

A. Maintain concrete in a moist condition for at least seven (7) days after the placement of the concrete per ACI 318 Section 5.11.

B. Initial Curing For Exposed Concrete: Provide fog spray or mist operation, (rainbirds not permitted) continued for a minimum of six (6) hours, to take place immediately after final troweling operations are completed. Under conditions of low relative humidity, high heat and drying winds, start curing while the finishing work is still in progress, sufficient to prevent any crazing, cracking or "surface-dry" spots.

C. Promptly upon completion of initial curing, moist curing shall be started.

D. Moist Curing shall be continued for a total combined curing period of seven (7) days by the following method:
   1. An approved curing compound applied in accordance with manufacturer's instructions. Cuts into the slab, such as joints, must receive an immediate reapplication of compound.
   2. Throughout the curing period, maintain a uniform membrane (as evidenced by the compound dye). Where construction operations or excess traffic causes damage to the membrane apply a second coat. Provide an inspection schedule subsequent to coating an area and insure that the provisions of this Section are met.
   3. Where elastomeric coating is to be applied to concrete deck, cure by placement of "Visqueen" or equal vapor barrier immediately after final troweling operations are completed. Retain vapor barrier in place until proper curing is achieved. Verify procedure with material manufacturer; curing compounds may not be permitted.

3.11 WEATHER CONDITIONS AND PROTECTION

A. Protect concrete placing operations and freshly poured work from rain with canvas or other approved covering until set, giving special attention to protection of floor slabs during this period.

B. Concrete placed when atmospheric temperature is below 40 degrees F. or is anticipated to be at freezing or near freezing temperature within 72 hours, shall have a temperature of not less than 50 degrees F., nor more than 80 degrees F. and shall be maintained at a temperature of at least 50 degrees F. for not less than five (5) days after placing. Additives to prevent freezing will not be permitted. Methods to maintain temperature of the air, forms or materials in contact must be reviewed by the Architect.

C. Cold weather concreting shall be as per ACI 306R. Cold weather concreting shall be performed only upon approval of the Architect. Cold weather concreting methods shall be used under the conditions stated and in accordance with the recommendations and

directions all as contained in Chapter 1 of ACI 306. Do not use admixtures unless specifically permitted by the Architect.

D. Hot weather concreting shall be in accordance with all the recommendations, directions and requirements of ACI 305R. Do not use admixtures unless specifically permitted by the Architect.

3.12 CLEANING

A. Upon completion, wash and clean concrete flat work and vertical walls and columns leaving free from cement and concrete droppings or splatters, form release agents, curing compounds, oil, paint, plaster and other foreign substances, leaving ready to receive the scheduled coverings and paint.

B. Where surfaces are to remain exposed, surfaces are to be free of stains, markings or other discolorations of any nature, which mar the appearance of the concrete. Contractor shall include as part of the Scope of Work all procedures required to clean surfaces exposed to view. Procedures shall include, but not be limited to power washing, acid washing or wet sandblasting, or concrete cleaner as approved by the Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Grouting: Fill-in holes, surface defects, and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other sections is in place. Mix, place, and cure concrete as herein specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete the work. Refer to Structural Drawings for column base plate and other structural grouting requirements.

B. Steel Pan Stairs:
1. Provide transit mixed concrete fill for steel pan stair treads and landings and associated items. Reinforce all pans at center of fill with 1 layer of WWM 4 x 4 - W1.4 x W1.4. End wires parallel to edges shall be placed 1-1/2 inch maximum from edge of pan. Inspect edge of pan stair nosing edges to verify each step or landing has not been damaged or dented due to construction operations. Make repairs prior to concrete fill. Install stair nosing strips, as specified in Section 05 50 00, as soon as possible after concrete is placed. When fill is ready, screed, tamp, and finish concrete surface as scheduled. Provide perimeter groove for sealant as required. Slope stair
treads 1/8 inch from base of the risers to the nosings. Slope landings toward lower stairs as shown on the drawings or as required to avoid ponding of water. Apply a light non-slip swirl finish across stair run on treads and light swirl non-slip finish on landings.
2. See Section 07 14 16 for waterproofing.

3.14 ANCHORING SYSTEMS

A. Post-installed anchors will not be permitted in post-tensioned concrete unless specifically accepted by the structural engineer prior to use. Submit all requests for use to Architect for review prior to starting work.

B. Adhesive / Injection / Epoxy Systems: Installation to be as instructed by the manufacturer based on type of insert to be used as accepted by the structural engineer.

C. Provide special inspection.

END OF SECTION

SECTION 03 38 00 – POST TENSIONED CONCRETE

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Post-tensioning materials, including prestressing steel tendons, anchorage, distribution plates, and tendon enclosures.
   2. Placing of post-tensioning strands.
   3. Performing all post-tensioning operations, including jacking and anchoring.
   4. Cooperate in keeping records of elongations, gauge readings, etc.
   5. Provide allowance for one (1) ton (2,000 lbs.) of additional post tensioning steel tendons and associated materials, anchorage, plates, enclosures, etc. as required, installed, over and above the requirements shown on drawings. These extra materials shall be installed during the course of construction at locations as directed by the Architect. Credit, using unit prices, shall be given the Owner for any material not actually used.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 11 13: Concrete Formwork.
B. Section 03 20 00: Reinforcing Steel.
C. Section 03 30 00: Concrete and Concrete Finishes.
D. Section 05 50 00: Miscellaneous Metal.

1.03 CONDITIONS

A. The "General Notes" on the structural drawings are part of these specifications.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)
   1. ACI 301 - Standard Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.
   3. ACI 423.3R - Recommendations for Concrete Members Prestressed with Unbonded Tendons.

B. American Society for Testing and Materials (ASTM).
   1. ASTM A416 - Specifications for Uncoated Seven-Wire Stress Relieved Strand for Prestressed Concrete with supplement for Low Relaxation Strand
   2. ASTM A421 - Specifications for Uncoated Stress Relieved Wire for Prestressed Concrete
   3. ASTM E328 - Recommended Practice for Stress-Relaxation Tests for Materials and Structures.

C. Post Tensioning Institute (PTI).
   1. Guide Specifications for Post Tensioning Materials.
   2. Performance Specification for Corrosion Preventive Coating.
   3. Specification for Unbonded Single Strand Tendons.
   4. Field Procedures Manual for Unbonded Single Strand Tendons.

D. Precast/Prestressed Concrete Institute PCI Design Handbook.

E. International Conference of Building Officials (ICBO).

F. 2016 California Building Code CBC Chapter 19.

1.05 SYSTEM DESCRIPTION

A. Building Characteristics: The project utilizes post tensioned concrete. The drawings show the building in its final position. Since post tensioned concrete exhibits significant shrinkage and creep characteristics, make provisions to account for such anticipated creep and shrinkage in the layout of the building including beam and column placing.

1.06 QUALITY ASSURANCE

A. Provide post tensioning system from a fabricator with a minimum of five (5) years experience in the fabrication of post tensioning materials. Post tensioning fabricator shall be PTI Certified Plant. Upon special request, the Architect may approve a fabricator if, prior to the bid date, the Contractor provides a 'Letter of Certification' from an independent testing lab stating that all material specifications specified herein are met, in lieu of the required PTI Certification. Post tensioning product shall be from a manufacturer whose complete system has been approved by ICBO.

B. The post tensioned concrete work shall be performed by an organization that has successfully performed previous installations of a major nature similar to the one involved in this Contract for a minimum period of five (5) years.

C. All post tensioned concrete work shall be under the immediate control of a person with at least three years experience in PT concrete. Exercise rigid control of all operations for full compliance with requirements.

D. All work shall conform to Post Tensioning Institute (PTI) Manual standards entitled "Specification for Unbonded Single Strand Tendons" for minimum requirements.

E. Mix designs for concrete to be post tensioned shall be prepared and submitted in accordance with Section 03 30 00.
   1. Calcium chloride or admixtures that contain chloride ions shall not be used.
   2. Minimum concrete strength shall be as indicated on the structural drawings and/or specified herein.
   3. Maximum drying shrinkage per 03 30 00 2.02.

F. Post tensioning strand from a US manufacturer shall have current certified relaxation test results per section 1.09.B.2.e.ix below. The Contractor shall inform the Architect in writing at time of award of contract if material is from a foreign source. Post-tensioning strand from a foreign source shall have additional relaxation tests provided and paid for by the Contractor and performed by an independent testing lab located in the continental US. The test shall meet relaxation-testing requirements of ASTM A416 and shall be performed for a minimum of 200 hours. At least two tests from two heats shall be made. Manufacturer’s relaxation tests (see section 1.09.B.2.e.ix below) shall accompany additional relaxation test results. Discrepancies between manufacturer’s test results and additional test results shall be grounds for rejection of the strand.

G. Post tensioning steel is shown in U.S. dimensions. If metric sized steel is supplied, the equivalent poundage of steel must be provided, subject to Owner's, Architect's and the SEOR acceptance.

1.07 REQUIREMENTS

A. Slab tendons shall be stressed before beam tendons and beams before girders. Design shoring to resist loads transferred by stressing sequence.

B. Stressing shall commence within 96 hours after concrete pour and after test cylinders, cured under jobsite conditions, have been tested and indicate that the concrete has reached a minimum strength of 3000 psi.

D. Where drilling of completed members is necessary, Contractor shall x-ray surfaces, using a method accepted by the Architect/Engineer.

1.08 TESTING AND INSPECTION

A. Material Tests: Owner's testing laboratory will provide all material tests indicated on the structural drawings, as required by CBC and as specified herein.
   1. Samples for testing shall be accompanied by vendor's certification that submitted samples are representative of material being furnished.
   2. Prestressing steel shall be tested for tensile strength and elongation at rupture.

B. In the event that adequate information, as judged by the engineer, concerning the suitability of prestressing system cannot be furnished, the Architect may require tests to be made of the system. Tests may include any or all indicated in section 1.09.B.2 below.

C. Inspections: Owner will arrange and pay for the services of a Registered Deputy Building Inspector for continuous inspection of all post tensioning work. Inspector will inspect the placing of post tensioning materials and be continuously present during post tensioning installation and stressing operations, make written reports and certifications as to compliance with Building Code requirements and Contract Drawings and Specifications.

D. Field Quality Control: Contractor shall furnish the following samples to Testing Laboratory for testing:
   1. One sample of wire strand from each heat of wire to be used:
      a. Submittal of samples shall be accompanied by a transmittal and vendor affidavit that all samples submitted are taken from, and are representative of, materials that will be used in the work.
      b. Prestressing steel shall be tested by Testing Laboratory for modulus of elasticity, tensile strength and elongation at rupture. One test shall be made for each heat and shall be tagged for identification purposes. Each size of strand to be shipped to the site shall be assigned an individual lot number and tagged accordingly.
      c. Both pieces of each broken sample shall be fastened together and tagged with the job name, heat number, coil number, date tested and ultimate load; and shall be retained for inspection at any time.
      d. Prestressing steel whose tested modulus of elasticity differs by more than 500ksi with that noted in the mill certificates shall be tested for relaxation, at the Contractor’s expense, per section 1.06.F above.

1.09 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data:
   1. Submit manufacturer's technical data for post tensioning products, including certification that each product complies with specified requirements. Include instructions for handling, storage, installation and protection of each product.
   2. Product Data Information: Contractor shall furnish following information to Architect and Testing Laboratory.

a. Gauge calibration chart/curve for each set of stressing equipment, dated just prior to use of equipment.
b. Test strand stressing record.
c. Field stressing procedure.
d. Stress-strain curves for each heat, by an Independent Laboratory.
e. Certified mill test reports for each coil pack of strands containing as a minimum the following test information:
   i. Heat number and identification.
   ii. Standard chemical analysis for heat of steel.
   iii. Ultimate tensile strength.
   iv. Yield strength at 1% extension under load.
   v. Elongation at failure.
   vi. Modulus of elasticity.
   vii. Diameter and net area of the strand.
   viii. Type of material.
   ix. Full 1000hr Relaxation Test report performed within the previous three years and at least one 200hr relaxation test extrapolated to 1000hrs performed within the previous year. If the material is from a foreign source provide additional test reports per section 1.06.F above.

C. Shop Drawings:
1. Show tendon layout and dimensions locating tendons in horizontal plane at all points. Detail horizontal curvature of tendons at block-outs and anchorages. Show all openings in slabs and beams.
2. Provide tendon profiles showing chair heights and locations, and any required placement steel. Show clearly the location of each tendon and the method of tendon support.
3. Furnish details indicating post tensioning and reinforcement at column and beam intersections around stressing pockets and closures, or where interference with post-tension tendons or anchors may occur, coordinating with reinforcing and conduit.
4. Include calculations, signed by a California Registered Civil or Structural Engineer, of friction losses, initial stresses and anchorage stresses on the shop drawings to determine that design forces are obtainable. Furnish calculations, or test results, as to the adequacy of anchorage and bearing stress. Include effect of restraint by columns on slab or beam shortening where applicable.
5. Show required elongation of each tendon at jacking point.
6. Furnish complete prestressing procedure to include the following:
   a. Jacking force and jacking pressure.
   b. Maximum temporary jacking force and jacking pressure.
   c. Certified gauge calibrations and method of jack identification.
      NOTE: Non-calibrated jack and pump combination shall not be used on the job.
   d. Method of determining anchor force, or force remaining in tendons after anchorage.
7. Furnish method of burning-off excess tendons, after anchorage.
8. Provide method of sealing tendons.
9. Provide manufacturer's written guarantee that post tensioning material is of the strength and relaxation characteristics required.
10. Complete all submittals in compliance with the current edition of ACI 301.
11. Provide fabricator’s PTI plant certificate or certification letter per Article 1.06.A above.

D. Samples:
1. One sample tendon (uncoated and sheathed), with complete tendon and end anchoring system for review.
2. Samples of wire strands from each heat of wire to be used, as required for testing.

E. Review of shop drawings will be for general consideration only. Compliance with requirements for materials, fabrication, and performance of post-tensioning work is the Contractor's responsibility.

F. When reviewed without exceptions noted, the shop drawings and data shall not be changed nor shall construction operations be deviated from, unless resubmitted and re-reviewed.

1.10 DELIVERY, STORAGE AND HANDLING

A. Package each tendon coil in a plastic stretch wrap or completely covered with a plastic tarp, clearly marked with manufacturers labels, to positively protect strand from moisture and corrosion during transit and storage. Protect sheathing from being cut by binding materials. No part of the tendon shall be unprotected against moisture. Corrosion preventative coated bare strand is unacceptable.

B. Store tendon coils under cover, off ground, in a dry location to prevent damage from weather, soiling or construction activities. Do not deliver to site ahead of installation time.

2.00 PRODUCTS

2.01 MATERIALS

A. Prestressing Steel: Prestressing steel shall be plastic sheathed, or as otherwise approved, low relaxation, high tensile cold drawn wire 7 wire strand of 1/2" diameter minimum (area = 0.153 sq. in. min.), approximate modulus of elasticity of 28,000,000. Yield load shall be 35,000 lbs. at 1% extension with initial load of 4,130 lbs. and shall conform requirements of Title 24, CCR and shall conform to the following:

	SEVEN-WIRE STRAND
ASTM Designation	A416/E328
Ultimate Strength	270 KSI
Temporary Stress to Overcome Friction	216 KSI
Anchor Stress	189 KSI
Minimum Effective Stress	174 KSI
Elongation	0.0825 IN/FT
Relaxation (initial load = 80% GUTS)	2.5% Max. @ 1000 hours

Concrete - As indicated on structural drawings and specification Section 03 30 00.

Relaxation tests reports shall include all reporting requirements of the applicable ASTM's. At a minimum the size and type of strand, strand ASTM specification number, test ASTM specification number, initial load as a percentage of the guaranteed minimum ultimate tensile strength of the strand, actual area of the test strand, testing agency and operator, relaxation percentage at 1000hrs, date range over which the strand was tested and at least one of the following: the heat number, coil number or lot number from which the test sample was taken. The report shall be certified by the manufacturer.

B. Design and configuration of bearing plates, anchorage devices, stressing grippers, slippage sheathing, and related materials shall be standard for the method of post-tensioning used, and shall conform to approved shop drawings and data. Materials shall have ICBO approval. Post tensioning anchorages and couplers must be reviewed by the Structural Engineer of Record.

C. Distribution Plates and Anchorages: Prestressing steel shall be secured at ends with approved non-corrosive anchoring devices.

1. Provide ICBO approved anchoring devices that will not kink, neck down or otherwise be damaged, and shall hold the prestressing steel without exceeding anticipated set at load equal to 100% of the minimum ultimate tensile strength of the pre-stressing strand and conform to requirements of ACI Title 66-8.
2. Distribution plates shall conform to ASTM A36 and be welded steel or cast steel or cast steel bearing assemblies that permanently support and distribute the load from anchoring devices. Bending stresses in the plates induced by pull of prestressing steel shall not exceed 27,000 psi for structural steel and 15,000 psi for cast steel. Castings shall be non-porous and free of sand, blow holes, voids and other defects.
3. Wedge grippers shall be designed to preclude premature failure of the prestressing steel due to notch or pinching effects under the static and/or dynamic test load conditions as outlined in Post-tensioning Manual Specification static and dynamic test requirements.
    a. Finish of the anchorage wedge seating zone shall not exceed microfinish of 125 for stressing end anchorages, and a microfinish of 250 for fixed anchorages.
4. Special reinforcement, required for the performance of the anchorage, shall be designed, supplied and installed by the Contractor. Such reinforcement shall not be less than 2 No. 4 bars, unless shown otherwise on the Drawings.
5. Maximum concentrated bearing stresses in concrete shall not exceed that permitted by P.T.I. bearing stresses. Concrete shall conform to approved mix design.
6. Design shall conform to latest AISC and AWS standards, including qualification test of welders.
7. End bearing forces and grouting shall be provided as specified herein.
8. Anchorages shall be recessed to provide minimum grout or concrete coverage as indicated on structural drawings or required by Code, 1-1/2" minimum over anchors.

D. Sheathing: Shall include design features permitting a watertight connection of the sheathing to the anchorage, and watertight closing of the wedge cavity for stressing and nonstressing (fixed) anchorages. All stressing anchorages shall be designed to permit complete watertight encapsulation of the prestressing steel.
    1. The tendon sheathing shall be made of material with the following properties:
        a. Sufficient strength to withstand unrepairable damage during fabrication, transport, installation, concrete placement and tensioning.
        b. Watertightness over the entire sheathing length.
        c. Chemical stability, without embrittlement, damage, or softening over the anticipated exposure temperature range and during the service life of the structure.
        d. Non reactive with concrete, steel and the tendon corrosion preventive coating.
    2. Minimum thickness of the sheathing shall not be less than 0.040 inches for medium or high density polyethylene or polypropylene.
    3. Sheathing shall have an inside diameter at least 0.010 inches greater than the maximum diameter of the strand.
    4. Sheathing shall be continuous and watertight between anchor faces.

E. Corrosion Preventive Coating:
    1. Corrosion preventive coating material shall be lithium based, containing corrosion inhibitors, wetting agents, less than 10 parts per million of chlorides, sulfides or nitrates, and have the following properties:
        a. Corrosion protection for the duration of the service life of the building.
        b. Lubrication between the strand and the sheathing.
        c. Resist flow from the sheathing with the anticipated temperature range of exposure.

d. Continuous non-brittle film at the lowest anticipated temperature of exposure.
e. Chemically stable and non-reactive with the prestressing steel, sheathing material and the concrete.

2. The film shall be an organic coating with appropriate polar, moisture displacing and corrosion preventive additives.
3. Minimum weight of coating material shall be not less than 2.5 pounds of coating material per 100 feet of 0.5 inch diameter strand. The amount of coating material used shall be sufficient to ensure essentially complete filling the annular space between the strand and the sheathing. The coating shall extend over the entire tendon length. Minimum thickness 0.005 inches over crest of strands.
4. Corrosion preventive coating material shall comply with following performance specifications:

TEST	TEST METHOD	ACCEPTANCE CRITERIA
1. Dropping Point Deg. F (Deg. C)	ASTM D 566 or ASTM D 2265	Minimum 300(148.9)
2. Oil Separation @ 160 deg.F (71.1 deg.C) % by weight	FTMS 791B Method 321.2	Maximum 0.5
3. Water, % Maximum	ASTM D 95	0.1
4. Flash Point, deg. F (deg.C) (Refers to oil component)	ASTM D 92	Minimum 300(148.9)
5. Corrosion Test 5% Salt Fog @ 100 deg,F (37,8 deg,C) 5 mils, min. hours (Q Panel Type S)	ASTM B 117	Rust grade 7 or better after 1000 hours of exposure according to ASTM D 610
6. Water Soluble Ions (2)		
a. Chlorides, ppm max.	ASTM D 512	10
b. Nitrates, ppm max.	ASTM D 992	10
c. Sulfides, ppm max.	APHA 427D	10
7. Soak Test 5% Salt Fog at 100 deg.F (37.8 deg.C) 5 mils. coating Q panels, Type S. Immerse panels 50% in a salt solution and expose to salt fog	ASTM B 117 (Modified)	No emulsification of the coating after 720 hours of exposure
8. Compatibility with sheathing		
a. Hardness and volume change of polymer after exposure to grease, 40 days @ 150 deg.F.	ASTM D 4289	Permissible change hardness 15% Permissible change in volume 10%
b. Tensile strength change of polymer after exposure to grease, 40 days @ 150 deg.F.		Permissible change in tensile strength 30%

F. Broken strands or strands showing fabrication defects shall be removed and replaced, or the member may be rejected.

G. All prestressing steel within every group of the same type of members shall be of the same heat where practicable. All steel shall be assigned a heat number and tagged accordingly.

H. All prestressing steel shall be protected from rust or other corrosion prior to placement, and shall be free from deleterious substances when tensioned.

2.02 TENDON ANCHORAGES AND COUPLINGS

A. Anchorages and couplings shall be designed to develop static and dynamic strength per PTI requirements. Castings shall be nonporous and free of sand, blow holes, voids and other defects. Seal barrel end on stressing side of anchor with plastic cap. Bearing side of anchor casting shall have provision for plastic sleeve which prevents moisture leaks into anchor casting and tendon sheathing creating a completely encapsulated system. For wedge type anchorages, wedge grippers shall be designed to preclude premature failure of prestressing steel due to notch or pinching effects under static and dynamic test load conditions stipulated for low relaxation prestressing steel materials.

B. Blockouts: Use plastic pocket formers at stressing ends to provide 2 inch minimum recess to anchor casting and 3 inch minimum width to allow access to cut off excess strands. At intermediate stressing ends, use grommet to prevent moisture leaks into anchor casting or tendon sheathing.

2.03 OTHER MATERIALS

A. Provide other materials, not specifically described, but required for a complete installation, subject to review by the Architect and SEOR.

B. Tape: 3M Tape No. 226 black polyethylene masking tape, or approved equal.

C. Tendon Tail and Anchor Coating Material:
1. Bituminous: Tnemec 46-465 High Bolt Tneme-col, Farbertite Bituminous Coating by Briggs Bituminous Composition Co., or equal.
2. Epoxy: Dayton Superior Rebar Epoxy Spray (J-62), or approved equal.

D. Provide chairs and bolsters in accordance with 03 20 00 – Reinforcing Steel.

E. Grout: Refer to Section 03 30 00 and 3.09B of this section.

3.00 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine areas and conditions which post tensioning work is to be performed and correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION REQUIREMENTS

A. Prestressing tendons shall be firmly supported at intervals not exceeding 42 inches, or less where shown on the approved Drawings, with sufficient number of positioning devices to prevent displacement during concrete placement. Remove staple legs projecting from concrete after deck is completed. Tie tendons to supporting chairs and reinforcement so sheathing is not damaged.

B. Drapes shall conform to controlling points shown on Drawings and should be in an approximate parabolic drape between supports. Dimensionally locate center of gravity of

the tendon or group of tendons. Low points are at midspan, unless otherwise shown or noted.

C. Slab strands shall be tied and chaired at intersections where they contact accessories or strands in perpendicular directions by a standard "figure eight" cross tie. In addition to indicated reinforcing steel, chairs shall be stapled and/or extra support steel shall be provided and tied to strands and chairs to prevent lateral movement during concreting operations. Strands shall not be supported on beam top bars or ties.

E. Vertical deviations in tendon location shall be kept to 1/4 in. maximum for slabs, 3/8 in. in concrete with dimensions over 8 inches. Maintain minimum required concrete coverage.

F. All strands shall be straight in plan. Offset of strands and adjustment of spacing shall be done only with approval of Architect. Horizontal plane deviations which may be necessary to avoid openings, ducts, chases, inserts, etc., shall be detailed to scale on the shop drawings and submitted for approval.

G. Tendons shall not be exposed to excessive temperatures, welding sparks or electric ground currents.

3.03 STRESSING ANCHORAGES

A. Stressing anchorages shall be installed perpendicular to the tendon axis. Curvature in the tendon profile shall not be closer than three feet from the stressing anchorage, unless approved otherwise by the Architect.

B. Stressing anchorages shall be attached to the bulkhead forms by threaded pocket former fittings. Connections shall be sufficiently rigid to avoid accidental loosening due to construction traffic or concrete placement.

C. Pocket formers used to provide a void form at stressing and intermediate stressing anchorages shall positively preclude intrusion of concrete or cement paste into the wedge cavity during concrete placement. The depth of the pocket former from the edge of the concrete to the face of the anchorage shall not be less than 1-1/2 inches.

3.04 INTERMEDIATE ANCHORAGES

A. Intermediate anchorages shall, if used, be embedded in concrete at the construction joint.

B. Minimum concrete cover for the anchorage shall be as indicated on Drawings.

3.05 FIXED ANCHORAGES

A. Fixed end anchorages shall be installed on the tendon at the suppliers plant prior to shipment to the job site.

B. For wedge type anchorages, the fixed end wedges shall be seated, with a load of not more than 80% of the minimum ultimate tensile strength of the tendon. The seating load shall be sufficient to ensure adequate capacity of anchorage.

C. Fixed end anchorages shall be placed in the formwork with 2" minimum, 3" maximum clearance from inside of edge form at the locations shown on the placing drawings, and securely fastened to the reinforcing steel.

3.06 SHEATHING INSPECTION

A. After installing tendons in the forms and prior to concrete casting, the sheathing shall be inspected for damage.

B. Damage shall be repaired to restore the complete encapsulation system.

3.07 TENDON STRESSING - POST TENSIONING

A. Perform under inspection of a deputy/inspector.

B. Losses in stress due to creep, slip at anchorage, elastic shortening, shrinkage of concrete, relaxation of steel and sequence of stressing shall be assumed to be not less than 15,000 psi unless substantiated by tests and calculations, and accepted by the Structural Engineer.

C. Final post tensioning shall not start until tests on concrete cylinders manufactured and cured under same conditions as members to be prestressed indicate a compressive strength as required for anchorage bearing, but not less than 3,000 psi. Stressing must commence within 96 hours after concrete placement.

D. Hydraulic stressing rams used to stress unbonded single strand tendons shall be equipped with stressing grippers which will not notch the strand more severely than normal anchoring wedges.

E. Stressing rams and gauges shall individually be identified and calibrated against known standards and within 30 days of their use. Calibration certificates shall accompany each gauge.

F. In placing strands, adequate provision shall be made for access of stressing equipment. A minimum stressing equipment space of 3 ft. normal to the stressing edge of any member shall be kept clear of construction material, equipment, or other obstructions until stressing operations are completed.

G. Inserts in concrete work shall be accurately installed and secured in place including prestressing items such as enclosures, spacer bars, anchorages, etc., as well as all inserts required for attaching electrical, mechanical, steel studs, and other items of equipment. Use of powder driven studs shall not be permitted. Embedded inserts, conduits, etc., shall not be attached to prestressing strands.

H. All pockets required for anchorage shall be adequately reinforced so as not to decrease the strength of the structure. All pockets shall be waterproof so as to eliminate water leakage through the pocket, including into protective sheathing. All pockets are solid grouted using a bonding agent.

I. Holes, other than those shown, are not permitted within 24 inches of prestressing anchorages.

J. Strands shall be stressed by hydraulic jacks equipped with accurate reading calibrated hydraulic gauges of at least 6 inches diameter and having a fine pointer to permit stress in prestressing steel to be computed at any time. A certified calibration curve shall accompany each gauge/jack combination. If inconsistencies between the measured elongation and the jack gauge reading occur, the jack gauges shall immediately be recalibrated.

K. Stressing procedure for each strand, in general, shall be as follows:
   1. Stress to the required elongation. Stress may be increased to, but not exceed 216 ksi, 80% of ultimate, to overcome friction.
   2. Gradually reduce load and set grippers to transfer full force to anchorage at 189 ksi, 70% ultimate strength.
   3. Elongation measurements shall be made at each stressing location to verify that the tendon force has been properly achieved.

4. Elongation of strands shall be recorded on an approved form. A variation of plus or minus 7% is. Cumulative negative tolerance which would result in an overall reduction of initial force exceeding 3% will not be permitted.
5. Discrepancies exceeding above variations shall be resolved with the Architect.
7. Cut off tendon tails per drawing details when stressing is accepted by the structural engineer.
8. Waterproof the post tensioning anchorage.
9. Grout the post tensioning anchorage.

L. Stressing operations shall be per approved sequence. Uniformly spaced slab tendons shall be stressed before beam tendons. Beam tendons shall be stressed before girder tendons. Temperature tendons may be stressed after beam tendons.

M. Stressing records shall be compiled during the tensioning operation, with the following data recorded as a minimum:
1. Tendon mark or identification.
2. Required elongation.
3. Gauge pressure to achieve required elongation.
4. Actual elongation achieved.
5. Actual gauge pressure.
6. Date of stressing operation.
7. Signature of the stressing operator and inspector.
8. Serial or identification number of jacking equipment and calibration date.
9. Calibration chart for each jack/gauge set used.
10. Lift-off gauge pressure per Article 3.07.K.6 above.

N. Stressing records shall be submitted to the Owner, Architect, Structural Engineer, Contractor, for review.

3.08 ALLOWABLE STRESSES FOR PRESTRESSING STEEL

A. Maximum stress (jacking stress): Tendons may be temporarily stressed to a value higher than the anchoring stress in order to overcome stressing friction. In no case shall temporary stress exceed 80% of the guaranteed ultimate tensile strength of the strand ($0.8f_{pu}$).

B. Initial stress (anchoring stress): Maximum stress in strand at anchorage immediately after seating shall not be greater than 70% of the guaranteed ultimate tensile strength of the strand ($0.70f_{pu}$). Maximum stress anywhere in strand shall not exceed 74% of the guaranteed ultimate strength of the strand ($0.74f_{pu}$). Gauge pressure at seating shall be no less than 70% f_{pu} and no more than 74% f_{pu}. Jacking force shall be decreased and elongations adjusted as required to meet these criteria.

C. Effective design stress (final stress): Effective design stress, f_{se}, shall be that remaining after all losses and is the stress which shall be used in calculating the minimum effective forces. It shall not be less than 64% of the guaranteed ultimate stress of the strand (173 ksi). The post tensioning supplier shall calculate the stress distribution in the strand, based upon means, methods, and experience and submit to structural engineer for review.

3.09 TENDON FINISHING

A. Trim excess tendon length only after approval of tensioning. The tendon length protruding beyond the wedges after cutting shall be between 3/4 and 1-1/4 inches, coordinated with the grease cap, and in no case less than 1/2 inch, see the Structural Drawings. Minimum concrete cover over tendon anchor grease cap sheathing shall be 3/4 inch.

1.
2. The tendon tails may be cut by means of either oxyacetylene cutting, abrasive wheel or hydraulic shears. In case of oxyacetylene cutting of the tendon, care shall be taken to avoid directing the flame toward the wedges.

B. Stressing pockets shall be filled with non shrink grout as soon as practical after tendon stressing and cutting. Under no circumstances shall the grout used for pocket filling contain chlorides or other chemicals known to be deleterious to the prestressing steel.
   1. The exposed strand and wedge areas shall be coated with bituminous tendon coating material or other sealant and capped to encapsulate the tendon.
   2. Follow with grouting operation per manufacturers instructions with products as specified under Concrete and Concrete Finish, Section 03 30 00.
   3. Whenever the grouted pocket is to be left exposed, the grout shall be smoothed and rubbed to match and blend in with adjoining surfaces.

3.10 SAFETY PRECAUTIONS

A. Take precautions to prevent workers from standing directly behind, above or in front of the jacks.

B. Comply with requirements issued by CAL-OSHA Industrial Relations Department, State of California.

END OF SECTION

SECTION 04 22 00 – CONCRETE MASONRY UNIT

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Concrete block (medium and lightweight precision concrete masonry units, standard natural gray.
   2. Reinforcing steel for concrete block masonry and dowels including steel projecting into subsequently placed concrete.
   3. Setting of anchors, frames and other work to be embedded into masonry.
   4. Grouting of block cavity walls.

1.02 RELATED WORK IN OTHER SECTIONS

A.	Section 03 20 00:	Reinforcing Steel
B.	Section 03 30 00:	Concrete and Concrete Finishes
C.	Section 05 50 00:	Miscellaneous Metal
D.	Section 08 10 00:	Hollow Metal Doors and Windows and Frames
E.	Division 22:	Plumbing
F.	Section 23 05 00:	Mechanical
G.	Division 26:	Electrical

1.03 CONDITIONS

The "General Notes" on the structural drawings are part of these specifications.

1.04 REFERENCE STANDARDS

A. Comply with California Building Code CBC, Chapter 21.

B. International Conference of Building Officials (ICBO)

C. American National Standards Institute (ANSI)

D. American Society for Testing and Materials (ASTM)

E. Portland Cement Association, "Concrete Masonry Handbook"

F. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practices".

G. Concrete Masonry Association of California and Nevada (CMACN)

H. American Concrete Institute (ACI), Building Code requirements for Masonry Structures (ACI 530-13)
Specification for Masonry Structures (ACI 530.1/ASCE 6-99/TMS 402-99)

I. Masonry Standards Joint Committee (MSJC) and The Masonry Society (TMS)

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 33 00.

B. Materials list of items proposed under this Section, including special shapes, accessories and all other manufactured products.

C. Manufacturer's product literature, installation instructions and material certificates.

D. Manufacturer's test reports and certifications of material compliance with the specified requirements. Samples and tests to be in accordance with ASTM C140 to comply with requirements of ASTM C90, for mortar, grout mixes and masonry units.

E. Submit mortar and grout mix designs for approval prior to use. Submit all mix designs to Architect and SEOR for review prior to their use.

F. Shop drawings for reinforcing detailing fabrication, bending and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" and ACI 530 "Building Code Requirements for Masonry Structures", showing bar schedules, stirrup spacing, diagrams of bent bars and arrangement of masonry reinforcement. Indicate block pattern(s) and exposed block conditions.

G. Samples of standard sized block and different shapes, colors and all other masonry related accessories, as requested by the Architect.

1.06 QUALITY ASSURANCE

A. Preconstruction Testing: Perform preconstruction testing to establish compliance of proposed materials and construction with specified requirements, as specified hereinafter.
   1. Concrete Masonry Units: Test units for strength, absorption and moisture content per ASTM C140 and CBC 2105A.
   2. Prism Tests: Test masonry prisms per ASTM E447, Method B and CBC 2105.
   3. Evaluate mortar and grout composition and properties per ASTM C780 and CBC 2105.
   4. Verify f'm of all materials prior to construction.

B. Fire Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E119 by a testing and inspection agency by equivalent concrete masonry thickness, or by another means as acceptable to authorities having jurisdiction.

C. Single Source Responsibility for Mortar Materials: Obtain mortar and grout ingredients of uniform quality from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.07 INSPECTION AND TESTING

A. The setting of masonry, low and high lift grouting operations shall be continuously inspected by the Deputy Inspector, to verify building code conformance and project drawing requirements.
   1. Contractor shall arrange and pay for all mortar and grout mix designs. Composition and properties evaluated per ASTM C780 and CBC Section 2105.

2. Sample and test mortar cylinders and grout prisms. Pre-construction prism tests shall be performed to verify compliance with these requirements. F'm shall be determined by prism testing per CBC Section 2105, ASTM E447, Method B and these specifications. Compressive strength of block unit and mortar and grout component materials, shall have a total assembly F'm of 1500 psi minimum or higher as specified on the Drawings. Ultimate compressive strength of individual components of the CMU assemblage shall be equal to that specified and therefore exceeding F'm.
3. Core Tests: Required for questionable workmanship, materials or test results. Sample and test not less than two cores. Diameter and length shall be per code requirements.

B. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store masonry units above ground on level platforms that allow air circulation under the stacked units. Cover and protect against wetting prior to use.

B. Store cementitious materials on elevated platforms, under cover and in dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.09 PROJECT CONDITIONS

A. Stain Prevention: Prevent grout, mortar and soil from staining face of masonry to be left exposed or painted.
1. Prevent base of walls from rain-splashed mud and mortar splatter using coverings spread on ground and over wall surface.
2. Protect surfaces of doors and frames from mortar droppings.

B. Hot-Weather Requirements: Comply with referenced concrete unit masonry standard for hot weather construction and the following:
1. Protect masonry work when temperature and humidity conditions producing excessive evaporation of water from mortar and grout.
2. Provide artificial shade and wind breaks and use cooled materials as required.
3. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg. C) and above.

2.00 PRODUCTS

2.01 MATERIALS

A. Unless otherwise indicated on the Structural Drawings to be lightweight (103 pcf) , concrete masonry units shall be precision medium weight (115 pcf) hollow load-bearing concrete masonry units, standard natural gray, conforming to ASTM C90, Grade N, Type I, with minimum 1500 psi (Mpa) gross compressive strength with compressive strength of the net area 1900 psi minimum, as manufactured by Angelus Block Co., Orco Block Co., or equal. Comply with CBC Section 2105 and requirements specified herein for strength of individual units and for total CMU assemblage.

B. Dimensions:
   1. Provide units of the dimensions shown on the Drawings.
   2. Where dimensions are not shown on the Drawings, provide units having nominal face dimensions of 16" long by 8" high by 8" depth, unless otherwise required.
   3. All openings shall be provided with lintel U-beam blocks to match surrounding block.
   4. Provide special shapes for lintels, corners, jambs, control joints, headers, bonding and other special conditions. Provide square edged units for outside corners, except where noted otherwise.

C. Reinforcement and Accessories: Provide accessory shapes as indicated or otherwise required. Comply with the following as minimums.
   1. Bars: ASTM A615, Grade 60, CBC 2103.14, using deformed bars for No. 3 and larger.
   2. Bending: ACI 318 and ACI 315.
   3. Wire reinforcement: ASTM A82 #9 wire ties.

D. Cement: Conform to ASTM C150, Type I or Type II, low alkali. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturers standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.

E. Hydrated Lime: Conform to ASTM C206 and C207, Type S, or Quicklime, or equal complying with ASTM C5. Contain no additives for the purpose of entraining air, in accordance with the requirements of Test Method ASTM C110. Conform to the chemical composition requirements of ASTM C25.

F. Aggregates: Conform to ASTM C144 for mortar and ASTM C404 for grout and with CBC Section 2103.13.3.
   1. Sand: Fine granular material, composed of hard, strong, durable mineral particles, free from injurious amounts of saline, alkaline, organic or other deleterious substances.
   2. Pea Gravel: Graded with no more than 5% passing No.8 sieve and with 100% passing 3/8" sieve.

G. Water: Clean, potable, from domestic supply.

H. Admixtures: Do not use unless specifically accepted in advance by the Architect and SEOR and included as part of mix designs.

2.02 SCAFFOLD AND PROTECTION

Provide, install and maintain scaffolding, staging and forms of protection necessary for execution of the work of this Section.

2.03 SHORES AND CENTERING

Provide and install shores and centering for the work, constructed to required shape, size and form, well braced and made rigid and capable of supporting and sustaining the loads imposed. Leave shores and centering in place until the masonry is sufficiently strong to safely carry its own weight and added loads of construction or retained earth.

2.04 MORTAR

A. Type "S", as designated on the Drawings or otherwise directed by the Architect, and in accordance with Section 2103.9 CBC 2016 & ASTM C270/C780, minimum 1800 psi at 28 days

B. Proportions:
   1. Composed (by volume) of one part Portland cement, 1/4 part lime putty, and sand in not less than 2-1/4 and not more than 3 times the sum of the volumes of cement and lime used, and admixture in the proportion recommended by the manufacturer and as approved by the Architect. Use measuring box to measure materials by volume.
   2. Mortar for block walls shall match color of block.

C. Mechanically mix in a batch mixer from three to five minutes, using only sufficient water to produce a mortar that is of a workable consistency. A continuous mortar mixer will not be permitted.

D. Retemper mortar with water as required to maintain high plasticity.
   1. On mortar boards, retemper only by adding water within a basin formed with mortar, and by working the mortar into the water.
   2. Discard and do not use mortar which is unused after 30 minutes after leaving mixer or 2-1/2 hours after adding water to initial mixing.

2.05 GROUT

A. Provide "fine grout" or "coarse grout" as hereafter specified and in accordance with ASTM C476, and Section 2103.13 of CBC 2016, minimum 2000 psi compressive strength at 28 days, and higher as required by specified f'm.
   1. Proportions: (by volume)
      a. "Fine Grout": Provide one part Portland cement to 2-1/4 parts minimum to 3 parts maximum of damp loose sand, with sufficient water to achieve fluid consistency.
      b. "Coarse Grout": Provide one part Portland cement to 3 parts maximum of damp loose sand to two parts coarse aggregate, with sufficient water to achieve fluid consistency.
      c. Do not use admixtures including air entraining agents, accelerators, retarders, water repellant agents or other admixtures unless otherwise indicated.
      d. Grout for exposed block cells shall match color of block.
   2. "Fluid consistency" is interpreted as meaning as fluid as possible for pouring intimately in place without segregation.
   3. Use one (1) cubic foot measuring box at mixer for accurate measurement of sand. No shoveling of sand into mixer is allowed.

B. Use "fine grout" where the grout space is less than 2" in its least dimension, and where otherwise directed by the Architect or required by governmental agencies having jurisdiction.

C. Provide laboratory design mix for grout in excess of 2000 psi where indicated on drawings, prepared as required for design mixes of concrete under Section 03 30 00 of these specifications.

D. Grout not used within 30 minutes after leaving mixer shall not be permitted on the work. Retempering of mixture will not be allowed.

3.00 EXECUTION

3.01 ENVIRONMENTAL CONDITIONS

A. Do not place masonry units when air temperature is below 40 degrees F. during or within 24 hours of installation.

B. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 90 degrees F in the shade, with relative humidity less than 50%.

C. Comply with all hot weather and/or cold weather mortar preparations.

3.02 INSTALLATION

A. Field Conditions: Verify drawing dimension with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect any conditions that prevent proper execution of this work.

B. Previously placed concrete or masonry: Clean off encrustations, laitance, oil and coatings that reduce bond. Wash work thoroughly with water under pressure; leave surfaces damp where masonry units connect with earlier placed work.

C. Lay only dry masonry units. Do not wet concrete block units before installation.

D. Cut masonry units with motor driven saws to provide fractional masonry units with clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full size units without cutting where possible. Install cut units with cut surfaces concealed.

E. Set units plumb, true to line, and with level courses accurately spaced, unless noted otherwise.

F. Clean the top surface of foundation free from dirt, debris, and laitance, and expose the aggregate prior to start of installing first course provide starter bed joint as required by code.

G. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes. Coordinate openings for equipment to be installed under other sections.

H. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.

I. Thoroughly clean masonry units of dust, grease, oil or other matter that would reduce bond.

J. Clean reinforcement of mill scale, loose rust, oil and coatings that would reduce bond.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls and arises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For top surface of bearing walls, do not exceed 1/8 inch in 10 feet, nor 1/16 inch within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/2 inch in 20 feet, nor 3/4 inch in 40 feet or more.

D. Variation in Mortar-Joint Thickness: Do not vary from bed joint thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary bed joint thickness of adjacent course by more than 1/8 inch. Do not vary from head joint thickness indicated by more than plus or minus 1/8 inch. Do not vary head joint thickness from adjacent head joint thickness by more than 1/8 inch. Do not vary from collar joint thickness indicated by more than 1/4 inch.

3.04 INSTALLATION OF REINFORCED MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement type joints, returns and offsets. Avoid use of less than half size units at corners, jambs and where possible at other locations. Coordinate location of openings both vertical and horizontal with block modules.

B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Place units in mortar with full shoved bed and head joints, to prevent leakage of grout. Strike joints around cells smooth.

D. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

E. Hold racking to an absolute minimum.

F. Provide cleanouts at the bottom of each cell of hollow units for removing mortar droppings for high lift grouting, if approved by Architect. Do not close the cleanouts until they have been cleaned, and inspected and approved by the Deputy Inspector.

G. Fractional parts of masonry units are prohibited where whole units can be used. The chinking of interstices with fragments will not be allowed. Provide special units as necessary to form openings and lintels.

H. No part of any masonry wall may be carried more than six (6) feet higher than adjoining portions.

I. As construction progresses, build in items specified or required. Fill solidly with masonry around built in items. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

J. Comply with structural details to maintain clearances from structural concrete.

3.05 PLACING REINFORCEMENT

A. Accurately place and tie reinforcing steel. In spaces containing reinforcement, except small rods or mesh one-quarter inch or less in diameter, the minimum clear distances between masonry and the reinforcement shall be one-half inch.

1. Vertical Bars: Continuous from bottom to top of wall centered in cells, except where otherwise indicated. Where indicated otherwise bars may be overlapped

provided splices are of the dimension indicated. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

2. Horizontal Bars: Provide continuous horizontal reinforcement 16 inches o.c., unless noted otherwise. Install entire length of longitudinal side rods in mortar. Lap reinforcing as indicated by Structural drawings.
   a. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
   b. Install horizontal reinforcing in the first and second bed joint above and below openings extending beyond each side of opening, as indicated by structural drawings.
   c. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, pipe enclosures and other special conditions.

3.06 BEDDING, JOINTS AND COURSING

A. Lay Concrete Masonry Units as follows:
   1. With full mortar coverage on horizontal and vertical face shells.
   2. Bed webs in mortar in starting course on footings and in course piers, and pilasters and where adjacent to cells or cavities to be filled with grout.
   3. Build walls to preserve the unobstructed vertical continuity of the cells to be filled.

B. Joints:
   1. Make mortar joints straight, clean and uniform in thickness. Tool joints in masonry to a dense, smooth surface, well bonded to edges.
   2. Joints that are not tight at time of tooling shall be raked out, pointed and then tooled.
   3. Tool when the mortar is partially set but still sufficiently plastic to bond.
   4. Finish joints that are to remain exposed with tool slightly larger than width of joint to form concave surface.
   5. Tool vertical joint first.
   6. Maintain joint width of 3/8 inch unless otherwise indicated.
   7. Provide the following joints:
      a. Concave tooled joints, horizontal and vertical, at exposed masonry.
      b. Flush tooled joints, horizontal and vertical, at all scored block.
      c. Flush tooled joints, horizontal and vertical, at masonry below grade against dirt, or where bonded finish is specified for a concealed flush finish.

C. Unless otherwise shown on the drawings, provide running bond with vertical joints located at center of masonry units in the alternate course below.

3.07 MOVEMENT (CONTROL AND EXPANSION) JOINTS

A. Install control and expansion joints in unit masonry. Build in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in plane restraint of wall or partition movement. (Form control joints in concrete masonry by installing preformed control gaskets designed to fit standard sash block).

B. Locate 3/8 inch wide control joints as indicated but do not exceed 35 feet on centers for exterior walls and 45 feet on center for interior partitions.

C. Build in horizontal pressure relieving joints where indicated. Construct joints by either leaving air space or inserting compressible joint filler of width required to permit

installation of sealant and backer rod as specified in Section 07 92 00 Sealants and Caulking.

3.08 LINTELS

A. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with grout.

B. Provide a minimum bearing of 8" at each jamb, unless otherwise indicated.

3.09 HOLLOW METAL FRAMES

Accurately locate, erect plumb and securely attach to the floor and brace in position as required to start of masonry erection. Adjust anchors to coincide with horizontal joints in masonry. Fill frames solid with mortar as the erection progresses. Provide temporary spreaders and shores to support frames and prevent deflection.

3.10 BOLTS, ANCHORS AND FRAMES

Set bolts, anchors, frames and inserts necessary for the attachment of subsequent work and items furnished under other sections. All vertical bolts in masonry shall be centered in cells.

3.11 GROUTING

A. Perform grouting procedures in strict accordance with the provisions of the CBC Section 2104.6.

B. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them.

C. Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 3 inches by 3 inches.

D. Low Lift Grouting Procedures: Conform to Section 2104.5.1.1.1 of CBC.
1. Units may be laid to a height not to exceed 4 feet.
2. Place vertical steel into cells with enough steel extending to provide lap splice as required by structural drawings.
3. Grout cell, stopping grout 2 inch below top of unit or over horizontal steel which shall be fully embedded in grout.
4. Expanded metal mesh or other material that will not interfere with bond may be laid on top of unit to permit bond beams and horizontal members to be grouted in without fully grouting the wall.

E. High Lift Grouting Procedures: Conform to Section 2104.5.1.1.1.2 of CBC.
1. Cleanout openings shall be provided at the bottom of cells to be filled at each pour of grout where such grout pour is in excess of 4 feet in height. Any overhanging mortar or other obstruction or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed after inspection and before grouting.
2. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 100 diameters of the reinforcement.
3. Cells containing reinforcement shall be filled solidly with grout. Grout shall be consolidated at time of pouring by puddling or mechanical vibrator and then reconsolidated by again puddling later, before plasticity is lost. When total grout

pour exceeds 8 feet in height the grout shall be placed in 4 foot lifts. Minimum cell dimension shall be 3 inches.

F. When grouting operations are stopped for one hour or longer, provide horizontal construction joints formed by stopping the grout pour not less than 1/2 the height of the course below the top of the uppermost unit grouted. Horizontal steel shall be fully embedded by grout in an uninterrupted pour. Fill all masonry cells solid with grout, unless otherwise noted. At the top course see structural details for grout level.

G. Comply with fire resistive wall construction where noted on the Drawings, or where required.

3.12 REPAIRING, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged or if units do not match adjoining units, for whole block module. Install new units or full veneer module to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. During tooling of joints, enlarge voids or holes, and completely fill with mortar. Point-up joints including corners, openings and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

C. Leave exposed surfaces clean and free of surplus mortar, mortar stains, cement runs, soil or foreign material to be left exposed or for proper application of specified painted finishes. Exercise care to keep grout and mortar droppings off finished surfaces.

D. Staining and Excess Mortar: Protect exposed masonry against staining. Where grout or mortar does contact the faces of masonry, remove it immediately, by dry brushing to remove mortar fins and smears prior to tooling joints. Should accidental spillage occur, wash and clean surfaces immediately.

E. Test hand cleaning methods on sample panel. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

F. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.

G. Wet wall surfaces with water prior to application of cleaners, remove cleaners promptly by rinsing thoroughly with clear water.

H. Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.13 CLEANUP

A. Undamaged excess masonry materials are Contractor's property and shall be removed from the project site.

B. Remove excess debris and legally dispose off Owner's property.

3.14 FIELD QUALITY CONTROL

A. The Owner will employ and pay a qualified independent testing agency to perform the testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at the Contractors expense. .

B. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

END OF SECTION

SECTION 05 12 00 – STRUCTURAL STEEL

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. All structural steel framing including shapes, channels, plates, angles and rods.
   2. Machine bolts, shop and field welding.
   3. Base and bearing plates, templates, connections, shims and wedges.
   4. Furnishing of anchor bolts.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finish
B. Section 05 30 00: Metal Decking
C. Section 05 50 00: Miscellaneous Metal
D. Section 14 21 23: Electric Traction Passenger Elevators

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)
"Specification for the Design, Fabrication and Erection of Structural Steel for Buildings."
"Code of Standard Practice for Steel Buildings and Bridges."
"Manual of Steel Construction, Allowable Stress Design"

B. American Welding Society (AWS) -AWS D1.1 Structural Welding Code

C. American Society for Testing and Materials (ASTM)

D. California Building Code (CBC)

E. Federal Emergency Management Agency FEMA 353 – Quality Assurance Guidelines for Moment Frame Connections.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Shop Drawings: Prepare under the direct supervision of a California licensed Structural Engineer. Detail drawings including all erection diagrams, all bolted or welded connections, schedules for fabrication and assembly. All parts of the work not specifically detailed on the Contract Drawings shall be detailed in accordance with standard practice.
   1. Indicate details of cuts, connections, camber, holes and other pertinent data. Indicate welds by standard AWS symbols and show size, length and type of each weld.
   2. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorage to be installed as work of other sections.
   3. Contractor shall not assumed that all dimensions, quantities or details are correct.
   4. Miscellaneous metal shop drawings shall not be included in structural steel shop drawings.
   5. All shop drawings used in the field must bear the Architect's shop drawings review stamp.

C. Product Data: Provide manufacturers specifications and installation instructions. Include laboratory test reports and other data to show compliance with specifications for the following products:
   1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
   2. High strength bolts
   3. Structural steel primer paint
   4. Non-shrink grout.

D. Mill Test Reports: Submit manufacturer's certified test reports to the testing laboratory and Architect showing chemical analysis and results of tensile and bending tests. Tests shall meet the requirements of ASTM A6.

E. Test reports conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results.

F. Record Drawings: After the structural steel has been erected and the shop and erection drawings have been corrected to correspond with field conditions, deliver a complete set of "As-Built" prints and printable transparencies of the Drawings to the Architect for review and forwarding to the Owner.

1.05 REQUIREMENTS

A. Weld filler metal shall have a notch toughness not less than 20 foot-pounds at -20 degrees F as measured by a standard Charpy Vee notch test ASTM E23 in accordance with the applicable filler metal specification referenced in AWS D1.1.

B. All welds shall be started and ended on runoff tabs where practicable. Remove all tabs and grind smooth.

C. If backer bars are used at flanges of rolled beams, remove bar at bottom flange, back-gouge the root weld and repair and reinforce with a fillet weld per AWS D1.1.

D. Welding and special inspection requirements of AWS D1.1 as incorporated into and modified by the Building Code shall be strictly enforced.
   1. Special visual inspection shall be continuous throughout the approved welding procedure from fit-up through weld completion.
   2. The fabricator, who shall be approved by Architect, SEOR, the Owner, and the Building Official, shall provide, as part of shop drawing submittal, Welding Procedure Specifications (WPS) containing the information required by AWS D1.1. Each WPS shall be acceptable to the Engineer of Record, furnished to the Building Department and shall be part of the basis for special visual inspection.
   3. Each WPS shall list the welding position, electrode size, type; travel speed, stickout, voltage and amperage within acceptable limits, head size, weld sequence, stress relieving and other pertinent data.
   4. The certified welder and the Project Inspector shall maintain the appropriate WPS at hand for reference during the fabrication process.

1.06 QUALITY ASSURANCE

A. Materials, design fabrication and erection of the structural steel shall be accordance with reference standards.
B. Provide certification that welders to be employed in work have passed the AWS qualification tests.

C. Source Quality Control:
1. Materials and fabrication procedures are subject to inspection and tests in mill, shop and field, conducted by a qualified testing and inspection agency. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
2. Promptly remove and replace materials or fabricated components that do not comply.
3. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay of the work. Promptly notify the Architect whenever design of members and connections for any portion of structure are not clearly indicated.

1.07 TESTS AND INSPECTION

A. Identified Material: If material is properly identified, mill report will be accepted and testing is not required.

B. Unidentified Material: One tension and bend test for every 20 tons or fractional part thereof. Submit copies of all test reports to the Architect for review in reasonable time before start of fabrication.

C. Tests and Inspections: Contractor shall arrange for and schedule testing and inspections of all materials and fabrication at source of supply, fabrication and at site.

D. Testing agency shall provide certified Project Inspector, to inspect all shop and field welding. Testing and inspection shall comply with all regulations of the CBC / Building Department having jurisdiction. Testing agency shall certify in writing upon completion of Work, that the welding has been performed by fully certified welders and in accordance with Drawing and Specification requirements and with all applicable requirements of regulatory agencies having jurisdiction. Cost of testing will be paid by the Owner.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to ensure uninterrupted progress of work. Deliver anchor bolts and anchorage devices which are to be embedded in cast in place concrete or masonry in ample time to not delay work.

B. Transporting and handling the fabricated or partially fabricated members shall be performed with equipment of adequate size to accomplish the intended work safely. All assembled members shall be tied and bridled. Use wood blocks in stacking and transporting the steel to insure that no part of a member will be subject to damage that will impair its strength, durability or accuracy of fit.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms or other supports. Protect steel members and packaged materials from erosion and deterioration.

2.00 PRODUCTS

2.01 MATERIAL

A. Use new tested stock of domestic manufacture complying with standard specifications hereinafter referenced. If foreign material is used, it shall meet or exceed the requirements of all authorities having jurisdiction.

B. Structural Steel, Shapes and Plates: conform to ASTM A36, and as noted otherwise except that W shapes shall be ASTM A992 or ASTM A572 Grade 50. Steel plates and bars 3/8" thick and greater shall conform to ASTM A572 Grade 50.

C. Steel Tubes: Conform to ASTM A500 or A501, Grade B for structural purposes, minimum fy=46 ksi.

D. Steel Pipe: Conform to ASTM A53, Grade B.

E. Unfinished Steel Machine Bolts, Nuts and Washers: Conform to ASTM A307, Grade A, low carbon steel bolts and nuts.

F. High Strength Bolts: Heavy hexagon, quenched and tempered medium carbon, structural bolts nut and washers. Conform to ASTM A325, unless noted otherwise. Where indicated as galvanized, provide units that are zinc coated, either mechanically deposited complying with ASTM B695, Class 50, or hot dip galvanized complying with ASTM A153.

G. Filler metal and flux for welding: Conform to the applicable requirements of the following articles in the AWS Code referred to above:
   1. Welding electrodes for manual shielded metal-arc welding shall conform to AWS A5.1, or A5.5 E70XXX. Use low hydrogen electrodes for A572 steel.
   2. Electrodes for manual shielded metal-arc welding: Article 408, in the series recommended by the electrode manufacturer for the specific type of welding work being performed.
   3. Electrodes and flux for submerged arch welding: Article 412, Grade F80. Welding electrodes and flux used in submerged arc process shall conform to AWS A5.17 F7X-EXXX

H. Primers: Conform to Fed. Spec.TT-P-664
   1. Members to be concealed or paint finished: Tnemec 10-1009 Gray Metal Primer; Ameron - Amercoat 5105 Gray; Rust-Oleum 960 Zinc Chromate Gray; or approved equal. (Refer to Section 09 90 00)

2.02 FABRICATION

A. Fabrication of the structural steel shall be performed in a licensed shop to AISC standards, and approved by the Architect and the Owner. All tolerances shall conform to the applicable requirements of the reference standards referred to above. Exposed steel shall have factory applied rust-inhibitive primer. Do not fabricate until shop drawings are approved.

B. Fabricate the steel in the exact sections, shapes, sizes, weights and details of construction indicated on the Drawings. However, because of manufacturer's stock on hand or shop practice, changes in the structural items indicated on the Drawings may be suggested, provided that all such changes are made only with the specific written consent of the Architect.

C. The structural steel anchor bolts and anchor bolt setting drawings shall be delivered to the Contractor for setting. The structural steel contractor shall verify the position of the bolts prior to the delivery of the steel and report any errors or deviations in the work to the Contractor so that the bolts may be reset correctly.

D. Before being fabricated, all the structural steel members shall be thoroughly wire brushed, cleaned of all loose scale or rust and be straightened by methods that will not injure the material. After punching or working the component parts of a member, all twists or bends shall be removed before the parts are assembled.

E. The work of this Section shall include all cutting, punching, drilling and tapping of the structural steel work required by other trades so that the work of the other trades will properly connect with the work of this Section, provided that the details as to location and the requirements for such work are supplied to the structural steel contractor at the time the shop drawings are being prepared.
NOTE: No field cutting or other field modification of structural steel will be permitted without written approval by Architect.

F. Furnish bearing plates, connection stiffeners, gussets, shelf angles, angle clips and other miscellaneous structural steel items shall be provided as necessary for the work indicated on the Drawings, whether individually detailed or not.

G. Holes for Other Work: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members.
1. Provide threaded nuts welded to framing and other specialty items as indicated to receive other work.
2. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

H. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

2.03 SHOP PRIMING AND TOUCH-UP

A. Do not prime concealed structural steel or steel to be embedded in concrete or mortar.

B. Clean exposed structural steel of dust, dirt, mill scale, oil, grease, and other deleterious substances per (Steel Structure Painting Council) SSPC-SP2 and SSPC-SP3 as a minimum for all metal surfaces to be primed prior to priming, and given a shop prime coat of specified metal primer, per manufacturer's written instructions.

C. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturers instructions and at a rate to provide a dry film thickness of not less than 1.5 mils. Use painting methods that result in full coverage of joints, corners, edges and exposed surfaces.

D. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

E. After erection, field welds and damage to shop coat shall be cleaned and touched-up with the same primer.

3.00 EXECUTION

3.01 FIELD CONDITIONS

Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect all conditions which prevent proper execution of this Work.

3.02 ERECTION OF STRUCTURAL STEEL

A. General: The work of erecting the structural steel shall be carefully planned in advance and the erection shall be performed by skilled riggers. The steel framing shall be completely plumbed before the final connections are made.
1. When the field connecting is complete and the member is properly supported by other portions of the structure, the temporary bracing shall be removed. The steel shall be erected in its proper sequence so that the structure will be plumb, level, straight and true at all times.

2. The equipment used on the work of this Section shall be of sufficient capacity and suitable design to erect properly, easily and safely all parts of the structural steel frame without overloading any parts of the equipment of stressing or deflecting any structural steel member.
3. Remove all protecting tabs such as weld back-up bars, erection clips, lifting tabs and similar items shall be removed so as to extend no more than 2" past the main member to which they are attached.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. The temporary bracing shall be designed and erected to fully accommodate all erection loads and stresses, all construction loads, all dead and live loads and all wind loads. Shoring shall be provided where noted on the structural drawings, and as required. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices. Set each column base in its correct position, both as to alignment and height.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and base plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure.

D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure within specified AISC tolerances.
2. Splice members only where indicated and accepted on shop drawings.

E. Columns: Erect the structural steel columns as detailed on the Drawings.

F. Holes:
1. Install all bolts in punched or drilled holes accurately spaced to the centers indicated on the Drawings. Any slight inaccuracy in matching the holes may be corrected by careful reaming; drifting of unfair holes shall not be allowed.
2. Poorly matched, drifted or carelessly drilled holes in a member shall be cause for the rejection of the material. Each finished bolt hole shall be 1/16" larger in diameter than the nominal diameter of the bolt.
3. Should the thickness of the steel not exceed the bolt diameter by more than 1/8", the holes may be punched. In thicker materials, the holes shall be drilled from the solid or be subpunched and carefully reamed to the required size. All sub-punched holes shall be punched with a punch 1/4" less in diameter than the finished hole.

G. Bolting:
1. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces. Do not enlarge holes in members by burning or by using drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

2. Common Bolts: Unfinished bolts may be used for all connections that are so indicated on the Drawings, using bolts of the sizes called for with the nuts drawn tight. The edge distances shall be at least those indicated in the reference standards referred to above.

H. Gas Cutting: Do not use gas cutting torches in field for connecting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to the Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

I. Welding:
1. Conform welding to the applicable requirements of the AWS Code. The welders and welding operators shall be thoroughly trained and experienced in arc welding and be certified within the preceding 12-month period in accordance with the procedures specified in the AWS Code. Appropriate evidence of such certification shall be submitted to the Architect.
2. A cutting torch may be used where the metal being cut is not carrying stress and where such cuts are smooth and regular in contour. To determine the effective width of the members so cut, 1/8" shall be deducted from the width of the gas-cut edges. Make the radius or re-entrant of the gas-cut fillets as large as possible but never less than 1". A gas-cutting torch shall not be used to cut bolt holes or align unfair holes.
3. Hold residual stresses and distortions from any cause to a practical minimum by the application of proper procedures and sequences to the welding operations. The material to be welded shall be securely clamped or held in full and accurate contact throughout the welding operation and the completed members shall be straight and free of twists, bends, buckling and open joints.
4. The effective length of any segment of intermittent fillet welding shall be at least 4 times the weld size or at least 12" long. The size of all structural fillet welds shall be at least 3/16".
5. Where members and connection pieces are required to be coped, trimmed, shaped or otherwise cut in the field to permit welding, such work may be done with a gas-cutting torch by a worker experienced in accurate flame cutting. Care shall be taken to avoid cutting or damaging the adjoining metal which is not intended to be cut and to avoid burning the metal along the cut faces. No flame cutting shall be done without the approval of the Architect.
6. Spot welding will be permitted for minor details in which the welds do not transmit working stresses.
7. Cut out and replace defective welds or the rejected parts of welds.
8. Upon the completion of the welding, all welds shall be slagged and cleaned of all flux and spatter by wire brushing, leaving the weld clean and bright for inspection.
9. Continuous inspection is required for all welding.
10. All welding shall be specially inspected by an AWS-CWI qualified inspector approved by Building Official.

J. Touch-up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils.

K. Automatic End Welded Studs:
1. Material: Automatic end welded studs shall be Nelson Granular Shear Connector studs or Nelson Deformed Bar Anchor Studs (or approval equal).
Studs shall be manufactured of C-1015 cold rolled steel which conforms to A.S.T.M. Specification A-108, Grades C-1010 through C-1020 cold-drawn steel.
Nelson Deformed Bar Anchor Studs are produced from deformed wire complying with A.S.T. M. A496.

2. Installation: The studs shall be automatically end welded in accordance with the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8" for 5/8" inch and under, and 3/16" for over 5/8" diameter. Welding shall be done only by qualified welders approved by an AVVS-CWI inspector approved by Building Official.
3. Inspection and Tests: Inspection, in accordance with Title 24, Section 2213.2. of all the shop and field welding operations for the automatic end welded studs shall be made by an AWS-CWI inspector approved by the Building Official. The type and capacity of the welding equipment shall be in accordance with the manufacturer's recommendations and shall be checked and approved by a welding inspector.
At the beginning of each day's work, a minimum of two test studs welds shall be made with the equipment to be used to metal which is the same the actual work piece. The test studs shall be subjected to a 30% bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing out or cracking.
Testing of end-welded studs shall be in accordance with Section 2213.2, Part 2 Title 24.

3.03 QUALITY CONTROL

A. The Owner will engage an independent testing and inspection agency to inspect high strength bolted connections, welded connections, to perform tests and prepare test reports.
   1. Testing agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations there from.
   2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
   3. Testing agency may inspect structural steel at plant prior to shipping.

B. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests at Contractors expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

C. Shop Bolted Connections: Inspect and test in accordance with AISC specifications. Verify that gaps of installed Direct Tension Indicators are less than gaps specified in ASTM F959, Table 2.

D. Shop Welding: Certify welders, conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies. Perform visual inspection of all welds. Perform tests of welds by Ultrasonic Inspection in compliance with ASTM E164.

E. Field Bolted Connections: Inspect in accordance with AISC specifications.

F. Field Welding: Certify welders, conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies. Perform visual inspection of all welds. Perform tests of welds by Ultrasonic Inspection in compliance with ASTM E164.

END OF SECTION

SECTION 05 30 00 – METAL DECKING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1 apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Floor and roof steel deck units.
2. Bearing plates, angles and supports at columns.
3. Bent plate closures at decking edges, openings and pour spots.
4. Openings through decking including reinforcing.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finish
B. Section 04 22 00: Concrete Masonry Unit
C. Section 05 12 00: Structural Steel
D. Section 05 50 00: Miscellaneous Metal

1.03 REFERENCE STANDARDS

A. American Iron and Steel Institute (AISI)

B. American Society for Testing and Materials (ASTM)

ASTM A36	Standard Specification for Structural Steel.
ASTM A570	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.
ASTM A611	Carbon, Cold Rolled Sheet, Structural Quality.
ASTM A653	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
ASTM D1056	Flexible Cellular Materials-Sponge or Expanded Rubber.
ASTM D1692	Rate of Burning or Extent and Time of Burning, or Both, of Cellular Plastics Using a Supported Specimen by a Horizontal Screen.

C. American Welding Society (AWS)

AWS D1.1	Structural Welding Code.
AWS D1.3	Specification for Welding Sheet Steel in Structures.

D. Steel Deck Institute (SDI)

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Shop Drawings:
1. Indicate type of deck units, anchorage, details, conditions requiring closure strips, supplementary framing, cut openings, special joining, finish, gage of metal, where located, arrangement of sheets, necessary fabrication to incorporate decking into project, and correlation with other required openings and flashings.
2. Prepare decking shop drawings using approved shop drawings of the supporting members, showing supporting structural members.
3. Show locations and details of all deck accessories, sumps and closures.

C. Calculations and Data: Provide comprehensive manufacturer's descriptive data including specifications and installations recommendations. If steel decking is of type differing from that indicated or specified, submit the proposed manufacturer's calculations and supporting data showing conformance to requirements. Include all technical product data, physical properties, load tables and copies of code approvals. Obtain approval prior to fabrication and delivery.

1.05 QUALITY ASSURANCE

A. Qualification of Welders: Certified in compliance with applicable code requirements and the testing laboratory.

B. Fire Ratings: Obtain U.L. and Building Department approval of the decking, when used as part of an assembly indicated on the Drawings in which fire resistive construction ratings are required.

C. FM: Loss Prevention Data Sheet 1-28.

D. Tests and Inspections:
1. Fabricator's identification:
   a. Steel identified by the fabricator will be acceptable without further testing provided the identification system has been previously established and on record prior to fabrication.
   b. The fabricator shall furnish sufficient evidence to the testing laboratory, and the testing laboratory shall file with the Owner an acceptable affidavit attesting to compliance.
2. Unidentifiable steel: Testing is required for steel which is not readily identifiable as to grade from markings and test records to determine conformity to specified standards. If testing is required, provide all specimens required by testing laboratory as part of work of this Section.
3. Contractor shall pay all costs in connection with inspection of identifiable and unidentifiable steel.
4. Welding:
   a. Testing laboratory shall verify welding operator qualifications, welding operations and welds. Welders: Currently qualified by tests as prescribed in AWS D1.3.
   b. Continuous inspection of all welding will be performed by testing laboratory.
   c. Visually inspect all connections in field to determine quality, size and compliance with reviewed erection drawings. Where the quality of a weld is in question, Contractor may be required to remove and reweld the connection.
   d. Testing laboratory shall certify to Owner in writing at completion of Work that welding has been done in accord with Contract requirements and applicable standards.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver, store and handle metal decking in such a manner that will not damage or deform. Do not damage or overload decking during construction, or use decking for storage or as a working platform until sheets have been welded in position. Stack decking at site before installation on platforms or pallets and protect from weather.

2.00 PRODUCTS

2.01 MANUFACTURE

Provide product as manufactured by Verco, or equal, by members, in good standing, of Steel Deck Institute (SDI). Current ICBO report is required.

2.02 DESIGN CRITERIA

Compute the properties of deck sections on the basis of the effective design width as limited by the provisions of the AISI specification. Provide not less than the deck section properties specified, including modulus of elasticity and moment of inertia per foot of width.

2.03 MATERIALS

A. Metal Decking: Smooth surface (non-embossed) roll-formed sheets minimum 20 gage conforming to ASTM A570 or ASTM A653, Grade C with G90 zinc coating, minimum yield strength of 33,000 psi.
   1. Provide metal decking with indentations and embossments on flanges and webs for composite coaction of concrete and steel. Provide slots only in deck to vent concrete deck.
   2. Refer to Drawings for structural requirements and types.

B. Bearing Plates and Angles: ASTM A36 steel welding materials.

C. Flexible Closure Strips for Deck: Vulcanized, closed-cell, expanded chlorophene elastomer, complying with ASTM D1056, Grade SCE #41.

D. Metal Flashing and Closures: ASTM A653, G90 zinc coating. Provide 22 gage minimum, except where otherwise indicated on Drawings.

E. Shear Connectors: Headed stud type, ASTM A108, Grade 1015 or 1020, cold finished carbon steel with dimensions complying with AISC specifications.

F. Galvanizing Repair Material: Z.R.C. "Cold Galvanizing Compound", All States Galvanizing Powder, "Drygalv" by American Solder and Flux, 74-S27 by the Sherwin-Williams Co., Tneme-Zinc by Tnemec Co., or equal, repair material, or anodic zinc-rich galvanizing repair paint. (conforming to Mil Spec DOD-P-21035.)

G. Primers - Members shall be concealed or paint finished: Tnemec 10-1009 Gray Metal Primer; Ameron - Amercoat 5105 Gray; Rust-Oleum 960 Zinc Chromate Gray; or approved equal. (Refer to Section 09 90 00)

2.04 FABRICATION

A. Fabricate metal decking in accordance with the Steel Deck Institute, to accommodate maximum working stress of 20,000 psi and maximum span deflection of L/360.

B. Provide all decking which supports concrete fill with vent clips, perforations or approved joint deformations as required for relief of vapor pressure.

C. Wherever practicable, provide decking in lengths to span over three or more supports, with flush telescoped or nested 2 inch laps at ends and interlocking or nested side laps, of metal thickness, depth and width as indicated.

D. Except as detailed otherwise, provide all decking with interlocking side laps, 2-1/4" minimum end bearing, and 1-1/4" minimum side bearing.

E. Steel deck manufacturer shall supply decking free of lubricants, oils, or metal shaving.

3.00 EXECUTION

3.01 FIELD CONDITIONS

Verify drawing dimension with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect all conditions which prevent proper execution of this Work.

3.02 ERECTION

A. Erect metal decking in accordance with the decking manufacturer's recommendations, requirements of the Drawings, approved shop drawings and specifications.

B. Place metal decking on the supporting steel frame work and adjust to final position permanently fastening in place.
   1. Bring each unit to proper bearing on the supports.
   2. Place units in straight alignment for entire length of run of cells with close registration of the cells of one unit with those of abutting unit.
   3. Place deck units flat and square, secured to adjacent framing without warp or deflection.
   4. Stagger end joints of adjoining sheets.
   5. Do not place deck units on concrete supporting structure until concrete has cured and is dry.
   6. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
   7. Do not use deck units for storage or working platforms until permanently secured.

C. Cut and reinforce units to provide openings which are located and dimensioned on the Drawings.

D. Provide openings required for work of other trades and which are not indicated on Drawings only upon acceptance of the Architect and SEOR as to size, location and reinforcement.

E. Fasten decking to supports at ends of units and at intermediate supports. Weld as shown on the structural drawings. Make all plug welds with 1/2 inch effective diameter.

F. Fasten side laps between supports as indicated on Drawings.

G. Perform all field cutting parallel with the cells in the area between the cells, taking care to leave sufficient horizontal material to permit satisfactory welding to supporting steel. Clean all other galvanized surfaces which are damaged or abraded by welding during erection. Coat damaged surfaces with a zinc-rich coating.

H. Metal Flashings and Closures
   1. Weld in position, all sheet metal closure flashings, closure angles, closure plates, profile plates and shear plates.
   2. Close open ends of all cell runs at openings, walls, and similar interruptions and terminations.

I. Welding:
   1. Make welds which are to be watertight continuous and free from voids or cracks. Take precautions when welding to prevent heat blisters, burn-throughs, and surface distortions.

2. Use electric shielded-arc process in strict accordance with Welding Specifications of American Welding Society as modified by Referenced AISC Standards. Use only welding operators trained and skilled in arc welding and qualified as per AWS D1.3. Grind smooth all welds exposed to view. Weld shall be free of holes, slag, or other defects and flush with adjoining surfaces. No finishing treatment is required for concealed welds. Cut out and replace any defective welding.
3. Clean or grind off mill scale, rust and pitting prior to any galvanizing or priming.

J. Shear Connections: Weld shear connectors to supports through decking units in accordance with manufacturers instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.

K. Field Galvanizing Repair: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified galvanizing repair compound where surfaces remain exposed and unpainted.

L. Corrosion Protection of Dissimilar Materials: Protect surfaces that are in contact with concrete or masonry, or contact surfaces of dissimilar metals for all interior and exterior work and decks, by painting or coating the contact surfaces of each with two heavy coats of bituminous paint, or by suitable isolation gaskets, as approved and as applicable for each condition. Do not extend coating onto exposed surfaces.

END OF SECTION

SECTION 05 50 00 – MISCELLANEOUS METAL

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Steel pan stairs and stringers, complete, including supports and accessories. ***
2. Stair handrails / stair guardrails. ***
3. Guardrails under stairs ***
4. Barrier cables at ramp barrier walls.
5. Steel rung ladders.
6. Galvanized steel barrier guard cables and supports
7. Steel pipe bollards
8. Trench and area drain, frames and grates.
9. Elevator shaft framing, including columns, support beams, separator beams, hoisting beam, bearing plates, rail supports, sill support angles, etc.
10. Clearance barriers
11. Standpipe and storm drain guard barriers.
12. Stair nosing inserts.
13. Pipe sleeves, except where furnished under Electrical and Mechanical sections.
14. Formed sheet and bent plates, 11 gage and heavier.
15. Clip angles, anchors, bolts, plates, tubes and miscellaneous supports.

*** Denotes deferred approval item. Refer to Section 01 35 00, Special Project Procedures.

1.02 RELATED WORK IN OTHER SECTIONS

A.	Section 01 35 00:	Special Project Procedures
B.	Section 03 30 00:	Concrete and Concrete Finish
C.	Section 05 12 00:	Structural Steel
D.	Section 05 30 00:	Metal Decking
E.	Section 07 60 00:	Sheet Metal Work
F.	Section 09 97 13:	Steel Coating System
G.	Section 10 22 13:	Wire Mesh Screens & Partitions
H.	Section 23 05 00:	Mechanical

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)
Standard Practice for Steel Buildings and Bridge
Specification for Design, Fabrication and Erection of Structural Steel for Buildings
Steel Construction Manual

B. American Society for Testing and Materials (ASTM)

C. American Welding Society (AWS) - D1.1 Structural Welding Code

D. California Building Code (CBC), Chapter 22.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit to the Building Department the drawings with calculations as required for the deferred approval. Refer to Section 01 35 00.

C. List of Materials: Review all related work to compile several comprehensive lists to address the requirements requested herein. First, provide a list of all items & materials proposed under this Section, whether shop fabricated or are related materials supplied by others under the work of other sections. Include the name of the subcontractor(s), if any fabricated or manufactured item is by that other than the contracted fabricator, include the product name or number, shop drawing sheet and detail number locations where each item can be found, the type of surface preparation and shop primer system that is to be used. Where other fabricated items are required to be galvanized a separate list is required and is to include the detailed shop drawing location of these items.

D. Product Data: Provide manufacturer's product data and specification sheets for all related items / materials that are purchased outside the fabricators shop and required for incorporation into the work of this section for compliance review to that specified.

E. Design / Build Stair and Railing Requirements: Contractor shall provide a complete set of shop drawings and design calculations stamped and signed by an Engineer registered / licensed in the State of California for the completion of the stair and railing design indicated. Submit to the Architect for review prior to obtaining permits and paying fees for the work required.
   1. Provide a complete set of calculations and fully detailed shop drawings necessary to complete the stair and railing design intent indicated. The indicated design intent is not guaranteed to be accurately complete in its detailing, fabrication requirements as needed structurally to meet project and code requirements. Contractor shall complete the detailing and add any additional bolted or welded connections necessary to meet the code requirements.
   2. If Contractor proposes a stair and/or railing design / fabrication that deviates in any way from the design intent and detailing indicated in the contract documents, then proposed differences shall be detailed and submitted as a separate shop drawing submittal for review. Obtain acceptance of proposed deviations prior to submitting the required complete submittal.

F. Shop Drawings: Shop drawings will be returned and not reviewed unless verified by the Contractor that the entire submittal is complete as required and stamped attesting to this claim and also is in conformance with the specified contract document requirements.
   1. Drawings shall fully detail the fabrication, welding and installation of anchorage required for interface of work of this section with work by others. Include connections and fastenings not indicated or specified in the contract documents to meet project conditions. Indicate on each and every drawing detail the required surface preparation and surface finish / procedure to be supplied. Cross-reference all items back to the required materials list numbering system.
   2. Shop drawings reviewed by the Architect and any requested revisions noted therein will become the basis for accepting or rejecting actual fabrication of items, acceptance of materials used and details used for installation of the work.

G. Manufacturer's recommended installation procedures which, when reviewed by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

H. Certification for surface preparation and priming materials. Provide a list of all items to be prepared in conformance with Section 09 97 13, Steel Coating System and which miscellaneous items are to be prepared in conformance with Section 09 90 00, Painting. Both lists shall be coordinated with the scope of work of each section.

I. Submit a 1'-0" wide section of stair guardrailing, including post, intermediate horizontal rails or infill panels, and top handrail demonstrating radii bending, handrail & bracket, welding & grinding, and priming galvanizing procedures.

1.05 QUALITY ASSURANCE

A. Owner-selected testing laboratory shall inspect finished steel welds and bolted connections. Field test any welds showing deviations from accepted standards. If in need of repair, perform at Contractor's sole expense.

B. Qualifications of Fabricator/Erector: The firm manufacturing and installing the work of this section shall have had not less than five (5) years successful experience in work of similar nature and complexity to that required under this Contract.

C. Certification of Welders: All welders shall be certified per current AWS D1.1 Standards.

D. Qualification of Welders: Welders shall be properly certified for the type of work involved, in compliance with all applicable code requirements. In the absence of code requirements pertaining to certification, welders shall be certified by the Testing Agency.

E. All miscellaneous metal attachments, weld plates and embeds that are to be set into concrete or masonry shall have the entire fabrication galvanized after fabrication, whether exposed in the finished work or not.

1.06 REQUIREMENTS

A. Verify locations of all pipe guards with drawings and required areas to be protected from vehicular damage or intrusion. Coordinate locations of parking equipment pipe guards with equipment installer. Provide protection at free standing fire department inlet body, stairways and elevator lobbies.

B. Design / Build Steel Stairs: Conform to design intent details indicated. If proposed detailing and fabrication is to differ from the intent indicated, Contractor shall detail the proposed differences for Architect review before incorporating into the required shop drawing plans and calculations submittal or to the Building Department submittal for permit.

1.07 PERFORMANCE

A. Contractor shall engineer, fabricate and install metal fabrications to withstand specified loads without exceeding the allowable working stress of the materials involved, including anchors and connections.
   1. Apply each load to produce the maximum stress in each component.
   2. Allow for thermal movement resulting from 100 deg.F change (range) in ambient temperatures, to prevent buckling, opening up of joints and overstressing of welds and fasteners.

B. Handrails and Guardrails:
   1. Design and erection shall conform to the following ASTM standards:
      ASTM E894 Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings

ASTM E935 Standard Test Method for Performance of Permanent Metal Railing Systems and Rails for Buildings.
ASTM E985 Standard Specification for Permanent Metal Railing Systems and Rails for Buildings

2. Fabricate and install solid without shake or wobble.
   a. Concentrated load of 250 lbs. applied at any point non-concurrently, vertically or horizontally at the top rail.
   b. Concentrated load of 250 lbs. applied horizontally over any 1-foot square area of intermediate rails or infill panel.
   c. Uniform load of 50 lbs. per linear foot applied horizontally at the top rail, and a simultaneous load of 100 lbs. per linear foot applied vertically.
   d. Concentrated and uniform loads need not be assumed to act concurrently.

C. Ladders: For lengths up to 10 feet, ladders including attachments shall support two loads of 250 lbs. each concentrated between any two consecutive attachments. For each 10 feet additional length or fraction thereof, ladders including attachments shall support an additional concentrated load of 250 lbs. Each step or rung in each ladder shall support a single concentrated load of 250 lbs. minimum.

1.08 FIELD MEASUREMENTS

A. Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements and survey before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Secure all field measurements prior to fabrication and installation of all work covered in this Section. Field alterations which become necessary as a result of the inexact dimensions are not permitted.

C. Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.09 COORDINATION

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

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect items from damage during shipping, storage and handling. Work showing dents, creases, deformations, weathering, or other defects is not acceptable. Deliver welding electrodes to site in unbroken packages bearing manufacturer's name and contents identification.

2.00 PRODUCTS

2.01 MATERIALS

A. Structural Steel Shapes, and Plates: ASTM A36, smooth surfaces free of defects except that W shapes shall be ASTM A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Architectural and Miscellaneous Steel Items: ASTM A283, Grade C to be bent or cold formed.

D. Iron Casting and Shapes: Malleable iron castings shall be ASTM A47, Grade 32510. Gray iron Castings shall be ASTM A48. Class 30, unless another class is indicated or required by structural loads.

E. Steel Sheets: ASTM A611 Grade C

F. Steel Pipe and Pipe Columns: ASTM A500, Grade B.

G. Stair Steel Tube Railing Posts: AWHR/AWCR mechanical tubing ASTM A513, Grade 1020 or ASTM A500 Grade A or B. Stainless steel tubing conforming to A269.

H. Steel Bars: ASTM A108.

I. Fasteners (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.
3. Furnish lugs, clips, bolts, nuts, screws, washers, concrete inserts, anchors and any other fastenings necessary for proper erection of various items. All fastenings to be designed to alleviate vandalism and theft.

J. Unfinished Bolts and Nuts: Regular hexagon head bolts, low-carbon steel externally and internally threaded standard fasteners, ASTM A307, Grade A, with case hardened nuts, ASTM A576, GR 1015.

K. Structural Framing Bolted Connections: High strength bolts, nuts and washers conforming to ASTM A325, slip critical type.

L. Machine Bolts: Conform to ASTM A307, with malleable washers. All structural bolts shall be 3/4" diameter, unless noted otherwise.

M. Anchor Bolts / Rods: ASTM F1554 for hooked, headed, threaded and nutted in Grades 36, 55 or 105 with a special weldability supplement for 55 ksi.

N. Machine Screws: Provide cadmium plated steel type complying with Federal Spec. FF-S-111.

O. Washers:
1. Plain washers: Comply with Federal Spec. FF-W-92, round, carbon steel.
2. Lock washers: Comply with Federal Spec. FF-W-84, helical spring type carbon steel.

P. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron or cast steel, ASTM A47. Provide bolts, washers and shims as required, hot dip galvanized, per ASTM A153.

Q. Anchorage Devices: Provide expansion shields complying with Federal Spec. FF-S-325.

R. Welding Electrodes: ASTM A36 or A283 Series, as required for intended use. Comply with AWS D1.1 for base metal / filler metal combinations unless noted otherwise in drawings.

S. Galvanized Barrier Guard Cables and Accessories: Extra high strength, high tensile cold drawn wire 3/8" diameter, 7 - wire pre-stressing strands with a minimum breaking strength of 26,900 lbs. ASTM A416; Grade 250, use three-part grippers for cable anchoring, galvanized. Provide anchors and anchor plates as required, galvanized. In areas where the run is to small to have a standard anchoring system, provide a three mechanical anchoring assemblies (GRABB-IT Cable Splice, GCA4-1). Cable can be anchored into concrete (embedded insert) with Ferrule loop insert F-64 as manufactured by Dayton/Richmond, or equal.

T. Metal Decking: Roll-formed sheets minimum 20 gage conforming to ASTM A570 or ASTM A653 Grade C with G90 zinc coating, minimum yield strength of 33,000psi. Panels are to be smooth non-vented stock without embossments or deformations. Products as manufactured by McIntyre Co., H.H. Robertson Co., Inryco, Bethlehem Steel Corporation, Verco, ASC Pacific, Inc., Republic or equal.

U. Perforated Steel Plate: Minimum 16 gage carbon steel sheet with standard pattern perforations, as manufactured by McNichols Co. (800) 237-3820. Round 5 /16" diameter 8.20 holes-psi, 63.0% open area.

V. Non-Shrink Grout: Master Builders "General Construction Grout" Sika "SikaGrout 212", Cormix "Gilco Construction Grout", Sonneborn "Sonogrout G.P.", or equal, min. 5000 psi at 28 days complying with ASTM C827.

W. Stainless Steel Sheet, Strip, Plate and Flat Bars: ASTM A666, Type 304.
Stainless Steel Bars and Shapes: ASTM A276, A314 or A484 Type 304, or as required.

X. Rolled Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D, raised diamond tread pattern (pattern No.2).

2.02 OTHER MATERIALS

Provide other materials, not specifically described, but required for a complete installation, as selected by the Contractor subject to the review and acceptance by the Architect.

2.03 GALVANIZING - Required for all embeds in direct contact with concrete / masonry.

A. Galvanizing: ASTM A123, ASTM A153, as applicable, hot dip after fabrication with a coating G90 thickness of at least 2.0 mils or 2.0 ounces psf on actual surface and 1.8 ounces psf minimum on any specimen, as specified herein.

B. Galvanizing Repair Material: Z.R.C. "Cold Galvanizing Compound", All States Galvanizing Powder, "Drygalv" by American Solder and Flux, or equal repair material, or anodic zinc-rich galvanizing repair paint.

2.04 PRIMERS

A. For Steel Coating System Over Bare Steel: Tnemec "90-97 Tneme-Zinc"; Ameron - Amercoat 441 Urethane Zinc Rich Primers, or equal of same manufacturer as finish coating system. (Refer to Section 09 97 13).

B. Ferrous Metal Paint Finish: Fast curing, lead and chromate free, universal modified-alkyd primer complying with performance requirements in FF TT-P-664; resistance to normal atmospheric corrosion, compatibility with finish paint systems and compatibility with finish coats specified. Tnemec 10-1009 Gray Metal Primer; Ameron - Amercoat 5105 Gray; Dunn-Edwards IP 507; Rust-Oleum 960 Zinc Chromate Gray; or equal of same manufacturer as used for finish paint system (Refer to Section 09 90 00).

2.05 FINISHES

A. All items of miscellaneous metal shall be free from burrs, rust, scale, and rough surfaces, and shop primed after fabrication with the appropriate primer, as noted in Article 2.04 above, unless otherwise specified.

B. All items of miscellaneous metal shall be hot dip galvanized after fabrication where hereafter specified, to produce specified galvanized finish coating free of burrs, roughness, whiskers, unsightly spangles, icicles, runs, barbs, sags, droplets and other surface blemishes.

C. Certification: Verify type and manufacturer of finish steel coating and/or finish painting system to be utilized in selection of proper primer and manufacturer before application. Primer and finish steel coating or painting shall be of same manufacturer. Submit to Architect certification that proper blast cleaning surface preparation and priming has been accomplished per requirements of Section 09 97 13 and 09 90 00.

2.06 DESIGN AND FABRICATION REQUIREMENTS

A. Design and fabricate work to support any normally imposed loads. Fabricate and form the Work to meet actual installation conditions as verified at the job site. Obtain necessary templates and information and provide all holes, cutting, punching, threading, tapping and drilling indicated or required for securing work of other sections to metal fabrications. Coordinate metal work with adjoining work for details of attachment and fittings. Verify hardware and weather stripping requirements, if any, for proper cutouts, fittings and attachments.
   1. Except as otherwise shown on the Drawings or the reviewed shop drawings, use materials of size, thickness, and type required to produce reasonable strength and durability to complete the entire work of this Section, unless otherwise indicated, comply to code as minimum standard.
   2. Provide all metal fabrications indicated, specified, and required to complete the work, including all anchors and supports. Include all parts necessary to complete metal fabrication work whether or not specifically indicated.
   3. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding all exposed welds smooth to the touch and flush, forming exposed connections without unsightly ridges and with hairline joints, and using concealed fasteners whenever possible. Ease exposed edges to radius of approximately 1/32" unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
   4. Fabricate steel work in shop, including welding. Assemble at site with bolted connections only. All bolted connections shall be from the same side. No field welding of galvanized metal is permitted, unless field weld is cleaned, galvanized, primed and encased in concrete, or approved otherwise by Architect. No torch cutting is permitted unless specifically authorized in writing by Architect.
   5. Miter all corners and angles of moldings or frames, unless otherwise noted or approved.
   6. For fabrication of metal work which will be exposed to view in finished work, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, mill scale, rolled trade names and roughness.
   7. Close fit exposed joints to hairline joints. Cut off exposed bolts and screws flush with adjacent metal.
   8. Form metal work with anchorage when built into concrete or masonry or provide with suitable anchors, expansion shields, or other anchoring devices indicated or required. Provide such metal work in ample time for setting and securing in place.

9. Bolt with proper size bolts; draw nuts tight so threads are entirely concealed; upset threads. Counter sink heads of rivets and bolts. Provide Phillips flat head countersunk bolts and screws in exposed work and elsewhere as required, unless otherwise indicated.

B. Design / Build Steel Stairs - Design Criteria: (Design/Build criteria applicable if deviating from details indicated on the drawings, refer to Paragraph 1.06 B above) Drawings indicate design intent, general arrangement, aesthetic requirements and minimum sizes of principal members only. Contractor shall complete the design and provide stairs of the design indicated, constructed to support the following minimum design loads for stair and ships ladder fabrication, installation and supports:

Stair Tread: 100 lbs. live load per square foot with minimum 300 lbs. point load.
Handrails: 50 lbs./l.ft. or 250 lbs. concentrated load whichever produces higher stresses, applied horizontally both ways and vertically to the top rail.

1. Calculations: Provide complete calculations indicating conformance with specified design criteria and code compliance. Submit calculations and shop drawings stamped / signed by a registered professional engineer licensed in the State of California.
2. Architect reserves the right to accept or reject the entire stair and handrail design or any particular detail, regardless of engineers stamp and calculations or manufacturers standards, that are in its opinion, inadequately structured or detailed for project requirements.
3. Handrails shall be 34" above nosing and shall extend 12" beyond top nosing and 12" plus tread width beyond bottom nosing.
4. All railings shall have intermediate rails spaced with a less than 4" maximum gap.
5. Narrow all vertical posts above the top intermediate rail to 1", shall butt under the 1-1/2" top horizontal grab rail
6. Railing shall be mounted 1-1/2" minimum clear from sidewalls.
7. Guardrails shall be minimum 3'-6" height or as noted in drawings or as required by CBC.
8. Provide required reinforced openings for electrical conduit, lighting fixtures and connections.

C. Welding:
1. Make welds which are to be watertight continuous and free from voids or cracks. Take precautions when welding to prevent heat blisters, burn-throughs, and surface distortions.
2. Use electric shielded-arc process in strict accordance with Welding Specifications of American Welding Society as modified by Referenced AISC Standards. Use only welding operators trained and skilled in arc welding and qualified as per AWS. Grind smooth all welds exposed to view. Welds shall be free of holes, slag, or other defects and flush with adjoining surfaces. No finishing treatment is required for concealed welds. Cut out and replace any defective welding.
3. Clean or grind off mill scale, rust and pitting prior to any galvanizing repair or priming.

D. Shop Priming and Surface Preparation:
1. Prior to shop priming, clean metal surfaces as required for the specified finish and per manufacturer's printed instructions as follows:
   a. Commercial blast clean per (Steel Structure Painting Council) SSPC-SP6 all bare metal surfaces prior to priming for all metal receiving steel coating system finish.
   b. Use solvent and hand tool cleaning (SSPC-SP1) on surfaces previously galvanized, prior to priming.

c. Hand tool clean and power tool clean per (Steel Structure Painting Council) SSPC-SP2 and SSPC-SP3 as a minimum all metal surfaces prior to priming for all metal receiving paint finish.

2. Apply shop coat of specified metal primer to 3.0-3.5 dry mil thickness to all surfaces receiving steel coating system (refer to Section 09 97 13) and 1.0-1.5 dry mil. thickness to all surfaces receiving paint finish. Refer to Section 09 90 00.
3. Work primer into joints. Do not prime galvanized items or items embedded in concrete or masonry. Shop prime all ferrous items not to be galvanized unless otherwise indicated or specified.
4. On surfaces which are not galvanized and are inaccessible after assembly or erection, apply two coats of the specified shop primer. Change color of second coat to distinguish it from the first.

3.00 EXECUTION

3.01 INSPECTION

Report in writing to the Architect conditions that prevent or interfere with correct installation of work of this section.

3.02 INSTALLATION

A. Grouting: Provide grouting for work of this section as shown, specified, and required. Use non-shrink grout and conform to manufacturer's directions.

B. Field Galvanizing Repair: Wire brush welds and damaged coating to clean bright metal. Apply one coat of galvanizing repair paint where surfaces are concealed or are to be finish painted. Use the specified galvanizing repair compound where surfaces remain exposed and unpainted.

C. Shop Prime Coat Repair: Do not apply metal primer in wet weather unless steel is protected from dampness and is dry. Clean field welds, field bolts, and all damaged shop primer after erection and apply a spot coat of the same primer as used for the shop coat.

D. Fasteners: Provide fasteners and connectors of approved types as required for the installations, whether or not indicated. Provide galvanized fasteners for galvanized items. Fasten metal work to solid masonry with expansion bolts. Provide screws threaded full length to screw head.

E. Corrosion Protection of Dissimilar Materials: Protect surfaces that are in contact with concrete or masonry, or contact surfaces of dissimilar metals for all interior /exterior work and work to be built into exterior and below grade walls and decks, by painting/coating the contact surfaces of each with two heavy coats of bituminous paint, or by suitable isolation gaskets, as approved and as applicable for each condition. Do not extend coating onto exposed surfaces.

F. Provide all loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting. Provide plates flat, free from warps or twists and of required thickness and bearing area. Galvanize plates after fabrication.

3.03 SCHEDULE OF ITEMS

The following list of specific items is not necessarily complete. Check drawings and all other sections, and provide miscellaneous metal fabrications as required to complete the entire work:

A. Stair handrails / guardrails shall be fabricated from 1-1/2" x 1-1/2" tube steel posts and top rail framing with 1" x 1" x .120 top and bottom intermediate tubing with 1/2" x 1/2" x .065 square vertical pickets spaced so that the maximum clear space between pickets does not exceed 3-7/8". Provide 1-1/2" o.d. x 5/32" inboard handrail. Handrails are to be anchored to the guardrails using 5/8 diameter rod handrail brackets. Railings are to be mounted 1-1/2" minimum clear from sidewalls. All joints to be continuously welded and ground smooth. Galvanized fabrication.

B. Guardrails shall be fabricated from 1-1/2" x 1-1/2" tube steel posts and top railing. Intermediate horizontal rails are to be 1-1/4" x .120 square rails. Railings are to be mounted 1-1/2" minimum clear from sidewalls. All welds are to be continuous and ground smooth. Galvanized fabrication

C. Wall Handrails shall be 1-1/2" o.d. x 5/32" pipe rail and mounted 1 ½ "minimum clear from side walls. Return ends bent to a 1-1/2" radius with end closures welded. Provide 1/4" clearance to wall.

D. Wall Handrail Brackets: Use standard cast iron brackets of size and profile shown. Space at 5'-0" maximum with 3/8" expansion bolt to wall or to backing, as shown. Conceal fastenings with bracket fillers. Return rail ends to within 1/4" of wall and weld plug over open end.

E. Embeds: Provide a steel weld plate consisting of a minimum 4" x 4" x 3/8"steel plate embed with four (4) 1/2" diameter x 5" Nelson studs, 3" each way, welded to the bottom for anchorage, unless indicated otherwise.

F. Sleeves through concrete walls and footings shall be furnished and installed, as required, and shall be standard weight galvanized steel sections of a size sufficient to allow 1/4" minimum clearance all around between the sleeve and item to be inserted. Verify clearance required for fire protection piping. Provide welded reinforcing as required. Pipe sleeves in connection with mechanical and electrical work are included in the respective mechanical and electrical sections.

G. Galvanized Barrier Guard Cables: Use high tensile cold drawn wire strands and high tensile iron bars, galvanized. Provide recessed anchors and pockets where indicated on Drawings, for tensioning. Cables shall not sag in finished installation. If sagging occurs, retention and reseat as required. Provide cable spacers to maintain proper spacing.
   1. Tensioning and Seating of Cables:
      a. Tension strands to force specified before losses (1.5 kip per tendon " tolerance 0.2 kip) plus a force corresponding to full seating loss of the anchor. Seat wedges at this force.
      b. Remove jack from anchor and transfer to the other side of the support at which the cable is anchored. Using a temporary plate against the support, tension the strand to 60% of ultimate tensile strength (14 kips) of the strand, fully seating wedges and relaxing the tendon by the extent of the seating loss.
      c. Residual force in each tendon shall be 1.5 kip +/- 0.2 kip.

H. Steel Ladders - (Elevator Pit): Construct as shown and according to Title 8 CCR and ANSI A14.3. Continuously weld all joints and grind welds smooth and flush, and provide required brackets and attachments. If dimensions are not shown, provide 3/8" by 1-1/2" flat bar rails spaced 1'-4" apart, and 3/4" diameter steel rungs spaced 12" on center. Extend rungs through holes at center line of rails with ends plug welded and ground smooth. Support ladder at top bottom and at intermediate points, spaced not over 4'-0" on center. Use welded steel brackets, top and intermediate points designed for adequate support and anchorage.

Use 6" x 3½" x 3/8" x 1 ½" w steel angle bolted to side rails with 1/2" diameter machine bolts and nuts. Secure to floor with (2) 1/2" diameter machine bolts in expansion shields. Hold ladder clear of wall surface and other construction, 4", unless detailed otherwise. Extend rails 42" above top rung, and return rails to wall or structure unless other secure hand holds are provided. Coordinate with elevator equipment and requirements. Galvanize complete fabrication.

I. Trench Drains and Area Catch Basins:
   1. Custom fabricate gratings for trench drains and catch basins of 1-1/2" x 3/16" steel support bars spaced 7/16" o.c. in short direction, with 1-1/2" x 3/16" spacer cross bars at 4" o.c. maximum. Bars to be headed into l-1/2" x 3/16" perimeter member and welded. Balance of connections to be welded. Fabricate gratings in section weighing not over 75 lbs. per panel.
   2. Fit gratings to frames so that grates will not rock or rattle and that no open space exceeds 1/4". Provide 3/8" diameter by 1-1/4" long bolts with lock nut and leveling nut at 6 places minimum. Weld bolts to support angles. Top of grating shall be flush with frame. Drain pans shall be formed of 10 gage steel with 2" x 2" x 3/16" angle frame welded to pan. Weld 1/2" diameter x 1'-0" rod anchors to pan at 6" maximum from each corner and 2'-0" o.c. maximum, 2 per side. Coordinate fabrication for side discharge tail piece outlet tubes.
   3. Galvanize complete fabrication.

J. Concrete Catch Basins: Fabricate frames for concrete catch basins of 2" x 2" x 3/16" galvanized steel angle with mitered and welded corners. Provide 1/2" by 6" bent rod anchors welded to frame at each corner and 1'-0" o.c. maximum. Install where shown on the Drawings, set level to intended planes as required by conditions.

K. Miscellaneous Steel: Furnish, fabricate and install all miscellaneous angles, channels, bent plate, clips, anchors, hangers, brackets, plates and other miscellaneous metal required for the complete job and construction as indicated on the Drawings. Such items shall be formed and of sizes, shapes and locations indicated, all complete as detailed or, if not detailed, as required for the location and purposes served, in accordance with applicable provisions specifically mentioned herein or in other sections, but which are customarily considered as part of the work, the same as if fully specified herein and detailed on the Drawings. Obtain templates, where required.

L. Elevator Shaft Framing: Provide structural steel tubing shaft framing, including shapes and plates for attaching to and supporting elevator guide rails, including where shown on structural drawings. Provide all miscellaneous rolled angles, for connection of the threshold for a complete installation. Install hoisting beam, separator beams with supports of sizes and connections shown; shop prime finish. Coordinate with requirements of elevator shop drawings.

M. Barrier Beam Supports: Provide cantilevered HSS welded to embed plates, as detailed on the Drawings.

N. Clearance Barrier: Provide a 6" PVC Schedule 80 barrier beam (12'-0" maximum) with capped/closed ends suspended by 3/16" stainless steel aircraft strand wire cable at 4" from each end of required length hanging from cantilevered HSS connection. Provide all required cable crimp/clamps, washers, and grommets as detailed and as required for a complete assembly.

O. Steel Pipe Bollards and Posts: Fabricate as detailed on the Drawings. Install in true vertical position.

1. (At Grade and Above Grade) Provide 4" diameter std. by 3'-6" high steel pipe welded to a 12" x 12" x 1/4" thick steel plate embedded/anchored to slab using (4) - 1/2" diameter with deformed bar anchors welded to bottom of plate. Field weld post to previously placed embed perfectly plumb and true with continuous weld ground smooth. Leveled and capped with 1/4 plate ground smooth.

P. Steel Stairs: (Design/Build and Railings)
1. Stringers: Steel tubes, ASTM A500, minimum size as shown on Drawings and/or as required. Provide plate closures for exposed ends.
2. Risers: Use sheet steel not lighter than 12 gage.
3. Concrete Filled Pan Treads and Landings: Use sheet steel pans not lighter than 12 gage filled with concrete. Provide reinforcing for concrete min. W.W.F. 6 x 6 - W 2.1 x W 2.1, fastened to pans, as required. Fabricate with steel angle supports attached to pans and stringers with welds. Welds indicated on drawings at stair stringers, plate treads, nosings and risers are minimum, but shall be provided and increased as required to prevent stairs and stringers from racking when design forces are applied including railings and posts. Provide stiffeners and intermediate landing support, as required.
4. Weld all connections in accord with AWS D1. Provide continuous welds, ground smooth where exposed.
5. Fabrication and Erection:
   a. General: Fabricate stringers from steel channels of min. sizes indicated on the Drawings or as required in conformance with the approved shop drawings and calculations. Weld all connections and grind smooth. Provide all bearing plates, clip angles, and other fastening devices. Stairs shall conform to referenced code requirements and applicable portions of National Association of Architectural Metal Manufacturer's (NAAMM) publication "Metal Stairs". Shop drawings to show size of all members and details of all connections. Provide stiffener angle supports under all landings, as required.
   b. Railing: Welded construction, as detailed. Cap intersections, continuously weld and grind welds smooth all connections. Weld rail posts to stringers.
   c. Make adjustments as required to leave work plumb, level, treads and risers uniformly parallel and equal, and level with adjoining floors as applicable. Railings shall be continuous and parallel to stair run with mitered intersections and returned to walls at terminations with uniform clearances and capped ends, unless otherwise indicated.
   d. Priming: Coordinate preparation and priming procedures with Section 09 97 13.

Q. Standpipe and Storm Drain Guard Barriers: Provide bent plate, channel, angles or pipe fabrications as detailed on the Drawings or as necessary per job conditions to conform as required by the Uniform Plumbing Code, Section 315e, to protect piping in an approved manner.

R. Stair Nosings: Provide heavy-duty extruded safety nosing with cast-in anchor system for pan filled and poured in place concrete stairs. Nosings to have anti-slip abrasive granule ribs to comply with State of California striping code for the visually impaired, with contrasting color 2 inches wide (70% recommended), parallel to and not more than 1 inch back from the front nose of each step and top landing. Coordinate size and profile with stair pan/nose profile. Products as manufactured by American Safety Tread Co. Inc., as distributed by M.H. Powell & Co. Inc. (323) 887-0037; Balco Inc., Metalines, or equal.

S. Elevator Canopy: Provide roof level elevator shaft canopy fabrication using 7/8” furring channels, continuous angles C12 x 25 and 3" x 3" x 1/8". Metal decking used for canopy cover is to have 3" non-venting flues (smooth). Fabricate as detailed. Connection to shaft as indicated on the structural drawings.

T. Exit Sign Posts at Roof Stairs: Provide 2-1/2" x 2-1/2" x .180" steel tubes with 6" x 4" x 3/8" steel plate base with (2) 3/8” Ø HSA with 3-1/2” minimum embedment. Include metal strap fastened to spandrel. Coordinate mounting of base plate with PT-cable locations.

3.04 CLEANING

Finished and primed surfaces shall be left free from grease, dirt or other foreign material, in preparation to receive final finish, paint or coating.

3.05 ANCHORING SYSTEMS

A. Post-installed anchors will not be permitted in post-tensioned concrete unless specifically accepted by the structural engineer prior to use. Submit all requests for use to Architect for review prior to starting work.

B. Adhesive / Injection / Epoxy Systems: Installation to be as instructed by the manufacturer based on type of insert to be used as approved by the structural engineer.

C. Provide special inspection.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1 apply to work of this section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the contract, including, but not limited to, these major items:
   1. Wood furring, stripping and nailers.
   2. Plywood backboards.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 04 22 00: Concrete Masonry Unit

1.03 REFERENCE STANDARDS

A. West Coast Lumber Inspection Bureau (WCLIB)

B. Western Wood Products Association (WWPA)

C. American Plywood Association (APA)

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site and store in a safe area away from traffic, off ground and under cover.

B. Handle with care to prevent damage and splitting.

2.00 PRODUCTS

2.01 MATERIALS

A. Plywood: Conform to U.S. Product Standard P.S. 1-09 and American Plywood Association, APA Rated. 3/4" Structural I, Sheathing CD, exposure 1, minimum 5 ply.

B. Miscellaneous Furring: Douglas Fir #2.

C. Bolts, Lag Screws, Wood Screws and Nails: Steel of standard manufacture per National Design Specification of NFPA and CBC Section 2304.9.

D. Power Driven Anchors: Provide 1/4" diameter threaded type anchors with threads upset to 3/8" shot through 12" x 1/8" washers. Provide 3/8" with 7/32" shank diameter headed drive pins. Provide anchors long enough to provide 12" penetration. "Omark", "Ramset; "Bonded" or equal.

E. Treated Lumber: Pressure treat lumber in contact with concrete or masonry with "Chemonite" or 'CZC' by J.H. Baxter, "Wolman CCA" by Koppers Co., or equal; kiln-dried after treatment. Soak cut ends in a wood preservatives, twice for 15 minutes each at least two (2) pours prior to installation. Mark or brand treated lumber. Seal cut ends of

joists, planks, beams and stringers. Where fire retardant protection is required, treat lumber and plywood with Barnard Chemical Company, Inc., "Bar-Flame 606G", J.H. Baxter "Exterior", Jasper Wood Treatment, Hoover Universal or equal.

3.00 EXECUTION

3.01 INSTALLATION

A. Install furring and stripping as required and indicated. Shim accurately to line, level and surface. Provide framing anchors or special nailing as indicated on drawings to support equipment backboards.

B. Fasten plywood with face grain perpendicular to supports, with maximum 1/8" at edge joints for expansion and contraction.

3.02 CLEANING

Upon completion of work thoroughly broom clean all surfaces.

END OF SECTION

SECTION 06 16 43 – EXTERIOR SHEATHING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to the work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Exterior gypsum sheathing shall be attached to steel framing members in exterior walls, ceiling and soffit, as shown on the drawings.

1.02 RELATED WORK IN OTHER SECTION

A.	Section 05 30 00:	Metal Decking
B.	Section 05 50 00:	Miscellaneous Metal
C.	Section 07 50 00:	Single Ply Membrane Roofing
D.	Section 09 22 16:	Metal Framing and Furring
E.	Division 26:	Electrical

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

ASTM C79	Standard Specification for Gypsum Sheathing Board
ASTM C442	Standard Specification for Gypsum Backing Board and Coreboard
ASTM C473	Standard Test Methods for Physical Testing of Gypsum Board Products
ASTM C475	Specification for Joint Compound/Tape for Finishing Gypsum Board
ASTM C630	Specification for Water-Resistant Gypsum Backing Board
ASTM C931	Specification for Exterior Gypsum Soffit Board
ASTM C1002	Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
ASTM E84	Test Methods for Surface Burning Characteristics of Building Materials
ASTM E96	Test Methods for Water Vapor Transmission of Materials
ASTM E119	Test Methods for Fire Tests of Building Construction and Materials

B. Gypsum Association - GA 253 and 505.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Materials lists and manufacturer's product data for all items or products used. Indicate material composition, thickness, sizes and fire resistance.

C. Manufacturer's written certification that products meet the specified requirements and required code requirements.

D. Warranty: Provide the requested warranty(s) without exclusions for review and approval as a condition of acceptance of materials. Coverage shall in no way limit exposure to installation, repair and replacement of rejected work demonstrating failure.

1.05 QUALITY ASSURANCE

A. Application shall comply with California Building Code, Sections 709 and Chapter 25.

B. Perform gypsum sheathing system in accordance with the manufacturer's recommendations and in conformance with the fire-rating requirements indicated on the Drawings or as required by code.

C. Gypsum sheathing proposed must be in compliance with ASTM E84, E96, and E119 for surface burning and water transmission of materials and building construction, and therefore have a maximum flame spread classification of 25.

1.06 ROOF SHEATHING LIMITATIONS

A. Sheathing shall be designed for attachment to a properly designed roof substrate system. The actual use of sheathing as a roofing component is the responsibility of the roofing system's designing authority.

B. Weather conditions, dew, application temperatures and techniques may cause adverse effects with adhered roofing systems. Always consult roofing system manufacturers for their specific instructions on applying products to the selected sheathing panel.

C. Accumulation of water due to leaks or condensation in or on the roof deck **must** be avoided during construction and after construction. Avoid overuse of non-vented, direct fired heaters during winter months. Avoid application of sheathing during rains, heavy fogs and other conditions that may deposit moisture on the surface.

D. Consult with the roofing membrane manufacturer for use of a separator sheet between the sheathing panel and the roofing membrane.

E. When applying solvent-based adhesives or primers, allow sufficient time for the solvent to flash off to avoid damage to roofing components.

F. Maximum flute span is 2-5/8" for 1/4" thick panels; 5" for 1/2" thick panels; and 8" for 5/8" thick panels.

G. Do not subject to abnormal or excessive loads or foot traffic such as on plaza decks or under steel wheeled equipment that may fracture or damage the panels. Provide suitable roofing system protection when required.

H. Use of 1/4" panels are not recommended for vertical framed parapet applications. Use 1/2" panels for 16"oc framing and 5/8" panels for 24"oc framing with fasteners spaced 8"oc maximum.

I. Hot mopping directly to 'DensDeck' roof sheathing Board:
   1. Hot asphalt mopping to 'DensDeck' is acceptable method of bonding membranes.
   2. Follow industry recommended EVT temperature guidelines and good roofing practices for full mopping applications.
   3. Ribbon or spot mopping or installation of a perforated base sheet are acceptable methods of bonding asphalt in lieu of full mopping.

J. Torch applied directly to 'DensDeck':
   1. 'DensDeck' Prime is the preferred substrate for torch application.
   2. Ensure proper torching technique. Limit the heat to the 'DensDeck Prime'. Maintain a majority of the torch flame directly on the roll.

3. When using 'DensDeck[in lieu of 'DensDeck Prime', prime the surface of the 'DensDeck' and allow to dry thoroughly.*

* Independent testing has shown that field priming of standard 'DensDeck' results in higher peel strength than unprimed 'DensDeck'.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver sheathing to the site in the manufacturer's original unopened containers or bundles bearing the manufacturer's name and brand designation. Fire resistant type shall bear the Underwriter's Laboratories, Inc., (UL) label or label of another organization acceptable to ICBO.

B. Store gypsum sheathing board so that it is protected from damp/wet surfaces, weather, direct sunlight, surface contamination, and corrosion or construction traffic. Stack flat and level, off the floor. Do not stack long lengths over shorter lengths.

C. Handle sheathing board to prevent damaged edges, ends, backs or faces. Replace damaged or defective materials.

1.08 WARRANTY

A. Provide sheathing manufacturers standard warranty covering sheathing materials for five (5) years commencing on date of purchase.

B. Provide a one (1) year material and labor warranty covering the performance of the installed sheathing substrate attachment / fastenings from "popping" which contributes to cracking in finished surfaces.

2.00 PRODUCTS

2.01 MATERIALS

A. Exterior gypsum sheathing: Conform to C79, C931 and C1177, noncombustible gypsum core treated with a water-resistant additive, (encased in a specially formulated water-repellant, alkali-resistant, inorganic glass mat surface coating, where indicated) (and a water-repellent paper bonded to the core, where indicated) on both sides and long edges, of standard v-shaped tongue and groove long edges (2' x 8') or square edges (4' x 8') sheet size. Product as manufactured by Georgia-Pacific "DensGlass Gold" or equal, matching performance results, fire rating and warranty requirements. USG Sheathing, Domtar or Gold Bond Sheathing, may be used upon Architects concurrence. If product is to remain exposed on the outside of the building for more than 6 weeks or subjected to inclement weather, provide a gypsum sheathing that is encased in a specially formulated water-repellant, alkali-resistant, inorganic glass mat surface coating. Product to be Georgia-Pacific "DensGlass Gold" or equal, matching performance results, fire rating and warranty requirements.

B. Provide a 5/8" thick type 'x' gypsum core panel with additives (where shown on drawings) to enhance the fire resistance of the core. Georgia-Pacific "DensGlass Gold Fireguard", USG Sheetrock or Gold Bond Sheathing Fire-Shield, may be used upon Architect's concurrence. Materials are to be non-combustible when tested in accordance with ASTM E136, Flame spread 0, smoke development 0 when tested in accordance with E84.

C. Gypsum Roof Deck Sheathing: Provide 4'-0" x 8'-0" square edge, glass mat-faced, noncombustible, nonstructural, water-resistant, treated gypsum core panel sheathing in conformance with ASTM C1177 and UL 790 Class A listed with a flame spread of 0 and

smoke development 0, when tested in accordance with ASTM E 84. Noncombustible when tested in accordance with ASTM E 136. Georgia Pacific 5/8" "Dens Deck Roof Guard" or 5/8"" DensDeck" or 5/8" "DensDeck Fireguard Roof Board 'X'", UL-classified Type DD when tested in accordance with ASTM E 119 where required or equal. Georgia Pacific ¼" "DensDeck Prime Cover Board" or equal.

C. Water/Vapor Barrier Building Paper: Waterproofed paper backing meeting Fed Spec. LIL-B-790 A(1), Grade D Black. Building paper shall be installed over the exterior gypsum sheathing boards in 2 layers in conformance with CBC requirements prior to non-paper-backed lath or EIFS system components. Paper shall have a flame spread rating of 25 or less when tested according to ASTM E84 and shall bear UL Label. Coordinate the work of Sections 07 24 00, 09 22 00, and 09 22 36.23.

D. Joint Tape: Tape specifically designed and manufactured to seal joints against water and air infiltration, formulated with an adhesive that permanently bonds to sheathing substrates, and as indicated below:
   1. Polypropylene sheathing tape, 0.0027 inch thick, 2-22" wide, composed of oriented polypropylene 10 by 10 glass mesh coated with permanent acrylic adhesive formulated to adhere to gypsum sheathing surface, No. 8086 Contractor Sheathing Tape by 3M Building Products, or equal.
   2. Polyethylene tape, 0.025 inch thick, 3 inches wide, composed of polyethylene backing coated with synthetic-rubber based adhesive. Polyken 612 Seam Seal Tape by Polyken Technologies, or equal.

E. Joint Compound: Georgia Pacific Corporation Speed Set, or equal setting type joint compound.

F. Fasteners - Screws, Metal Framing : Self-tapping, corrosion resistant, Type S-12 bugle head, fine thread, or (Type S sharp point for light gage framing and furring), minimum 1" long, complying with ASTM C1002 attaching sheathing to steel framing less than 0.03 inch thick, or ASTM C954 for framing 22 to 12 gage, (0.033 to 0.112 inch thick).

3.00 EXECUTION

3.01 INSPECTION

A. Examine subframing to verify that corners and framing are plumb, true, solid and that framing members are properly spaced. Plane of faces of adjacent members shall not vary more than 1/4".

3.02 APPLICATION OF BACKING/VAPOR BARRIER

Provide for a building paper over all sheathing prior to installation of lath. Apply specified waterproof membrane at all exterior vertical surfaces with the long dimension running horizontally. Lap joints at least 4" and lap upper courses over lower courses. Lap ends at supports. Secure at intervals not exceeding 12" o.c. 3" in from each edge, vertically along each framing member. Flash windows to provide a waterproof seal between window flashing paper and building paper.

3.03 INSTALLATION OF GYPSUM SHEATHING

A. Provide sheathing where indicated on Drawings. Install in accordance with GA 253.
   1. Use maximum lengths possible to minimize number of joints. Locate edge joints parallel to and with vertical orientations on framing. Stagger intermediate end joints of adjacent lengths. Block sheathing less than full height of wall at joint. Stop sheathing at horizontal or vertical control joints.

2. Cut boards at penetrations, edges and other obstructions of the work. Fit tightly against abutting construction, except provide a 3/8" sealant joint where non-load bearing construction abuts structural elements.
3. Coordinate sheathing installation with flashing and joint sealant installation so that these combined materials are installed in the sequence and manner that prevents exterior moisture from passing through completed exterior wall assembly.
4. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.
5. Sheathing may be initially tacked in place with screws if overlying metal lath is screw attached through sheathing to studs.
6. Attach sheathing to metal framing with #6 1-1/4” long bugle head corrosion-resistance screws spaced 8" o.c. at perimeter and 8" o.c. in field. Drive fasteners to bear tight against and flush with surface of sheathing without cutting into face; do not countersink. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.
7. Support, construct and finish work straight, plumb and level, clean with no unfinished parts, damaged edges or corners. All edges and ends of wallboard shall have solid bearing

B. Horizontal Installation: Install 2 foot wide gypsum sheathing boards horizontally with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of stud flanges and stagger end joints of adjacent boards not less than one stud spacing, two where possible. Screw-attach boards along perimeter edges and at ends to each steel stud as described above.

C. Vertical Installation: Install 4 foot wide gypsum sheathing boards vertically with vertical edges centered over flanges of steel studs. Abut ends and edges of each board with those of adjoining boards. Screw attach boards along perimeter edges and at ends to each steel stud as described above.

D. Fastening - Metal Framing: Attach sheathing with #6 1-1/4” long bugle head corrosion-resistance screws spaced 8" o.c. at perimeter where there are framing supports and 8" o.c. along intermediate framing in the field.

E. Sheathing Tape Application: Apply joint tape over joints and embed in setting type joint compound specified. Overlapping tape not less than the tape width at joint intersections. For polyethylene tape, apply primer specified by the tape manufacturer.

F. Joint Compound: Where required, provide in accordance with manufacturer's instructions and requirements of local governing authorities and in conformance with Drawing details. Skim coat surface for smooth finish.

3.04 CLEAN-UP

Upon completion of the work, remove tools, equipment, unused material and cuttings leaving the work in a clean orderly manner.

END OF SECTION

SECTION 07 13 26 – SELF ADHERING SHEET WATERPROOFING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplemental General Conditions and Division 1 apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Waterproofing system on retaining wall / spandrel surfaces.
   2. Waterproofing system for vertical ramp walls of the parking structure.
   3. Waterproofing system for elevator pit walls.
   4. Construction joints, waterstops, accessories and related materials.
   5. Protection of waterproofing membrane system.
   6. Coordination of gravel backfill.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 04 22 00: Concrete Masonry Unit
C. Section 07 60 00: Sheet Metal Work
D. Section 07 92 00: Sealants and Caulking
E. Section 31 20 00: Earthwork

1.03 SYSTEM DESCRIPTION

Product provided by this Section is a self-adhesive membrane of not less than 60 mils thickness, consisting of 56 mils of rubberized asphalt membrane laminated to a 4 mil cross-laminated polyethylene film.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit manufacturers product data and installation instructions for specific application.

C. Samples - Submit representative samples of the following for approval:
   1. Waterproof membrane materials and associated system accessories.
   2. Vapor barrier / cleavage membrane
   3. Membrane flashing

D. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

1.05 QUALITY ASSURANCE

A. Waterproofing contractor/applicator shall be trained and approved by the selected waterproof membrane manufacturer. Installer shall have a minimum of 5 years proven experience in application / procedures of the work of this section. Proof of experience shall be submitted at the request of the Architect.

B. Pre-installation Conference: Prior to commencement of the work the Contractor shall convene a meeting at the job site to review and discuss waterproofing work of this Section and all related work. The meeting shall be attended by the Architect, Owners Representative, Installer, Concrete Contractor and/or Masonry Contractor and a representative who is a full-time employee of the waterproofing manufacturer, and contractors of related work and inspection personnel, prior to executing associated work. Review and coordinate related requirements and procedures to be followed in performing the work of this Section. Discuss the sequencing, layout and installation procedures to determine and anticipate conditions prior to start of work. Notify all responsible parties a minimum of 48 hours before conducting meeting.

C. The manufacturers representative and the approved applicator shall inspect the installed membrane prior to protection course installation/operations. Any defects shall be corrected to the approval of the manufacturer, for warranty compliance. Additional materials and labor required for the repair of the waterproofing membrane shall be backcharged to the Contractor. Failure by the manufacturer and/or Contractor to inspect membrane installation shall not relieve the manufacturer from the conditions of the warranty.

1.06 REQUIREMENTS

A. All work in this Section shall only be done in dry weather. All surfaces shall be dry and cured, to the manufacturer's specifications before application of membrane waterproofing.

B. Subsurfaces and other construction adjoining or affecting the work of this Section shall be examined before any work is started, and the Architect shall be notified in writing of any defects which would be detrimental to the work. The application of materials shall be considered as acceptance of the surfaces by the Contractor.

C. Pre-installation Conference: Prior to commencement of the work the Contractor shall convene a meeting at the job site to review and discuss waterproofing work of this Section and all related work. The meeting shall be attended by the Architect, Owner Representative, Installer, Concrete Contractor and/or Masonry Contractor and a representative who is a full-time employee of the waterproofing manufacturer, and contractors of related work and inspection personnel, prior to executing associated work. Review and coordinate related requirements and procedures to be followed in performing the work of this Section. Discuss the sequencing, layout and installation procedures to determine and anticipate conditions prior to start of work. Notify all responsible parties a minimum of 48 hours before conducting meeting.

D. Strictly adhere to manufacturer's specifications for requirements and installation detailing. Installer is to correct or replace all system deficiencies prior to installation of the protection board or protection panel.

E. All materials shall comply with State of California and Air Pollution Control District (APCD) requirements for volatile organic compounds.

F. Drainage fittings, connections, metal aprons, metal edgings, flashings and counterflashings, collars and sleeves for pipes passing through the membrane shall be properly set.

1.07 JOB CONDITIONS

A. Protect all adjacent areas not to be waterproofed. Where necessary, apply masking to prevent staining of surfaces to remain exposed wherever membrane abuts to other finish surfaces. Coordinate with drawing details for elevations of proposed finish grade against the structure or at retaining walls.

B. Perform work only when existing and forecasted weather conditions are within manufacturers recommendations for the material and product used.

C. Ambient temperature shall be within manufacturers specifications (Greater than +40 deg F/ +7 deg C).

D. All plumbing, electrical and structural items to be under or passing through the waterproof membrane shall be positively secured in their proper positions and appropriately protected prior to membrane application.

E. Coordinate the installation of subdrainage piping, landscape piping, etc., through the waterproofed wall with membrane manufacturers special detailing prior to membrane installation. Do not allow construction activities by Contractors of subsequent trades until the membrane and protection course is installed and approved.

F. All surfaces that waterproofing membrane and accessories are to be adhered, shall be smooth with no sharp projections, rock pockets or voids.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with following information.
1. Name of material.
2. Manufacturer's stock number and date of manufacture.
3. Material data sheet

B. Store materials in protected and well ventilated area. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with local applicable regulations

1.09 WARRANTY

A. Manufacturer shall warrant its products to be free of defects. Additionally the approved applicator shall guarantee the wall surfaces that received application of the waterproofing membrane and vapor barrier from leakage due to faulty materials or installation for a minimum period of ten (10) years following acceptance of the structure by the Owner. Contractor, manufacturer and applicator shall be jointly responsible for any / all repair procedures required in the event of failure to remain watertight. Coordinate with the Owner for availability of optional longer length warranties.

B. Manufacturer shall not be released of any liability stemming from faulty materials or application by enforcement of standard warranty verbiage whether expressed or implied. Contractor shall be responsible for all repairs of any consequential or incidental damages and defects resulting from any subsequent work prior to the covering of the membrane.

2.00 PRODUCTS

2.01 MANUFACTURE

A. The waterproofing system / components listed herein are from the standard line of products as manufactured by Carlisle Coatings and Waterproofing, Inc. which is considered the standard of quality for application. Alternate manufacturers and systems must be reviewed and considered equal by the Architect, prior to acceptance.
   1. Carlisle Coatings and Waterproofing, CCW MiraDRI 860/861 sheet membrane waterproofing.

2.02 MATERIALS

A. MiraDRI 860/861: Membrane waterproofing shall be a high density sheet of polyethylene film backing coated/adhered on one side with a factory applied laminated rubberized asphalt (butyl rubber) to a controlled thickness of 1.5mm (60mil), after which a removable protective release paper is attached to the adhesive surface membrane, for a self adhering, cold-applied membrane.

B. Selected membrane must have the following tested properties:

PROPERTY	VALVE	TEST METHOD
Pliability (180E bend over1" mandrel at 45EF)	unaffected	ASTM D146
Tensile Strength Membrane (psi)	1720 minimum(Die C)	ASTM D412
Tensile Strength Film (psi)	34,500 minimum(Die C)	ASTM D412
Elongation Rubberized Asphalt	300 minimum	ASTM D412
Puncture Resistance	178 minimum	ASTM E154 and ASTM E781

C. Primer: As supplied and recommended by the membrane manufacturer, CCW-702 WB or CCW-AWP or as approved equal. Primer is to impart initial "tack" when joined with the adhesive backing of the membrane waterproofing and to assist in the overall bonding. The VOC content of the surface conditioner shall not exceed 350 g/l (grams per liter). Primers containing 1-1-1, triclorethane (methylchoroform) are forbidden.

D. Sealants, Mastics and Liquid Membranes: Products as compatible with membrane material and as recommended by the manufacturer, CCW Green Bond, CCW-703, CCW-201 or as approved equal. Materials to be cold applied polymeric / latex compounds of heavy trowel consistency, to be used as a fill material at change plane, concrete imperfections greater than 1/4 inch in depth or at membrane terminations.

E. Protection Board Adhesive: Compatible with waterproofing membrane systems polyethylene backing and selected protection board, CCW-Protection Board-V, CCW-200V, or as approved equal.

F. Drainage Board: Provide as detailed on the Drawings, for all vertical below grade foundation walls, CCW MiraDRAIN 6000, or as approved equal by the Architect.

G. Perimeter Drainage System: Where required shall be CCW MiraDRAIN HC, or as approved equal.

H. Backer Rod: Shall be closed-cell polyethylene foam rod.

2.03 SYSTEM ACCESSORY COMPONENTS

A. All necessary materials other than those described in this section must be supplied by the applicator.

B. Membrane Termination: If the membrane system is terminated on a vertical surface and exposed to the weather, counterflashing must be used. Refer to Section 07 60 00. Membranes that do not daylight can be terminated with a troweled bead of mastic as approved by the manufacturer.

3.00 EXECUTION

3.01 SURFACE PREPARATION

A. Surfaces shall be free of voids, loose aggregate, sprawled areas, and sharp protrusions, and dry before application of membrane waterproofing system components. Work is not to be executed until concrete has properly cured to the manufacturers written/approved recommendations and instructions. Concrete must be cured a minimum of 7 days. Form release agents which transfer to the concrete surface must be removed. Repair defects before applying primer. Remove sharp protrusions. Masonry joints must be struck off flush. Remove grease, oil or other contaminants. Clean surface with a broom, vacuum cleaner, or compressed air to remove dust, loose stones, and debris.
   1. If course aggregate is visible after form removal, use a purge coat to achieve a smooth surface. Remove any sharp protrusions and form seam lines which may cause damage to the membrane.
   2. Outside and inside corners must be free of sharp edges. Inside corners must have a cant formed with latex modified cement mortar. All inside and outside corners are to receive a double thickness of membrane.
   3. Projections/protrusions: Apply a double layer of waterproofing membrane around pipes or projections extending a minimum of six (6) inches in all directions or apply liquid membrane 90 mils (3/32") thick around the protrusion and overlap the membrane a minimum of 2" and apply vertically on the protrusion to a height of 6".

3.02 INSTALLATION

A. Coordinate installation of waterproofing materials and associated work to provide complete system complying with manufacturer's recommendations. Schedule installation to minimize period of exposure to membranes.

B. Apply a troweling of mastic to all daily terminations at all exposed membrane edges. Do not apply waterproofing membrane directly over fresh mastic.

3.03 PRIMER

Apply primer with a lambs-wool roller at a coverage of 250-350 sq. ft. per gal. Allow primer to dry 1 hour or until tack free. Prime only the area which will be covered with membrane the same working day. Areas not covered with membrane in 24 hours must be re-primed. Dry primed surfaces should be covered immediately where contaminants from the air are accumulating on the surface. Metal or other dense surfaces do not require priming but must be clean, dry, and free of loose paint, rust or other contaminants.

3.04 TEMPERATURE

Apply waterproofing membrane only in fair weather when air and surface temperatures are within range specified for particular product.

3.05 MEMBRANE AND JOINTS

A. Apply sheet membranes from the low point to the high point so that laps shed water. All end laps shall be staggered. Apply membrane in double thickness over properly sealed expansion, construction and control joints. Wall cracks over 1/16" in width shall be prestripped with 8" wide membrane. Apply membrane to vertical wall in lengths no greater than 8 feet.

3.06 SEALING SEAMS

All edge and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and roll the entire membrane firmly and completely as soon as possible to minimize bubbles caused by out-gassing of air or water vapor from the concrete. For vertical applications, use heavy hand pressure. Misaligned or inadequately lapped seams must be patched with sheet membrane. All fish-mouths must be slit and the flaps overlapped, repaired with a patch, pressed or rolled to make the seal, and the edges sealed with mastic. All "T-Joints" on horizontal surfaces must be sealed with mastic.

3.07 SEALING EDGES

A. Where membrane is terminated on the vertical surface, terminate by pressing very firmly to the wall.

B. All terminations must be sealed with a troweled bead of elastomeric mastic. Edges should be pressed with a metal or hardwood tool such as a hammer handle. Nailing, where required, shall be with large head nails at 12" intervals, covered with an 8" wide strip of sheet membrane. All terminations must be finished with a troweled bead of mastic.

3.08 CORNER DETAILS

A. Double-cover all inside and outside corners with an initial strip a minimum of 11" wide centered on the axis of the corner. This strip must be completely covered by the regular application of sheet membrane. Outside corners must be free of sharp edges. Inspect surfaces adjacent to all corners and repair if necessary to provide a smooth dense surface. Inside corners should receive a fillet formed with epoxy mortar (such as Daraweld-C mixed with cement mortar) and a double coverage of membrane. Do not use fiber or wood cants.

B. An alternative method (at 75 head ft. of water or less) is to form fillets with liquid membrane. Apply a 90 mil layer of mastic 6" in each direction from the corner with a minimum 1/2" fillet.

3.09 FOUNDATION FOOTINGS

Cover minimum 6" up and 6" out, or minimum 6" past the cold joint, with liquid membrane on footings and any other areas of possible standing water. At inside corners, form a fillet with liquid membrane and cover with regular application of sheet membrane.

3.10 PROTECTION TO MEMBRANE

A. Protect membrane to avoid damage from other trades, construction materials, etc. Install the same day the membrane is installed.

B. Vertical Surfaces:
1. The protection system shall consist of protection board (drainage composite

panel) adhered with protection board adhesive, tape or non-penetrating clips or fasteners. Apply at a rate of 250-350 sq. ft. per gallon minimum. Install (drainage panel) in protection board in adhesive offsetting all joints (and interlocking dimpled overlaps).

2. The protection system must be applied to vertical / horizontal surfaces on the same day the membrane is applied to prevent damage or injury to waterproofing membrane. No waiting before backfilling is necessary.

END OF SECTION

SECTION 07 14 16 – COLD FLUID APPLIED WATERPROOFING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplemental General Conditions and Division 1 apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Waterproofing system on steel pan concrete filled stairs

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
A. Section 05 50 00: Miscellaneous Metal

1.03 REFERENCES

ASTM C 836 100% Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for use with Separate Wearing Course

1.04 SYSTEM DESCRIPTION

Product provided by this Section is a coal-tar and solvent-free, single component, elastomeric liquid designed to create a seamless reinforced waterproofing membrane at 120 mil thickness.

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit manufacturers product data and installation instructions for specific application.

C. Samples - Submit representative samples of the following for approval:
   1. Waterproof membrane materials and associated system accessories.

D. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

1.06 QUALITY ASSURANCE

A. Waterproofing contractor/applicator shall be trained and approved by the selected waterproof membrane manufacturer. Installer shall have a minimum of 5 years proven experience in application / procedures of the work of this section. Proof of experience shall be submitted at the request of the Architect.

B. Pre-installation Conference: Prior to commencement of the work the Contractor shall convene a meeting at the job site to review and discuss waterproofing work of this Section and all related work. The meeting shall be attended by the Architect, Owners

Representative, Installer, Concrete Contractor and/or Masonry Contractor and a representative who is a full-time employee of the waterproofing manufacturer, and contractors of related work and inspection personnel, prior to executing associated work. Review and coordinate related requirements and procedures to be followed in performing the work of this Section. Discuss the sequencing, layout and installation procedures to determine and anticipate conditions prior to start of work. Notify all responsible parties a minimum of 48 hours before conducting meeting.

C. The manufacturers representative and the approved applicator shall inspect the installed membrane prior to protection course installation/operations. Any defects shall be corrected to the approval of the manufacturer, for warranty compliance. Additional materials and labor required for the repair of the waterproofing membrane shall be backcharged to the Contractor. Failure by the manufacturer and/or Contractor to inspect membrane installation shall not relieve the manufacturer from the conditions of the warranty.

1.07 JOB CONDITIONS

A. Protect all adjacent areas not to be waterproofed. Where necessary, apply masking to prevent staining of surfaces to remain exposed wherever membrane abuts to other finish surfaces. Coordinate with drawing details for elevations of proposed finish grade against the structure or at retaining walls.

B. Perform work only when existing and forecasted weather conditions are within manufacturers recommendations for the material and product used.

C. Ambient temperature shall be within manufacturers specifications (Greater than +40 deg F/ +7 deg C).

D. All plumbing, electrical and structural items to be under or passing through the waterproof membrane shall be positively secured in their proper positions and appropriately protected prior to membrane application.

E. Coordinate the installation of subdrainage piping, landscape piping, etc., through the waterproofed wall with membrane manufacturers special detailing prior to membrane installation. Do not allow construction activities by Contractors of subsequent trades until the membrane and protection course is installed and approved.

1.08 DELIVERY, STORAGE AND HANDLING

Deliver materials to site in original unbroken packages bearing manufacturers label showing brand, weight, volume and batch number. Store materials at site in strict compliance with manufacturers instructions.

1.09 WARRANTY

A. Manufacturer shall warrant its products to be free of defects. Additionally the approved applicator shall guarantee the wall surfaces that received application of the waterproofing membrane and vapor barrier from leakage due to faulty materials or installation for a minimum period of five (10) years following acceptance of the structure by the Owner. Contractor, manufacturer and applicator shall be jointly responsible for any / all repair procedures required in the event of failure to remain watertight. Coordinate with the Owner for availability of optional longer length warranties.

B. Manufacturer shall not be released of any liability stemming from faulty materials or application by enforcement of standard warranty verbiage whether expressed or implied. Contractor shall be responsible for all repairs of any consequential or incidental damages and defects resulting from any subsequent work prior to the covering of the membrane.

2.00 PRODUCTS

2.01 MANUFACTURE

A. The waterproofing system / components listed herein are from the standard line of products as manufactured by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 78098, Phone: (800) 527-7092 Fax: (972) 442-0076, or as approved equal.
   1. CCW-MIRASEAL Reinforced Liquid Applied Waterproofing Membrane at 120 mil thickness.
   2. Pacific Polymers Elasto-Deck BT manufactured by ITW Polymers Sealants North America (714) 898-0025. (Note: Install Elasto-Deck BT per manufacturer's specifications.)

2.02 MATERIALS

A. Waterproofing membrane shall be CCW-MIRASEAL for horizontal surfaces applied at 60 mils for each coat, reinforced by CCW-500 reinforcing fabric between coats and -MIRASEAL for vertical surfaces applied at 60 mils for each coat, reinforced by CCW-500 reinforcing fabric between coats and shall meet or exceed the requirements of ASTM C 836.

B. Steel pan concrete filled stairs: Provide 2 - ¼" ϕ minimum weep holes at each ends of tread and 4 – ¼" ϕ minimum at landings.

3.00 EXECUTION

3.01 EXAMINATION

A. All surfaces to be waterproofed shall be inspected and approved by the applicator at least one day prior to commencing work. Report any defects of work by other trades and unsatisfactory site conditions. Commencement of work shall be deemed approval and acceptance of substrata for waterproofing work.

3.02 SURFACE PREPARATION

A. Provide 24 inches minimum clearance out from surfaces to receive the waterproofing membrane. The application surface shall be prepared and provided to the applicator in accordance with manufacturers specifications listed below. Repair any defects with the manufacturers recommended trowel grade mastic materials.

3.03 FIELD QUALITY CONTROL

A. Field quality control is an essential part of this application. Contractor shall check its own work for coverage, thickness, and workmanship before calling for inspections by the manufacturer's representative and/or Owners independent inspection service as a condition of warranty.

B. When thickness or integrity is in question the system membrane should be tested in the proper manner as described below. Inspectors should always use visual and tactile measurement to guide them. Areas suspected of being too thin to the touch should be measured with the gauges to determine the exact thickness.

END OF SECTION

SECTION 07 18 00 – ELASTOMERIC DECK COATINGS

1.00 GENERAL

1.01 SCOPE

A. Requirements of General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Concrete deck surfaces over all equipment/storage rooms below
   2. Concrete pour strips at roof
   3. Stair flights of concrete filled steel pan stairs between Second and Third Levels

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 07 14 16: Cold Fluid Applied Waterproofing
C. Section 07 92 00: Sealants and Caulking

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide low odor, non-flammable, elastomeric urethane, seamless, traffic coatings that are watertight, UV resistant, and that will not deteriorate upon exposure to sun, weather, normal traffic, spillage of motor oil, transmission fluids, other motor vehicle operating compounds, and manufacturer recommended cleaning procedures.
   1. Deterioration of traffic coatings includes but is not limited to:
      a. Adhesive or cohesive failures
      b. Abrasion or tearing failure resulting from normal traffic.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt or deicer chemicals, etc. into deck substrate.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

ASTM C957	Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Membrane
ASTM D412	Rubber Properties in Tension
ASTM D2240	Property-Durometer Hardness
ASTM D4060	Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM E96	Water Vapor Transmission in Materials
ASTM E108	Fire Tests of Roof Coverings

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Samples: Submit samples 4" x 6" of coating systems used on 3" plywood base or suitable backing in specified mil. thickness, quality of work, texture and color, for approval. Colors as selected by Architect.

C. Product Data: Manufacturer's printed literature and instructions for evaluating, preparing, and treating the substrate, technical data and tested physical and performance properties of traffic coatings for materials proposed for use. Include Material Safety Data Sheets (MSDS) and those of other safety requirements, and manufacturers ISO 9002 certification.
   1. Manufacturer's literature shall indicate all results of specific ASTM testing procedures consistent with requirements of projects long term service conditions and with cold applied traffic bearing membranes with integral wear course to include:
      a. Weather resistance, including ultraviolet degradation.
      b. Hydrolitic stability
      c. Chemical resistance
      d. Recovery from elongation.
      e. Weight loss
      f. Adhesion in peel after water immersion
      g. Abrasion resistance
      h. Low temperature flexibility
      i. Slip Resistance: 1.0 Minimum Coefficient of Friction

D. Certificate of Compliance:
   1. Certification that products comply with local regulations controlling use of volatile organic compounds (VOC).
   2. Certificate of License, issued to applicator by manufacturer with evidence of a minimum of five (5) years experience in application of proposed products and system.
   3. Provide a field report prepared by the manufacturers representative or licensed applicator, stating that applied materials and procedures conform to project specifications and manufacturers requirements for application and required mil thickness of each area installed.

E. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

F. Bills of Lading: Within 3 days following notice of product and system approval, submit written computations of material quantities (by components) to be used to assemble full coating system to include primers, base coats, intermediate coats, top coats, finish coats and aggregate. Upon starting application follow with the original manufacturers bill of lading to verify quantities of materials purchased.

1.06 QUALITY ASSURANCE

A. Applicator: Installer shall be certified in writing by the manufacturer of the elastomeric coating used, that the applicator is experienced (minimum five years), in applying traffic coatings of comparable scope of this Project. Apply material by factory trained workers in strict accordance with manufacturer's instructions, using equipment and procedures recommended by the manufacturer.

B. Single Source Responsibility: Obtain primary traffic coating materials, including primers and aggregates from a single manufacturer regularly engaged in manufacturing traffic coatings. Provide secondary materials including sheet flashings, joint sealants and

substrate repair materials of type and from source recommended by traffic coating manufacture.

C. Field Samples: Apply traffic coating field sample to 200 sq. ft. of deck to demonstrate surface preparation, joint and crack treatment, thickness, texture, color and standard of workmanship.
   1. If Architect determines that field sample does not meet requirements, reapply traffic coating until the field sample is acceptable.
   2. Keep the accepted sample undisturbed during construction as a standard for judging completed traffic coatings. An undamaged field sample may be incorporated into the work.

D. Comply with the following procedures when requested by the Architect. Testing shall be done on the base membrane as applied by a recognized testing laboratory and certified reports shall be submitted.
   1. Fire Test: Minimum Class "B", and Building Code approved, tested in accordance with ASTM E108. Conform to Underwriter's Laboratories, Inc. or Warnock Hersey, Class "B" listing.
   2. Percent Elongation: Elongation tested in accordance with ASTM D412 to be at least 400 percent.
   3. Tensile Strength: Tensile strength tested in accordance with ASTM D412 to be at least 1200 psi.
   4. Abrasion Test: Tested in a Tabor Standard Tester for 1000 cycles under a 1000 gram load using CS17 Wheels. A 70 mil. specimen to lose no more than .004 inches in depth in wear. Perform test on a smooth sample without aggregate.

E. Upon completion, and as a condition precedent to final acceptance, the manufacturer shall issue a certificate to the Owner stating that the work of this Section has been performed in compliance with all Contract requirements.

1.07 REQUIREMENTS

A. Notify manufacturer of the material to be used before commencing work, allowing at least 72 hours to arrange for inspection service by manufacturer's representative. All unsatisfactory conditions disclosed by this inspection shall be repaired and reinspected before work is started. Manufacturer's representative shall provide such inspection at the job site which may be necessary to insure that proper procedures are being followed. All requirements of the manufacturer's representative relative to proper preparatory work and installation are mandatory requirements.

B. Mil thickness specified in this Section are "dry" film. Selected manufacturer must provide the mil thickness as specified regardless of the manufacturers approved system mil thickness.

1.08 COORDINATION

A. Consult and cooperate with other trades whose work affects or is affected by work of this section in order that all phases of the work are properly coordinated to avoid delays, omissions or damage to any part of the work.

B. Notify applicator and the manufacturer's representative in sufficient time to attend preconstruction conference to describe to the workers the type of concrete finish which will be acceptable for the areas which are to receive the coating.

C. Verify that only liquid curing agents approved by the membrane manufacturer are used to cure concrete in coating areas. Coordinate that the manufacturer does not request or require only water or moisture curing operations. Refer to Section 03 30 00, Concrete and Concrete Finishes.

1.09 ENVIRONMENTAL AND SAFETY REQUIREMENTS

A. Environmental Conditions: Apply traffic coatings within the ambient and substrate temperatures recommended by the manufacturer. Do not apply coatings to a damp or wet substrate, when relative humidity exceeds 85 percent or when temperatures are less than 5 deg F (3 deg C) above dew point. There shall be no precipitation during application of adhesive/primer or subsequent coatings.

B. Substrate Temperature: Do not apply coatings in rain, fog or mist or when such weather conditions are imminent. Substrate shall be not lower than 45 deg. F nor greater than 95 deg. F. during application or curing of adhesive/primer or subsequent coatings.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in the original manufacturer's sealed, undamaged packages and containers with seals unbroken and bearing manufacturers labels containing brand name, type of material, date of manufacture, lot or batch number, color, directions for storage and mixing with other components.

B. Store all materials out of direct exposure to the sun and so as to preclude damage from all other sources. Store materials in areas maintained at a temperature range between 50 and 90 deg. F.

1.11 GUARANTEE

The material and quality of work involved in this application shall be guaranteed jointly by manufacturer and applicator, under a single document to the Owner. The guarantee shall insure wearing and waterproofing performance of the system at no cost to the Owner for a period of three (3) years after the date of building acceptance. Provisions of the guarantee shall include responsibility for bridging cracking in the substrate up to 1/8" in width.

2.00 PRODUCTS

2.01 SYSTEM COMPONENTS

A. Acceptable Manufacturers (70 mil system):
1. Pacific Polymers Elasto-Deck 6500 VT - 70 mil Parking Deck System, manufactured by ITW Polymers Sealants North America, (714) 898-0025.
2. UI System #70H, UPI Sealant Products, Inc. (714) 560-0204
3. Vulkem 350 Traffic Deck Coating System as manufactured by Mameco International, Inc.
4. Pecora Deck 800 System as manufactured by Pecora Corporation (800) 233-9754, locally represented by (818) 991-3343.
5. Koba Thane Traffic Topping System, Exposure II and III, as manufactured by General Polymers (818) 365-9261. R.R. #24452
6. Poly-I-Guard, as manufactured by Polycoat Products, (562) 802-8834.
7. Or equal

B. Primers: Manufacturer's standard factory formulated epoxy primer, as required by the selected manufacturer for use on concrete and porous surfaces to improve adhesion and to reduce pinholes, and on any metal surface in which membrane may be applied.

C. Urethane Base and Intermediate Coats: Single or multi-component, solids, self leveling, aromatic liquid urethane elastomer coating.

D. Top Coat: Single or multi-component, solids, self leveling, aliphatic liquid urethane elastomer coatings to provide wearing characteristics, chemical resistance and ultraviolet degradation.

E. Miscellaneous Materials:
1. Sealants: Single or multi-component urethane sealants complying with ASTM C920 as recommended by the manufacturer for substrate and joint conditions, used in sealing cracks and expansion joints and for use in forming cants and for compatibility with the traffic coatings. Refer to Section 07 92 00.
2. Aggregate: Cleaned and graded, 20-30 or 40-60 mesh quartzite, silica sand, silicon carbide, alumina oxide, or commercially prepared ground walnut shells, as recommended by approved coating manufacturer, for selected wearcoarse, with a minimum hardness of 6 on the Moh Scale.
3. Sheet Flashing: 50 mil minimum non-staining uncured sheet neoprene.
4. Adhesive: Manufacturer's recommended contact adhesive.
5. Reinforcing Strip: Manufacturer's recommended fiberglass mesh.

3.00 EXECUTION

3.01 SUBSTRATE CONDITION

A. Examine substrate conditions under which traffic coating systems will be applied for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Start of work in any area to which traffic or roof deck coatings are to be applied implies acceptance of the surfaces and the assumption of all obligations under the required guarantee.

C. Do not commence sealing of pour and separation joints until after building is completed and all shortening has taken place. Width of joints may vary from dimensions detailed. Refer to application paragraph for procedures.

D. Verify that work performed under other sections meets the following requirements:
1. That concrete surfaces were finished in accordance with manufacturer's requirements.
2. That concrete was cured by a water based curing agent approved by the deck coating manufacturer.
3. That concrete has completed a 28-day curing period and is completely dry as approved by the deck coating manufacturer.
4. Concrete surfaces shall be visibly dry and pass a 4-hour rubber mat test (no condensate) prior to application of coating system. Mat shall be taped to deck on all sides. Conform to ASTM D4263.
5. That concrete is clean and free of contaminants.
6. Other requirements which may be prerequisite of the manufacturer of the coating used.

3.02 PREPARATION OF SURFACES

A. Clean and prepare substrate according to manufacturers recommendations and as specified. Provide clean, dust-free substrate. Remove oil and grease spots. Thoroughly rinse and dry.

B. Remove grease, oil, paints or other penetrating contaminants from concrete. Remove concrete fins, ridges or other projections. If required, provide an abrasive blast clean concrete surfaces to a uniform profile according to ASTM D 4259 with a self-contained recirculating blast cleaning apparatus. Remove remaining loose material and power wash to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners or form release agents. Surface blast profile to expose the top surface of the fine aggregates. Clean surfaces according to ASTM D4258.

C. Surfaces treated with solvent washing or muriatic acid shall be thoroughly flushed with a high pressure water. Wire brush, grind or sandblast surfaces, when required. Finish surface shall be structurally sound, clean and dry.

D. Thoroughly sweep or vacuum all surfaces prior to coating. Remove all dust and other loose material.

E. Shrinkage cracks in concrete over 1/16" in width shall be sawcut or routed clean to minimum 1/4 inch wide by 1/2 inch deep, and filled flush with flowing type liquid elastomeric sealant material or manufacturers standard repair mortar and made level with the existing surface. Other methods for crack treatment may be used which is standard with the manufacturer of the coating in order to effect the required guarantee.

F. Mask off adjoining surfaces not receiving traffic coatings and close off drains and other penetrations to prevent spillage and migration of liquid coatings.

3.03 PREPARATION AT TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains and sleeves according to ASTM C1127 and manufacturers recommendations.

B. Prime substrates and apply preparatory base coat. Embed joint reinforcing strip in coating when recommended by traffic coating manufacturer.

C. Terminate edges of deck to deck expansion joints with preparatory base coat strip.

3.04 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout and fill joints and cracks in substrate according to ASTM C1127 and traffic coating manufacturers recommendations. Remove dust and dirt from joints and cracks complying with ASTM D4258 prior to coating surfaces.
   1. Cut open existing cracks less than 1/8 inch, clean, prime and fill with sealant in accordance with manufacturer's instructions.
   2. Prime substrates on both sides of cracks and joints greater than 1/8 inch and apply a 20 mil minimum dry film preparatory base coat strip extending a minimum of 2 inches each side of joint. Embed joint reinforcing strip in base coat when recommended by traffic coating manufacturer.
   3. Apply bond breaker tape between sealant and preparatory base coat strip when required by manufacturer.
   4. Comply with recommendations of ASTM C1193 for joint sealant installation.

3.05 COATING APPLICATION

A. Clean surfaces to be coated, prime surfaces and mix materials in accordance with manufacturer's recommendations. Apply coatings by spray, roller, notched squeegee or other applicators according to printed recommendations. Apply liquid coating (membrane coating) as indicated, with not less than minimum thickness of each coating as recommended by the manufacturer. Extend coating over entire previous coating. Verify wet film thickness of each component coat every 100 sq.ft. Cure for a minimum of 24 hours prior to allowing pedestrian traffic onto finished surface.
   1. Apply coatings in minimum 3 coats to total thickness of not less than 70 dry mils on traffic decks, 50 dry mils in roof surfaces and all other areas, all in strict accordance with manufacturer's instructions.
   2. While still fluid broadcast aggregate to excess as follows:
      a. Roof Coatings: Normal duty minimum dry film thickness of 30 mils, excluding substrate primer and aggregate. Apply aggregate at a minimum rate of 5 lb/100 sq.ft.
      b. Vehicular Traffic Coating: Normal duty minimum dry film thickness of 50 mils, excluding substrate primer and aggregate. Apply aggregate at a minimum rate of 15 lb/100 sq.ft.
   3. Where coating adjoins walls, return coating minimum 4" up on wall to form base. Omit aggregate on vertical surfaces.
   4. Application of all coatings at pour strips and deck surfaces as noted on the Drawings, are to extend an additional 12" beyond the areas indicated to be coated.

B. Apply aggregate into wet coating according to manufacturers recommendations.

3.06 FIELD QUALITY CONTROL

A. Verify applied thickness before material attains final set by use of mil-thickness gauge as work progresses. Immediately apply additional coating to produce required thickness where readings indicate thickness less than that specified.

B. In-Place Testing: Contractor shall test each near-level deck area for leaks immediately after nominal cure of completed traffic coatings. Flood each area for 24 hours and examine underside of decks for evidence of leaks. Repair any leaks observed. Repeat test and make repairs until no leaks remain.

C. Visually inspect other areas which cannot be water tested for voids, damage or rupture.

D. If test results show coating materials do not comply with manufacturers requirements, remove all non-complying materials, prepare surfaces coated with unacceptable materials and reapply with specified materials.

3.07 CURING, PROTECTION AND CLEANING

A. Cure traffic coatings according to manufacturer's printed instructions taking care to prevent contamination and damage during application stages and curing.

B. Protect adjacent surfaces not scheduled to receive coating from over-spray and other damage during coating application, by masking and/or other means as may be necessary to accomplish this result.

C. After completion of application, do not allow vehicular traffic on coated surfaces for the required cure time needed for recoating / topcoating. Allow a minimum of 10-day period or longer as recommended by manufacturer of the coating used. Protect from damage and wear during remainder of construction period.

D. Remove temporary coverings and clean coatings just before final inspections. Use cleaning materials and procedures recommended by manufacturer.

END OF SECTION

SECTION 07 50 00 – SINGLE PLY MEMBRANE ROOFING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Provide a felt backed membrane with flashings and other components to comprise a roofing system fully adhered to the mechanically fastened insulation board over a vapor barrier over the metal deck substrate.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 04 22 00: Concrete Masonry Unit
B. Section 05 50 00: Miscellaneous Metal
C. Section 05 30 00: Metal Decking
D. Section 06 16 43: Exterior Sheathing

1.03 REFERENCE STANDARDS

A. American Society of Testing Materials (ASTM)
   ASTM D 751 Standard Test Methods for Coated Fabrics.
   ASTM E 96 Test Methods for Water Vapor Transmission in Sheet Form.
   ASTM E 108 Standard Test Methods for Fire Testing of Root Coverings.

B. National Roofing Contractors Association Construction Details

C. SMACNA "Architectural Sheet Metal Manual"

D. U/L Building Materials Directory

E. Warnock Hersey Materials Directory

F. Factory Mutual (FM), Factory Mutual Test Standard 4470
   1. Minimum 1-60 windstorm classification
   2. 149 Perimeter Securement

G. Federal Specifications (FS)-.FS 101 B, Method 2031 - Tear Strength

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Fire Hazard Compliance: Provide letter certifying that roof membrane assembly qualifies for U/L Class A fire hazard classification for the type of substrate, slope insulation membrane and components specified for this installation. Acceptable test method U/L 790 and ASTM E l08. Reports from Underwriters Laboratories and Warnock Hersey are acceptable.

C. Product Data: Latest edition of the Roofing System Manufacturer's material specifications and installation instructions.

D. Shop Drawings:
   1. Outline of roof with roof size, elevations, detailing roof configuration and sheet layout, details at perimeter and special conditions.
   2. Submit installation details of roofing and flashings including seam layout, roof slope, profile details of flashing methods for penetrations and accessories.

E. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.

F. Written approval by the insulation manufacturer for use and performance of the product in the proposed system.

G. Sample copy of Manufacturers warranty.

H. Sample copy of Applicator's warranty.

I. Certification by Manufacturer that Roofing Contractor is authorized / approved to install the roofing system specified

J. Certification by Manufacturer of roofing system that all materials supplied and system composite comply with all requirements of identified ASTM and industry standards, all identified code and insurance requirements as required by the Specification.

K. Material Safety Data Sheets (MSDS)

L. Provide the Owner with a Maintenance Manual with detailed instructions on recommended 'Maintenance procedures and procedures to follow if any modifications or penetrations are made to the roof.

1.05 QUALITY ASSURANCE

A. Upon completion of the installation and the delivery to Manufacturer by the Applicator of a certification that all preparatory work has been done in strict accordance with the contract specifications and Manufacturer's requirements, an inspection shall be made by a Technical Representative of the Manufacturer to review the installed roof system.

B. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Owner, the Owner's Representative and Manufacturer.

C. All work pertaining to the installation of the roofing membrane and flashings shall only be completed by the approved Applicator and personnel trained and authorized by the Manufacturer in those procedures.

1.06 REQUIREMENTS

A. Applicator: Certified / authorized by the Manufacturer to install the specified roofing system with a minimum of 5-years proven experience.

B. The Manufacturer / Applicator shall submit evidence that the proposed roof system meets the requirements of the local building code and has been tested and approved or listed by the following test organizations. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.
   1. Factory Mutual Research Corporation (FM) - Class 1-60
   2. Underwriters Laboratories, Inc. - Class A assembly

1.07 JOB CONDITIONS

A. Only as much new roofing as can be made weather tight each day shall be installed each day, including all flashing and detail work. All seams shall be cleaned and heat welded before leaving the job site that day.

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B. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.

C. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the equipment to dry the surface prior to application.

D. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.

E. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.

F. Do not install the roofing membrane in direct contact with any product containing asphalt, coal tar pitch, creosote, penta-based materials, acid, solvents, vegetable or mineral oil, animal oil, animal fat, etc.

G. Follow safety regulations as recommended by OSHA and any other applicable authority having jurisdiction.

H. Schedule and execute work without exposing interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against risks. Arrange work sequences to avoid use of newly constructed roofing for storage, walking surfaces and equipment movement. Provide necessary protection and barriers to segregate the work areas and prevent damage to adjacent areas. If excessive foot traffic over newly installed membrane is necessary, provide plywood or polyester felt protection to prevent damage.

I. Report unusual or concealed conditions discovered during the course of the work to the Architect in writing. Stop work until the Architect / Owner has responded.

J. When a system is specified to meet an Underwriter's Laboratories, Inc. rating, materials used in the system must be UL labeled and approved for that particular system.

K. Comply with the requirements of local building codes and requirements.

L. Do not use products near fire or flame.

M. Provide worker protection as recommended by roofing manufacturer.

N. Do not use open flames to expedite drying of surfaces, sealants, or adhesives.

O. Consult Material Safety Data Sheets and container labels for specific safety instructions.

P. Protection Requirements
   1 . Protection against staining and mechanical damage shall be provided or newly applied roofing and adjacent surfaces throughout this project.
   2. Applicator will be held responsible for any damage caused to building and grounds resulting from the execution of this work.

Q. Environmental Requirements.
   1. Roofing shall not be applied during precipitation and not started when rain is a probability before application can be completed.
   2. At ambient temperatures of 40 degrees F. and below, including wind chill, take all necessary precautions to insure that asphalt maintains the minimum acceptable temperature as recommended by the roofing materials manufacturer.
   3. Protect adjacent surfaces from staining and mechanical damage during application of roofing.

R. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over Sarnafelt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.

S. All roofing, insulation, flashings and metal work removed during construction shall be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials, such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable City, State and Federal requirements.

T. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.

U. The Applicator shall take precautions that storage and/or application of materials and/or equipment does not overload the roof deck or building structure.

V. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.

W. All rooftop contamination that is anticipated or that occurs shall be reported to Manufacturer to determine the corrective steps to be taken.

X. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing to the Owner's Representative for corrective action prior to installation of the roof system.

Y. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.

Z. The Applicator shall conduct fastener pullout tests in accordance with the latest revision of the SPRI/ANSI Fastener Pullout Standard to help verify condition of deck/substrate and to confirm expected pullout values.

AA. The adhered membrane shall not be installed under the following conditions without consulting Manufacturers Technical for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   3. The wall/deck intersection permits air entry into the wall flashing area.

BB. Precautions shall be taken when using Sarnacol adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.

CC. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

1.08 PRODUCT DELIVERY STORAGE AND HANDLING

A. Deliver materials to the jobsite in their original, tightly-sealed containers or unopened packages. Materials shall be clearly labeled with the manufacturer's name and product identification.

B. Protect materials from damage during transit, handling, storage, and installation. Place materials on pallets and protect from moisture.

C. Store materials in a dry area, protected from the elements. Store membrane rolls flat on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability. As a general rule all adhesives shall be stored at temperatures between 40º F (5º C) and 80º F (27º C). Read instructions contained on adhesive canister for specific storage instructions. Store flammable materials in a cool, dry area away from sparks and open flames. Follow precautions outlined by material manufacturer/supplier.

D. Damages: Any materials that are found to be damaged or stored in any manner other than as stated above shall be automatically rejected and shall be removed and replaced at Contractor's expense.

1.09 WARRANTY

A. Contractor Warranty
1. Prior to acceptance of the roofing work, furnish a certified written workmanship warranty signed by the Roofing Contractor / Applicator agreeing to provide all labor necessary to make repairs and replacements required to maintain roofing including flashings in a watertight condition for two (2) years from date of substantial completion.
2. In the event any work related to roofing, flashing or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with the Contract Documents, the Applicator shall repair that defect. The Applicator's warranty obligation shall run directly to the Owner with a copy sent to the manufacturer.
3. Make repairs or replacements at no additional cost to Owner.
4. Warranty shall include temporary repair work under emergency condition as required to maintain water tightness of the building pending permanent repairs.

B. Manufacturer's Warranty
   1. As part of the work of this section provide all required inspections of the completed work necessary by the manufacturer to secure and deliver to the Owner the standard manufacturers fifteen (15) year materials warranty for the roof membrane system.
   2. Exclusions listed under Terms and Conditions of the Warranty shall conform to generally accepted industry standards except for the following:
      a. Warranty shall be no dollar limit.
      b. Warranty shall contain no exclusion for 'gale force' winds.
      c. Warranty shall contain no exclusion for ponding water.
      d. Warranty shall include no disclaimer for failure or leakage caused by structural movement within the existing roof deck.

C. The terms of the warranty shall provide for the removal, replacement, repair, and making good, without cost to the Owner, of defects due to imperfect materials and workmanship.

D. All repairs required under the warranty shall be made within 3-days after receiving notice of the need for repairs from the Owner, weather permitting.

E. Owner shall notify both the Manufacturer and the Applicator of any leaks as they occur during the time period when both warranties are in effect.

2.00 PRODUCTS

2.01 MANUFACTURER

A. All specification product descriptions are shown for Sarnafil G410 roof membrane system. Other manufacturers are to provide equivalent products to those specified herein. Alternate manufacturer systems will only be reviewed if the proposed materials provide the Owner with the same tested performance characteristics as the specified product including conformance with approved standards, warranty requirements, and approval by the Underwriter’s Laboratories, Inc. rating for the particular system.

B. Components to be used that are other than those supplied or manufactured by the selected manufacturer may be submitted for review and acceptance by the selected manufacturer. Acceptance of any other product is for a determination of compatibility with the selected manufacturer’s products. The specifications, installation instructions, limitations, and/or restrictions of the respective manufacturers must be reviewed by the Owner's Representative for acceptability for the intended use with the selected manufacturer’s products.

C. Manufacturer: The selected roofing system and components are products of Sarna, Sarnafil Division, 'The Energy Smart Roof System' product line. Sarnafil adhered roof system as indicated on drawings and specified herein shall be the G410 roof membrane.

D. Roofing System: The G410 roof membrane system is to be adhered with Sarnacol Adhesive to the pre-secured insulation board. The insulation boards are secured to the roof deck by either mechanical fasteners, hot-asphalt or a Sarnafil accepted alternative. The G410 membrane overlaps and details are hot air welded creating a permanent watertight system.

2.02 MATERIALS

A. Roof Membrane: Sarnafil® G410 fiberglass reinforced membrane with a lacquer coating. Membrane shall conform to ASTM D4434-96 (or latest revision), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I, or equal.

1. Sarnafil$_{10}$G410-15, 60-mil thermoplastic membrane with fiberglass reinforcement.

B. Certified Polymer Thickness: Membrane manufacturer is to certify that the polymer thickness is of the polymer thickness specified (see 2.02, B, 1-5). Certification is to be signed by the membrane manufacturer's quality control manager. ASTM +/- tolerance for membrane thickness is not required.

C. Color of Membrane: EnergySmart (white), initial reflectivity of 0.83, initial emissivity 0.92, solar reflective index (SRI) of >104.

D. Typical Physical Properties: Refer to manufacturers current data sheets for the membrane physical properties for use as comparison in comparison with other membranes

2.03 FLASHING MATERIALS

A. Wall / Curb Flashing
1. Sarnafil G410 Membrane: A fiberglass reinforced membrane adhered to approved substrate using Sarnacol adhesive.
2. Sarnafil G459 Membrane: An asphalt-resistant, fiberglass reinforced membrane adhered to approved substrate using Sarnacol adhesive.
3. Sarnaclad: A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Sarnaclad is a 25 gauge, G90 galvanized metal sheet with a 20 mil (1 mm) unsupported Sarnafil membrane laminated on one side.

B. Perimeter Edge Flashing
1. Edge-Tite Flashing: A prefabricated perimeter edge attachment and fascia assembly provided by Sarnafil. Edge-Tite is made from three distinct parts. The (base) rail is made of formed 0.050 inch thick, 5052-H32 mill-finish alloy aluminum in 12 foot lengths, provided with predrilled fastening holes. The spring clips are 6 inches wide and made from 0.020 inch stainless steel. The snap-on fascia is made from 24 gauge G90 steel or from 0.040 inch aluminum in 12 foot lengths. Edge-Tite is available in a variety of fascia widths. Color to match adjacent wall surface.

C. Miscellaneous Flashing
1. Sarnaflash: A prefabricated expansion joint cover made from Sarnafil membrane. Sarnaflash is designed for securement to wall or horizontal surfaces to span and accommodate the movement of new and existing expansion gaps from 1 inch to 4½ inches across.
2. Sarnacircle –"G": Circular 0.048 inch (48 mil/1.2 mm) thick G410 membrane patch welded over T-joints formed by overlapping thick membranes.
3. Sarnacorner: Prefabricated outside and inside flashing corners made of 0.060 inch thick membrane that are heat-welded to membrane or Sarnaclad base flashings.

D. Multi-Purpose Sealant: A proprietary sealant used at flashing terminations.

E. Sarnacol 2170 Adhesive: A solvent-based reactivating-type adhesive used to attach membrane to flashing substrate.

F. Sarnafelt: A non-woven polyester or polypropylene mat cushion layer that is necessary behind G410 or G459 Flashing Membrane when the flashing substrates are rough-surfaced or incompatible with the flashing membrane.

2.04 INSULATION/UNDERLAYMENT/OVERLAYMENT BOARD

A. Sarnatherm Tapered Insulation: A rigid polyisocyanurate foam insulation with black mat facers. Sarnatherm is available in 4 ft x 4 ft or 4 ft x 8 ft sizes and various thicknesses. 1-1/2" minimum thickness shall be used.

B. DensDeck Fireguard Roof Board: A siliconized gypsum, fire-tested hardboard with glass-mat facers. Roof deck sheathing is provided in a 4 ft x 8 ft board size and in thickness of 5/8 inch.

C. DensDeck Prime Roof Board: A fiberglass, noncombustible gypsum board, Roof deck sheathing is provided in a 4 ft. x 8 ft. board size. Thickness shall be ¼ inch minimum.

2.05 ATTACHMENT COMPONENTS

A. Membrane Adhesive:

1. Sarnacol 2121 Adhesive: A water-based adhesive used to attach the membrane to horizontal or near-horizontal substrates.
   a. There is a significant increase in drying time due to an increase in humidity and/or a decrease in temperature. Do not install when outdoor or substrate temperatures during drying period are expected to fall below 40º F (5º C).
   b. Do not allow Sarnacol 2121 adhesive to skin-over or surface-dry prior to installation of membrane.
   c. Use a water-filled, foam-covered lawn roller to consistently and evenly press the membrane into the adhesive layer.

B. Insulation Board Adhesive
1. Sarnacol LR-2001 Adhesive: A two component (Part A and B) polyurethane low-rise adhesive for bonding insulation to approved compatible substrates.
   a. Adhesive must be applied as a continuous layer.
   b. Use a water-filled, foam-covered lawn roller to consistently and evenly press insulation into adhesive layer.
   c. Storage temperatures in excess of 90°F (32°C) may affect shelf life.
   d. If exposed to temperatures below 40°F (5°C), restored to a minimum temperature of 60°F (15°C) before use.
   e. Job site conditions may affect performance. Adhesive shall not be used if surface and/or ambient temperatures below 40°F (5°C) are expected during application or subsequent curing time.
   f. In The addition of Sarnacol LR-2001 Catalyst to Part B may be required when temperatures are between 40°F (5°C) and 80°F (27°C).
   g. Adhesive shall not be applied to wet or damp surfaces.

C. Sarnaplate: Used with various Sarnafasteners to attach insulation boards to roof deck. Sarnaplate is a 3 inch (75 mm) square or round, 26 gauge stamping of SAE 1010 steel with an AZ 55 Galvalume coating.

D. Sarnafastener #12: A #12 corrosion-resistant fastener used with Sarnaplates to attach insulation boards to steel roof decks. Sarnafastener #12 has a modified buttress thread, a shank diameter of approximately 0.168 inch (4 mm) and a thread diameter of approximately 0.214 inch (5 mm). The driving head has a diameter of approximately 0.435 inch (11 mm) with a #3 Phillips recess for positive engagement.

E. Sarnabar: An FM-approved, heavy-duty, 14 gauge, galvanized or stainless, roll-formed steel bar used to attach membrane to roof decks. The formed steel is pre-punched with holes every 1-inch on center to allow various Sarnafastener spacing options

F. Sarnacord: A 5/32 inch diameter, red-colored, flexible thermoplastic extrusion that is welded to the top surface of the Sarnafil membrane and against the side of the Sarnabar, used to hold the membrane in position.

2.06 VAPOR RETARDER

A. Sarnavap-10: A 10 mil (0.25 mm) thick polyethylene vapor retarder/air retarder. Sarnavap-10 is supplied in a folded panel that is rolled onto a core. The core width is 5 feet (1.5 m). When unrolled off the core and unfolded, the sheet dimensions are 20 feet (6.9 m) wide by 100 feet (33 m) long.

2.07 MISCELLANEOUS ACCESSORIES

A. Aluminum Tape: A 2 inch wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Sarnaclad joints.

B. Sealing Tape Strip: Compressible foam with pressure-sensitive adhesive on one side. Used with metal flashings as a preventive measure against air and wind blown moisture entry.

C. Multi-Purpose Tape: A high performance sealant tape with used with metal flashings as a preventive measure against air and wind blown moisture entry.

D. Sarnamatic 641mc: 220 volt, self-propelled, hot-air welding machine used to seal long lengths of Sarnafil membrane seams.

E. Perimat Welder: 120 volt, self-propelled, hot-air welding machine used to seal long-lengths of Sarnafil membrane seams along perimeter details.

2.10 SEALANTS AND PITCH POCKET FILLERS

A. Sarnafil Multi-Purpose Sealant

2.11 MISCELLANEOUS FASTENERS AND ANCHORS

All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch and shall be approved for such use by the fastener manufacturer. Fasteners into the metal roof deck shall be trimmed to a uniform dimension of ½” below the deck.

2.12 RELATED MATERIALS

A. Wood Nailer: Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49. All wood shall have maximum moisture content of 19% by weight on a dry-weight basis.

B. Plywood: When bonding directly to plywood, a minimum ½ inch (12 mm) CDX (C side out), smooth-surfaced exterior grade plywood with exterior grade glue shall be used. Rough-surfaced plywood or high fastener heads will require the use of Sarnafelt behind the flashing membrane. Plywood shall have maximum moisture content of 19% by weight on a dry weight basis.

3.00 EXECUTION

3.01 SUBSTRATE CONDITION

A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

B. Applicator shall verify that the work done under related sections meets the following conditions:

1. Roof drains and/or scuppers have been reconditioned and/or replaced and installed properly.
2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
3. All surfaces are smooth and free of dirt, debris and incompatible materials.
4. All roof surfaces shall be free of water.

3.02 SUBSTRATE PREPARATION

The roof deck must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner to eliminate risk of deck overload due to concentrated weight. The Owner's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.

A. New Construction:

1. Steel Deck: FM approved steel deck - The roof deck shall be 22 gauge (minimum) grade E and shall conform and be installed to meet the latest revision of FM's Loss Prevention Data Sheet 1-28 and the local code's current requirements.

3.03 SUBSTRATE INSPECTION

A. A dry, clean and smooth substrate shall be prepared to receive the Sarnafil Adhered roof system.

B. The Applicator shall inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work.

C. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.

D. All roof surfaces shall be free of water.

E. Sarnafil shall be applied over compatible and accepted substrates only.

3.05 WOOD NAILER INSTALLATION

A. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings.

B. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot in any direction. Individual nailer lengths shall not be less than 3 feet long. Nailer fastener spacing shall be at 12 inches on center or 16 inches on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall meet this requirement and that of the current Factory Mutual Loss Prevention Data Sheet 1-49.

C. Thickness shall be as required to match substrate or insulation height to allow a smooth transition.

3.06 INSULATION INSTALLATION

A. Insulation shall be installed according to insulation manufacturer's instructions.
1. Insulation shall be neatly cut to fit around penetrations and projections.
2. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
3. Install tapered insulation around drains creating a drain sump.
4. Do not install more insulation board than can be covered with Sarnafil membrane by the end of the day or the onset of inclement weather.
5. Use at least 2 layers of insulation when the total insulation thickness exceeds 2½. Stagger joints at least 12 inches between layers.

B. Mechanical Attachment
1. Insulation shall be mechanically fastened to the deck with approved fasteners and plates at a rate according to the insulation manufacturers, FM's and Sarnafil's recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the insulation boards to rest evenly on the roof deck/substrate so that there are no significant and avoidable air spaces between the boards and the substrate. Each insulation board shall be installed tightly against the adjacent boards on all sides.
2. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration into structural deck recommended by the fastener manufacturer and Sarnafil.
3. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

3.06 INSTALLATION OF SARNAFIL MEMBRANE

A. The surface of the insulation or substrate shall be inspected prior to installation of the Sarnafil roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

B. Sarnacol 2170 Adhesive:
1. Over the properly installed and prepared substrate surface, Sarnacol 2170 adhesive shall be applied using solvent-resistant ¾ inch nap paint rollers. The adhesive shall be applied to the substrate at a rate according to Sarnafil requirements. The adhesive shall be applied in smooth, even coating with no gaps, globs, puddles or similar inconsistencies. Only an area that be completely covered in the same day's operations shall be coated with adhesive. The first layer of adhesive shall be allowed to dry completely prior to installing the membrane.

2. When the adhesive on the substrate is dry, the Sarnafil roof membrane is unrolled. Adjacent sheets shall be overlapped 3 inches. Once in place, one-half of the sheet's length shall be turned back and the underside shall be coated with Sarnacol 2170 adhesive at a rate of ½ gallon per 100 ft² . When the membrane adhesive has dried slightly to produce strings when touched with a dry finger, the coated membrane shall be rolled onto the previously-coated substrate being careful to avoid wrinkles. Do not allow adhesive on the underside of the Sarnafil membrane to dry completely. The amount of membrane that can be coated with adhesive before rolling into substrate will be determined by ambient temperature, humidity and crew. The bonded sheet shall be pressed firmly in place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. The remaining un-bonded half of the sheet shall be folded back and the procedure repeated.
   Notes:
   a) The Applicator shall count the amount of pails of adhesive used per area per day to verify conformance to the specified adhesive rate.
   b) No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

C. Sarnacol 2121 Adhesive: Over the properly installed and prepared absorbent substrate, Sarnacol 2121 adhesive shall be poured out of the pail and spread using notched squeegees. The adhesive shall be applied at a rate according to Sarnafil requirements (no adhesive is placed on back of the membrane). The formation of a film on the surface of the adhesive shall not be allowed to occur. The membrane shall be carefully unrolled into the wet adhesive while the edges are overlapped 3 inches. The membrane shall be pressed firmly into the adhesive layer with a water-filled, foam-covered lawn roller by frequent rolling in two directions.
   a) Sarnacol 2121 shall not be used if temperatures below 40º F are expected during application or subsequent drying time.
   b) No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

3.07 HOT-AIR WELDING OF SEAM OVERLAPS

A. General
   1. All seams shall be hot air welded. Seam overlaps should be 3 inches wide when automatic machine welding and 4 inches wide when hand welding, except for certain details.
   2. Welding equipment shall be provided by or approved by Sarnafil. All mechanics intending to use the equipment shall have successfully completed a training course provided by a Sarnafil Technical Representative prior to welding.
   3. All membrane to be welded shall be clean and dry.

B. Hand Welding: Hand welded seams shall be completed in two stages. Hot air welding equipment shall be allowed to warm up for at least one minute prior to welding.
   1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
   2. The nozzle shall be inserted into the seam at a 45-degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1½ inch wide nozzle is recommended for use. For corners and compound connections, the ¾ inch wide nozzle shall be used.

C. Machine Welding
1. Machine welded seams are achieved by the use of Sarnafil's automatic welding equipment. When using this equipment, Sarnafil's instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated off the generator.

2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams: The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces and an uninterrupted flow of dark gray material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator to locations as directed by the Owner's Representative or Sarnafil's representative. One-inch wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.

3.08 MEMBRANE FLASHINGS

A. All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and Sarnafil. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

B. Sarnacol Adhesive for Membrane Flashings
1. Over the properly installed and prepared flashing substrate, Sarnacol adhesive shall be applied according to instructions found on the Product Data Sheet. The Sarnacol adhesive shall be applied in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner overlapping the edges of the panels as required by welding techniques.

C. Install Sarnastop/Sarnabar/Sarnacord according to the Detail Drawings with approved fasteners into the structural deck at the base of parapets, walls and curbs. Sarnastop is required by Sarnafil at the base of all tapered edge strips and at transitions, peaks, and valleys according to Sarnafil's details.

D. Sarnafil's requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by Sarnafil prior to installation.

E. All flashings shall extend a minimum of 8 inches above roofing level unless otherwise accepted in writing by the Owner's Representative and Sarnafil Technical Department.

F. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot air welded into place. No bitumen shall be in contact with the Sarnafil membrane.

G. All flashing membranes shall be mechanically fastened along the counter-flashed top edge with Sarnastop at 6-8 inches on center.

H. Sarnafil flashings shall be terminated according to Sarnafil recommended details.

I. All flashings that exceed 30 inches in height shall receive additional securement.

3.09 METAL FLASHINGS

A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).
2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.

B. Metal other than that provided by Sarnafil, is not covered under the Sarnafil warranty.

C. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.

D. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.

E. Metal joints shall be watertight.

F. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch.

G. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches on center into the wood nailer or masonry wall.

H. Counter flashings shall overlap base flashings at least 4 inches.

I. Hook strips shall extend past wood nailers over wall surfaces by 1½ inch minimum and shall be securely sealed from air entry.

3.10 SARNACLAD METAL BASE FLASHINGS/EDGE METAL

A. All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and Sarnafil. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings the affected area shall be removed and replaced at the Applicator's expense.

B. Sarnaclad metal flashings shall be formed and installed per the Manufacturers details.
1. All metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch.
2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. Adjacent sheets of Sarnaclad shall be spaced ¼ inch apart. The joint shall be covered with 2-inch wide aluminum tape. A 4-inch minimum wide strip of Sarnafil flashing membrane shall be hot air welded over the joint.

3.11 EDGE-TITE METAL

A. Position the Sarnafil membrane over the roof edge and down outside face of wall covering wood nailer(s) completely. Allow ½ inch excess membrane. Hot air weld all seams making sure there are no voids in welds.

B. Apply a 3/8-inch bead of Sarnafil sealant to the intersection of the right angle of the clean base rail. Install base rail from right to left as seen from rooftop, lapping joints 1 inch.

C. Fasten base rail into the side of the nailer 12 inches on center using #12 x 1-5/8 inch corrosion-resistant fasteners provided with Edge-Tite. Field cut sections as necessary. A second row of fastening may be required based upon site conditions.

D. Position spring clips at 6-foot centers on base rail. Locate spring clips at fascia cover laps and at mid-span of fascia cover.

E. Fascia covers are installed from right to left as seen from rooftop. Position fascia cover on top of base rail and overlap preceding panel by 1 inch at notches provided. Snap covers into place. Field cut where necessary.

3.14 TEMPORARY CUT-OFF

A. All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary water stops shall be constructed to provide a 100% watertight seal. Stagger insulation joints by installing partial panels of insulation. The new membrane shall be carried into the water stop. The water stop shall be sealed to the deck and/or substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of off site. None of these materials shall be used in the new work.

B. If inclement weather occurs while a temporary water stop is in place, the Applicator shall provide the labor necessary to monitor the situation to maintain a watertight condition.

C. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense.

3.15 COMPLETION

Prior to demobilization from the site, work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of Sarnafil shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and Sarnafil prior to demobilization.

END OF SECTION

SECTION 07 60 00 – SHEET METAL WORK

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Metal scuppers, conductor heads and downspouts.
2. Reglet and counterflashing assemblies.
3. Miscellaneous metal flashings, counterflashing, and sheet metal, except where provided under Mechanical and Electrical Sections.
4. Coping caps
5. Elevator shaft cant flashings.
6. Shop priming and field touch-up.
7. Caulking.

1.02 RELATED WORK IN OTHER SECTIONS

A.	Section 04 22 00:	Concrete Masonry Unit
B.	Section 05 30 00:	Metal Decking
C.	Section 05 50 00:	Miscellaneous Metal
D.	Section 07 18 00:	Elastomeric Deck Coatings
E.	Section 23 05 00:	Mechanical Functions
F.	Division 26:	Sheet Metal Work for Electrical

1.03 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: provide manufacturer's technical product data, installation instructions and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings: Submit for review prior to fabrication all fabricated sheet metal showing details, methods of joining, anchoring and fastening, thickness and gages of metals, concealed reinforcement, expansion joint details, finishes, sections and profiles. Drawings shall also show installation details of prefabricated items with relationship to project requirements, adjacent materials and adjoining construction.

D. Samples: Submit such samples for materials or assemblies as may be requested.

1.04 QUALITY ASSURANCE

A. Drawings and requirements specified govern. Conform to the current "Architectural Sheet Metal Manual" published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), 1611 North Kent Street, Arlington, VA 22209 for conditions not indicated or specified and for general fabrication of sheet metal items.

B. Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement and exposure to weather without failing.

C. Complete installation promptly after roofing installation to preclude moisture from entering

roofing system.

1.05 GUARANTEE

Guarantee all sheet metal work for two (2) years after date of acceptance, against any inherent or developed defect in materials, fabrication or installation. Guarantee that work will remain watertight during this period.

2.00 PRODUCTS

2.01 BASIC MATERIALS

Galvanized Steel:	ASTM A525, coating G90, mill phosphatized for paint adhesion, 22 gage minimum unless otherwise shown or specified.
Solder:	ASTM B32, B284, alloy grade as recommended by industry standards:
Galvanized Steel:	Grade SN 50 with 50% lead and 50% tin.
Solder Flux:	Standard brand non-corrosive acid-base type. Use a noncorrosive rosin flux over tinned surfaces.
Fasteners:	Zinc or cadmium coated steel or stainless steel of approved quality and strength for purpose specified. Match finish of exposed heads with material being fastened.
Rivets:	Soft iron, tinned.
Screws:	Phillips head, self tapping.
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 thickness required for performance.

2.02 MISCELLANEOUS MATERIALS

Asphalt Mastic:	SSPC Paint 12, solvent type asphalt mastic, bituminous paint, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4mm) dry film thickness per coat.
Elastomeric Sealant:	Low modulus silicone for exposed locations complying with requirements for joint sealants as specified in Section 07 92 00 Sealants and Caulking.
Paper Slip Sheet:	5-lb/square (0.244 kg/sq.m) red rosin, sized building paper conforming to FS UU-B-790, Type 1, Style 1b.
Primer:	Approved brand of zinc-dust zinc-oxide primer per Sections 09 97 13 or 09 90 00 or with manufacturer's pretreatment materials.

2.03 PRE-MANUFACTURED MATERIALS

A. Reglets and Counterflashings: Fry Reglet Corp. flashing systems complete with unions and preformed corners of necessary types for particular locations, of 22 gage galvanized steel, or Metco Metal Products Co., Pacific Loxtite Flashing Co., National Cornice Works, Redco, Lane-Air, or equal. Use a single manufacturer's products, equivalent to Type CO at concrete, Type MA at masonry, Type ST at plaster, or Type SM, as required by Drawings and details.

B. Prefabricated Aluminum Coping: Provide (.080) aluminum coping of size as required for wall construction. System shall feature a built in sealing mechanism incorporating a splice plate and a hold down cleat to add rigidity and insure a tight joint. Hold down cleat is to be fabricated with reinforcing strips and a center neoprene compression pad centered over the joint and provide holes for concealed fasteners. Splice plate shall accommodate coping joints of the flush butted type, edges spaced about 1/4" apart and

centered over an 8" long backing plate of the same profile, gage and finish as the cap, and have factory applied neoprene sealant strips. Secure both edges of caps with minimum 12" wide aluminum cleats spaced at maximum 32" centers and locked into 2" drip hem. Products as manufactured by Architectural Products Co. (800) 837-1001; MM Systems Corporation (800) 241-3460; PAC-CLAD by Petersen Aluminum (800) 722-7150; or approved equal.

2.04 FABRICATION REQUIREMENTS

A. Verify all field measurements for work which is to be shop fabricated with surrounding work and site conditions comparing dimensions and details of this work with those of adjoining work by other trades to insure against discrepancies, and provide for proper fit.

B. Do all cutting, drilling and fitting required by setting materials in place.

C. Fabricate items to avoid distortion and overstressing of fastenings due to expansion and contraction. Provide expansion joints where necessary in continuous runs of sheet metal, constructed watertight and spaced 20-feet apart maximum. Lock and solder corners and blind hem exposed edges. Make joints with 4" lap and solder unless otherwise shown or specified otherwise. Fill single lock seams with sealant where soldering is infeasible. Run flanges 4" minimum onto roof and wall surfaces. Fabricate sheet metal items in nominal 10-foot lengths unless otherwise shown or specified.
   1. Form sections true to shape, accurate in size, square and free from distortion or defects.
   2. Fabricate cleats and starter strips of same material as sheet, interlockable with sheet.
   3. Form pieces in longest practical lengths.
   4. Hem exposed edges on underside 1/2 inch; miter and seam corners.
   5. Form material with flat lock seams.
   6. Solder and seal metal joints. After soldering, remove flux. Wipe and wash solder joints clean.
   7. Fabricate corners from one piece with at least 18 inch long legs; seam for rigidity and seal with sealant.
   8. Fabricate non-moving seams with flat-lock seams. Tin edges to be seamed, form seams and solder.
   9. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to view.
   10. Fabricate cleats and attachment devices from same material and thickness as sheet metal component being anchored or from compatible, non-corrosive metal recommended by SMACNA.

D. Soldering: Thoroughly clean surfaces before soldering. Execute soldering slowly with full flowing joints and with joints as thin as possible. Make flat, locked seams at least 2 inch wide, and sweat full of solder. Lap seams where soldered at least 3 inches wide. Make flat and lap seam joints in direction of flow.

E. As work progresses, neutralize excess flux with 5 to 10 percent washing soda solution, and thoroughly rinse.

F. Weld sheet metal 18 gage and heavier using shielded electric arc method. Provide welding rods as recommended by manufacturer for use with galvanized sheet steel zinc alloy sheet or cold rolled sheet metal.

2.05 FABRICATED ITEMS

A. Provide 22 gage minimum galvanized steel unless otherwise indicated or specified.

B. Counterflashing: Except where indicated or specified otherwise, insert counterflashing in reglets and extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counter flashings 1/2 inch. Provide end laps in counter flashings not less than 3 inches and make weathertight with plastic cement. Lengths of metal counter flashings shall not exceed 10 feet. Form the flashings to the required shapes before installation. Factory form the corners not less than 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inches apart; at short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound as covered in Section 07 92 00. Turn up the concealed edge of counter flashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counterflashing to provide a spring action against base flashing.

C. Downspouts:
1. Factory fabricate 22 gage rectangular, 4 inch by 2 inch non-corrugated flat locked type seams. Set downspouts plumb. Telescope joints between lengths of downspouts with end of upper lengths at least 12 inches into lower length.
2. Provide one piece straps adjacent to the joint at top of each section of downspout with an additional strap adjacent to bottom joint of termination elbow and at 4 foot on center maximum. Bolt through flange legs into expansion shields.

D. Conductor Heads: Provide 22 gage box type conductor heads with flat locked soldered seams. Attach conductor heads plumb and not less than 1" below scupper bottom. Solder flanged, locked outlet tubes at bottom of conductor heads. Conform to size and shape of downspouts. Attach conductor heads to wall and loose lock back edge to bottom edge of scuppers.

E. Scuppers: Fabricate scuppers with 22 gage locked and soldered joints. Extend scuppers beyond exterior face of wall with bottom edge to form a drip, attached to conductor head. Return top and sides at interior face of wall, joining with closure flange, forming a gravel stop at bottom edge.

F. Miscellaneous Sheet Metal: Include all miscellaneous items of sheet metal called for in the Drawings or as required and not specifically mentioned in the specifications. Include all sheet metals and flashings not manufactured to a standard shape. Make all measurements at the building and make all templates and patterns, and supply with all necessary information for the proper execution of the work to insure that it is properly fabricated for its installation at the building.

G. Elevator Shaft Cant Flashings: Provide 20 gage cant flashings as indicated on the drawings or as required to eliminate all flat surfaces over 2" at the top edge of the pit, masonry spandrel beams, curtainwall mullions, and sills, etc., to provide a 75 degree cant angle preventing a stepping ledge.

2.06 FINISH All ferrous items shall be free from burrs, rust, seal and rough surfaces.

A. Galvanizing: Provide hot-dipped zinc galvanizing with 2.0 ounces minimum/square foot after fabrication G90 unless specified otherwise. Repair abraded galvanized surfaces in field. After repair do no additional cutting, drilling or welding. For repairs use, "Drygalv" (213) 254-9131; "Galicon" (714) 547-6684; or "Z.R.C. Cold Galvanizing Compound" (213) 698-6655, or equal.

B. Shop Paint Coating System: Tnemec "90-97 Tnemec-Zinc Rich Urethane Primer", or approved equal of same manufacturer as finish coating system. Refer to Section 09 97 13.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine substrate surfaces to receive flashing and sheet metal systems and associated work and conditions under which work will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as applicators acceptance of surface conditions.

B. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

3.02 INSTALLATION REQUIREMENTS

A. Conform to drawing details and performance requirements published in the SMACNA Manual and manufacturers installation instructions. Install metal items as indicated according to approved shop drawings, submittals, and as required to complete the entire work. Securely fasten, anchor and assemble, securely in place to make watertight and weathertight with provisions made for free expansion and contraction without leaks.
   1. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
   2. Insert flashings into reglets to form tight, permanent and secure fit. Seal flashings into reglets with sealant.
   3. Secure flashings in place using concealed fasteners, where possible.
   4. Apply plastic cement compound between metal flashings and felt flashings.

B. Install exposed sheet metal work that is without oil canning, buckling and tool marks and that is true to line and level, with exposed edges folded back to form hems.

C. Expansion and Contraction: Provide expansion and contraction joints at not more than 12-foot intervals for aluminum and at not more than 20-foot intervals for other metals, with no joints allowed within 24 inches of corner or intersection. Where the distance between the last expansion joint and the end of the continuous run is more than half the required interval, an additional joint shall be provided. Space joints evenly.
   1. Join extruded aluminum gravel stops and fascias by expansion and contraction joints spaced not more than 12 feet apart.
   2. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25mm) deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 12" (38mm), except where pretinned surfaces would show in finished work. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and splatter.

E. Sealed Joints: Form joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
   1. Fill concealed joint with mastic sealant and form metal to completely conceal sealant.
   2. Use mastic sealant for non-moving joints specified not to be soldered.
   3. Use elastomeric sealant for exposed joints and to seal against adjacent material.

F. Lap Joints: Form lap joints in sheet metal a minimum of 4 inches and set in bed of mastic sealant.

G. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed and soldered.

H. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

I. Roof-Penetration Flashing: Coordinate roof penetration flashing installation with roofing and installation of items penetrating roof. Verify that roof penetration flashing does not violate roofing warranty requirements.

J. Coordination: Coordinate sheet metal items in connection with roofing or waterproofing for proper installation, and furnish in sufficient time to avoid delay in roofing construction. Install roofing sheet metal simultaneously with roofing.

K. Caulking: Provide sealants and caulking as indicated and required to seal and complete work of this section. Conform to Section 07 92 00.

L. Protection from Contact with Dissimilar Materials: Paint metal surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.03 COMPLETION

A. Clean exposed metal surfaces removing substances that might cause corrosion of metal or deterioration of finishes.

B. Examine installed sheet metal, water test if necessary or directed, and correct damaged or defective items, or quality of work prior to installation of coverings.

END OF SECTION

SECTION 07 91 13 – COMPRESSION SEALS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to this Section.

B. Furnish all labor, materials, services, equipments and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Heavy duty integrally colored compression joint seals at parking decks

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 05 50 00: Miscellaneous Metals

1.03 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop Drawings: Detail typical cross section(s) indicating joint width and overall dimensions of blockout that will be critical to the proper placement and installation. Provide complete details and joint layout for all locations with installation requirements.

D. Samples: Submit sections of materials showing color, cross section, end splice and if a miter is to occur, demonstrate technique.

E. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

1.04 REQUIREMENTS

Expansion joints shall not be placed until the structure has undergone its anticipated short term post tensioning shortening and creep. Drawings indicate the design intent of the expansion joint system in its final configuration. If Contractor places expansion joints prior to the time the structure undergoes its short-term movement, then Contractor shall replace the expansion joint with the proper sized system without additional cost to the Owner. Coordinate with the Architect prior to execution.

1.05 QUALITY ASSURANCE

Products specified must conform to the material requirements, testing procedures and results as established by American Society for Testing and Materials (ASTM) in conformance with ASTM - D2628.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery products in manufacturer's original intact labeled container.

B. Store above ground protected from weather and construction activities.

C. After installation, protect seals from damage until completion of structure.

1.07 WARRANTY

Expansion joint system shall be free of defects and shall remain watertight for a period of three (3) years after project acceptance.

2.00 PRODUCTS

2.01 MANUFACTURE

A. Furnish compression seal expansion joint system as designed and manufactured by EMSEAL, Watson Bowman Acme Corp., as distributed by Harris Specialty Chemicals, Inc. (909) 867-2161, MM Systems Corporation, Neoprene Compression Seal by Permaquik distributed by Specified Sales (714) 497-1550; or approved equal.

B. Compression seal expansion joint systems to be EMSEAL DSM System, WABO Compression Seal Series WE Series, MM Systems EBS System, Permaquik WF Series; or equal, as indicated on Drawings and as required. Refer to Drawings for sizes and exact types needed to conform to project requirements.

2.02 MATERIALS

A. The compression seals shall be preformed and manufactured from vulcanized elastomeric compound using polymerized chloroprene as the base polymer. The seals shall meet the requirements of the properties listed in the table below exclusive of recovery and pressure sensitive tests unless specified otherwise. Color shall be manufacturers standard or availability for custom as required to match adjacent surfaces whether painted or EIFS.

Physical Properties of Neoprene Seal Element:

Property	Requirements	ASTM Method
Tensile strength, min.	2000 psi	D412
Elongation @ break min.	250%	D412
Hardness, Type A Durometer	(55+/-5)	D2240 (Modified)
Compression set.	40%	D395, Method B
70 hr. @ 212 deg.F max.		(Modified)
Oven Aging, 70 hr. @ 212 deg.F		D573
Tensile strength, loss, max.	20%	
Elongation, loss, max.	20%	
Hardness, Type A Durometer (points change)	0 to + 10	
Oil Swell, ASTM oil 3, 70 hr. @ 212 deg. F weight change, max.	45%	
Ozone resistance		D1149
20% strain, 300 pphm, in air@ 104 deg.F (wiped w/toluene to remove contamination)	No Cracks	

B. Lubricant Adhesive: Prima Lub or equal Adhesive (or as recommended by the joint manufacturer) shall be a one part moisture curing polyurethane and aromatic hydrocarbon solvent mixture which complies with ASTM D4070.

3.00 EXECUTION

3.01 INSTALLATION

A. Field Conditions: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect any conditions that prevent proper execution of this work.

B. Install the expansion/compression seals in strict accordance with the manufacturers' recommendations, typical details and instructions.

C. Install the seals in a neat, workmanlike manner. All surfaces to receive compression seals shall be free from dirt, water and any other loose foreign debris which may be detrimental to effective joint sealing.

D. Seal shall be supplied in the longest continuous lengths possible. Factory splices will be allowed. Adhesive shall be used to field splice and/or miter the seals to accomplish directional changes.

E. Provide for a clean accurate block out as required by the manufacturer, as indicated on the approved shop drawings or as requested by the Architect.

F. Apply approved lubricant or adhesive continuously to both joint interfaces immediately prior to seal installation to provide watertight assembly.

G. Compress bottom portion of seal and insert into joint, being careful not to spread excess adhesive on adjacent surfaces.

H. Position seal within the joint to the proper depth so that top is flush with adjacent surfaces, in its completed position.

3.02 CLEANING

Clean excess adhesive from exposed surfaces of compression seal with solvent cleaner as recommended by manufacturer.

END OF SECTION

SECTION 07 92 00 – SEALANTS AND CAULKING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all sealants and caulking, backing materials and supplementary work to complete the Contract including, but are not limited to, these major items:
1. At all door frames, louvers, windows, etc.
2. Roof penetrations not specified under Mechanical or Electrical Sections.
3. All concrete pour, construction and separation joints in elevated concrete slab.
4. Joints between concrete slab and walls.
5. All other Sealants and Caulking as indicated on Drawings.
6. Sealant between top of interior masonry walls and slab soffits.
7. Fire retardant sealants for type of rated penetration, as required. Alternate engineered ADA and California Title 24 field-tested products in service for a minimum of 5 years that are in compliance with these specified requirements and meet or exceed the specified test criteria and characteristics, may be submitted for review to be incorporated in the work

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 07 60 00: Sheet Metal Work
B. Section 08 10 00: Hollow Metal Doors and Frames
C. Section 08 41 13: Aluminum-Frame Storefronts
D. Section 08 80 00: Glass & Glazing

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
ASTM C 920 Specification for Elastomeric Joint Sealants
A sealant qualifying under this specification shall be classified as to type, grade, class, and use as follows:
1. Type S - Single component sealant
2. Type M - Multi component sealant
3. Grade P - Pourable or self-leveling
4. Grade NS - Nonsag or gunable
5. Class 25 - Adhesion and cohesion under movement shall withstand an increase or decrease of at least 25% of the joint width.
6. Use T - Pedestrian and vehicular traffic areas. Sealant shall have a hardness reading, after being properly cured, of not less than 25 or more than 50 when tested in accordance with Test Method C 661.
7. Use NT - Nontraffic applications
8. Use M - Mortar/Masonry
9. Use G - Glass
10. Use A - Aluminum
11. Use O - Other than the Standard Substrates meeting this specification.

ASTM C962 Standard Guide Use of Elastomeric Joint Sealants
ASTM C1193 Standard Guide for Use of Joint Sealants.
ASTM C1184 Standard Guide for Use of Structural Sealants.

ASTM D1565 Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell form)
ASTM D1667 Standard Specification for Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam)

B. Federal Specification
FS TT-S-00227E "Sealing Compound, Rubber Base, Two-Component."
FS TT-S-00230 "Sealing Compounds, Synthetic Rubber Base, Single Component, Chemically Curing.

C. Sealant, Waterproofing and Restoration Institute (SWRI) - Sealant and Caulking Guide Specifications.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Submit manufacturer's technical data, mixing instructions, application recommendations and installation instructions, including cleaning and priming instructions and sealant limitations for each type of material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material selected complies or is suitable for the temperatures, movements and weather conditions that will be encountered during the sealants service life.

C. Samples: Submit manufacturer's standard bead samples consisting of strips of actual products to be exposed to view showing full range of cured colors available.

D. Contractor's and manufacturers' guarantees and warranties respectively.

E. Sealant Schedule: Indicate each sealant type and backer rod type proposed for each appropriate location and for each appropriate substrate.

F. Certificates: Furnish manufacturer's certification that sealant systems comply with local regulations controlling use of volatile organic compounds. Manufacturer shall certify that sealant systems are compatible with adjacent substrate and related finish materials.

G. Product Testing: Include manufacturer or independent laboratory test results demonstrating hardness, stain resistance, adhesion and cohesion under cyclic movement per ASTM C719, low temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging and effects of accelerated weathering.

H. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an installer who has successfully completed within the last three (3) years at least three (3) joint sealer applications similar to type and size to that of this project.

B. Single Source for Materials: Obtain joint sealer materials from a single manufacturer for each different product required, for each different application.

C. Manufacturer's representative shall provide inspection of conditions prior to start of the work and initial supervision at the start of each application, to insure that any physical conditions which would result in defective work are properly corrected before materials are applied, and that proper procedures are being followed. Provide such inspection and supervision by qualified personnel. Report all unsatisfactory conditions existing at the time of inspection in writing to the Architect for correction before proceeding with the work.

D. Notify the manufacturer's representative at least 72 hours prior to the time inspection is required.

E. Failure or refusal of the manufacturer or manufacturer's representative to provide the inspection and supervision as required hereunder constitutes grounds for non-acceptability of materials manufactured, even though such materials have been specified or approved.

1.06 REQUIREMENTS

A. Sealant system shall include joint preparation, joint back-up or bond breaker, priming, sealant and caulking s required to seal exterior and interior joints throughout the project, including those not specifically indicated in the Contract Documents, but necessary to completely eliminate active, direct and indirect moisture and weather elements of water, air or dust, from entering through, around, over and under joints of building components, to provide a watertight, moisture tight and weather tight building envelope and seal joints between adjacent materials.

B. Sealants shall not harden or soften more than 10 Shore A durometer points as measured 21 days after original installation.

C. Verify compatibility of sealants with various other sealants or joint systems at any point of interface or possible contact.

D. Sealants and caulking joints shall not be placed until the structure has undergone its anticipated short term post tensioning shortening and creep. Contractor shall make provisions to replace all defective joints without additional cost to the Owner for all joints placed prior to the time that the structure undergoes short term movement in excess of the elongation capacity of the sealant materials. Coordinate with the Architect prior to execution.

E. When caulking and sealants are used in conjunction with EIF systems coordinate with adjacent work provided by related trades. Work shall not begin until finish coat has been applied and cured to manufacturers recommendations. Selection of sealant color shall be as selected by the Architect from manufacturers standard or custom color palette, without additional cost to the Owner.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original unopened containers or bundles with labels, indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.

B. Store at 80 deg. F or less in a cool, dry area. Handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

C. Use sealant within the time recommended by the manufacturer.

1.08 PROJECT/SITE CONDITIONS

A. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when ambient and substrate temperatures are below or above manufacturer's recommended limitations for installation or below 40 deg. F. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength.

B. Surface Conditions: Provide proper primers suited to conditions. Surface primers may be omitted by certification by sealant manufacturer that they are not required. Where any doubt exists, prepare sample joints on actual materials as furnished for the job to determine the matter.

1.09 GUARANTEE

Provide warranty from manufacturer and installer to repair or replace sealant compounds which have failed to provide airtight and watertight joints for any reason, or which appear to have failed (inherent or developed) defects in material or installation, due to adhesion, cohesion, abrasion resistance, migration-resistance, stain resistance, general durability, which fail, leak, crumble, harden, shrink, bleed, sag, stain or any other form of apparent deterioration. Guarantee that installed work will remain watertight for a period of two (2) years after date of acceptance.

2.00 PRODUCTS

2.01 MATERIALS

Use sealants of the following types and manufacturers. Use manufacturers standard or custom colored materials to match color of adjacent surfaces. Where adjacent materials on each side of the joint are different colors, the Architect will select sealant colors. If the desired color is not available from one manufacturer, select the proper color from another manufacturer.

2.02 MANUFACTURERS

A. Provide one of the following for each different product required:
1. Mameco/International, Inc.
2. Pacific Polymers
3. Pecora
4. Sika
5. Sonneborn Building Products
6. Equivalent products meeting performance criteria specified will be acceptable.

2.03 MATERIAL TYPES

A. Polyurethane Sealants
1. One part, non sag, non staining, gun grade sealants ASTM C920, Type S, Grade NS, Class 25, uses NT, M, G, A & O, FS, TT-S-00230C, Type II, Class A.
a. Location/Use: Exterior/Interior, Horizontal/Vertical joints in concrete, masonry, steel, aluminum and glass
b. Mameco International 'Vulkem 116 or 921'
Pacific Polymers 'Elasto-thane 230-Type II', Elasto-seal 230
Pecora 'Dynatrol 1'
Sika - Sikaflex - 1a or 15LM
Sonneborn 'Sonolastic NP-1/Ultra/Sonolastic 150

2. Two part, non sag, non staining, gun grade sealant, Type M, Grade NS, Class 25, uses NT, M, A & O, FS, TT-S-00227E, Type II, Class A.

a. Location/Use: Exterior/Interior, Horizontal/Vertical joints in concrete, masonry, steel, aluminum.
b. Mameco International 'Vulkem 227 or 922'
Pacific Polymers 'Elasto-seal 227 or Elasto-thane 920 Type II'
Pecora 'Dynatrol II'
Sika - Sikaflex - 2c NS/SL
Sonneborn 'Sonolastic NP-2'

3. One part, self leveling, pourable sealant, ASTM C920, Type S, Grade P, Class 25, Uses T, M, A & O,FS, TT-S-00230C, Type 1
a. Location/Use: Exterior/Interior, Horizontal expansion and control joints; light traffic.
b. Mameco International 'Vulkem 45'
Pacific Polymers 'Elasto-thane 230-Type I'
Pecora 'Urexpan NR-201'
Sika - Sikaflex - 1 CSL
Sonneborn 'Sonolastic SL1'

4. Two part, self leveling, pourable sealant, ASTM C920, Type M, Grade P, Class 25, uses T, M, A & O, FS, TT-S-00227E, Type I.
a. Location/Use: Exterior/Interior, Horizontal expansion and control joints; medium to heavy traffic.
b. Mameco International 'Vulkem 245-255'
Pacific Polymers 'Elasto-thane 227 High Shore'
Pecora 'Urexpan NR-200'or 'Dynatred'
Permapol 'RC-2SL'
Sika - Sikaflex 2CSL
Sonneborn 'Sonolastic SL2'

5. One or two part, low modulus, semi-self leveling sealant, pourable, ASTM C920, Type S, Grade P, Class 25, uses T, M, A & O, FS, TT-S-00227E, Type I.
a. Location/Use: Exterior/Interior, Horizontal joints in level and/or slightly sloped (6%) surfaces.
b. Mameco International 'Vulkem 300SL'
Pacific Polymers 'Elasto-thane 230 SL'
Sika - Sikaflex 2CSL
Sonneborn 'Sonolastic SL2'
Pecora Urexpan 'NR-201'

B. Silicone Sealants: Medium and Low Modulus silicone sealant, one-part, non-acidic, neutral curing, Type S, Grade NS, Class 25, Use NT, capable of withstanding movements from +50 to -50 for medium modulus and +100 to -50 percent for low modulus based on original joint design. Custom colors as selected by the Architect.
1. Silicone based, single components, non sag, conforming to Federal Spec. TT-S-0030C (2) & FS TT-S-001543A.
a. Locations/Use: Joints in glass and metal surfaces of walls and other vertical and sloping surfaces of window surrounds.
General Electric - GE1200
Dow Corning - 791
Pecora 864 or 890
Sonneborn - Sonolastic 150/Omniseal
b. Locations/Use: Joints in concrete, masonry and plaster in vertical and sloping surfaces.
General Electric - Silpruf

Dow Corning - 790, 795
Pecora 895
Sonneborn - Sonolastic 150/Omniseal

C. Joint Backing (backer rod): Closed cell materials, neoprene, polypropylene, polyolefin foam or polyethylene, ASTM D1565 or D1667 conforming to manufacturers written recommendations. Material is to be non-gassing, non-staining, free of asphalt, oils or creosote. Sized and shaped to control depth of sealant and to provide 25 - 50 percent compression upon insertion. Open cell polyurethane foam backer rod is not allowed.
   1. Ethafoam SB backer rod by Dow Chemical
   2. Sonofoam backer rod by Sonneborn/Rexnord
   3. Taylor Foam backer rod by Taylor Foam Products

D. Primers: As recommended in writing by sealant manufacturer. Verify that recommended primer has been tested not to stain the substrate. Refer to 3.02D below.

E. Bond Breaker: Pressure sensitive adhesive polyethylene tape, or other type recommended by sealant manufacturer.

F. Fire Retardant Sealant and Safing: Products as tested and listed by approved system design as indicated in the U.L.Inc Volume 2, directory. System shall be recognized by UL and ASTM E119 procedures, (and ICBO by report NER #243), for fire rating of penetration to be sealed. Products as distributed by Kirwan Corporation (714) 939-6887.
   1. Pecora Ultra-Block or equal fire safing joint system used in conjunction with acrylic latex sealants (AC-20 FTR), polyurethanes or silicones, as approved by the manufacturer, based on hardness or flexibility of the joint required. Alternate mineral wool safings must comply to approved system designs.
   2. Fire Resistant Sealants:
      a. Movement - Non-Traffic Joints: SpecSeal Pensil 300, silicone sealant non slump (PEN300), self-leveling (PEN300 SL) or Dow Corning (3M) - "Firestop Sealant".
      b. Non-Movement Joints: 3M - "Fire Barrier Caulk CP25 and Putty 303".

G. Fire Retardant Foam: UL tested and listed, conforming to ASTM E119 for rating of penetration to be sealed. 3M 2001 RTV "Firestop Foam" or equal.

2.04 INCIDENTAL REQUIREMENTS AND MATERIALS

A. Staining Characteristics: All joint fillers, primers, or other materials used in conjunction with sealants shall be of such composition as to not cause staining of the sealant or the materials to which they are applied.

B. Compressible Joint Filler: As recommended by the sealant manufacturer for use in conjunction with the sealant. Size closed cell joint backing for joint width plus 25 percent.

C. Primers: As recommended by the sealant manufacturer for use in conjunction with the sealant for application onto the various types of materials to which the sealer is applied.

D. Cleaners, where required in lieu of primers, as recommended by the sealant manufacturer, which will not stain or damage building materials.

3.00 EXECUTION

3.01 EXAMINATION

Examine substrate surfaces to receive sealant system and associated work and conditions under which work will be installed. Do not proceed with sealants until unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as applicators acceptance of surface conditions.

3.02 PREPARATION

A. Comply with manufacturer's latest written requirements, recommendations and specifications for cleaning, surface preparation and priming. Remove loose foreign materials that could impair adhesion or proper performance of sealants.

B. Prime joint substrates where recommended by joint sealant manufacturer or where required by pre-construction joint sealant substrate tests. Confine primers to areas of joint sealant bond. Do not allow spillage or migration onto adjoining surfaces.

C. Apply epoxy primers to all concrete surfaces to which joints are to be sealed. Surfaces between poured in place concrete walls and columns are to be primed prior to sealant application to increase adhesion, decreasing failure due to temperature exposure, thermal and structural movement.

D. Prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears.

3.03 APPLICATION

A. Install back-up and sealants in accordance with ASTM C1193 and manufacturers written recommendations as recommended for each use type and substrate, or as directed by manufacturers technical field representative to ensure proper preparation and application.

B. Accurately install joint back-up to provide support of sealants during application and at position required to produce the uniform cross sectional shape and depth of installed sealants relative to designated joint thickness and widths to achieve required width to depth ratios, that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of back-up rod.
   2. Do not stretch, twist, puncture or tear back-up rod.
   3. Install bond breaker tape where backer rods are not used due to shallow joint depth, to avoid three-sided adhesion.

C. Install sealants by proven techniques using caulking guns with proper nozzles using sufficient pressure that results in sealants directly contacting and fully wetting joint substrates. Completely fill recesses provided for each joint configuration, providing uniform, cross sectional shapes and depths relative to joint widths, and to assure/obtain uniform adhesion free of air pockets, voids, embedded matter, ridges and sags. During application keep tip of nozzle at bottom of joint, forcing sealant to fill from bottom to top. Finish joints smooth, uniform and free of ridges, wrinkles, sags, air pockets, and embedded impurities.

D. Tool sealants to form smooth, uniform beads of concave configuration finished below the surface. Use tooling agents that are approved by sealant manufacturer. Remove excess sealants from surface adjacent to joint.

E. Fire Retardant Foam and Sealant: Conform to manufacturer's printed directions for preparation and application of materials per applicable details for fire-rated penetrations. Seal all gaps, cracks, and holes around the perimeter of materials penetrating the fire rated floors and walls.

F. Fire Retardant Putty: Apply to thickness required for rating and type of construction, in accordance with manufacturer's directions.

3.04 PROTECTION

A. Protect joint sealants from contact with contaminating substances or from damage resulting from construction operations or other causes.

B. Cut out and remove damaged or deteriorated joint sealants and repair so that areas are indistinguishable from original work.

END OF SECTION

SECTION 07 95 00 – SEALING/EXPANSION CONTROL SYSTEM

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to this Section.

B. Furnish all labor, materials, services, equipments and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Provide moisture tight below grade expansion joints between wall and column, construction joints in retaining walls, where exposed to earth or waterproofing / drainage core membranes.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 07 92 00: Sealants and Caulking

1.03 REFERENCE STANDARDS

American Standards for Testing and Materials (ASTM)

ASTM D412	Test Methods for Vulcanized Rubber and Thermoplastic Rubbers - Tension
ASTM D1056	Specification for Flexible Cellular Materials-Sponge or Expanded Rubber
ASTM D2240	Test Method for Rubber Property-Durometer Hardness
ASTM D2628.	Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Manufacturer's specifications of joint system, epoxy adhesive and other data needed to prove compliance with the specified requirements. Provide a written statement from the manufacturer with recommendations for the proposed size, (width and depth) of the joint proposed.

C. Shop Drawings: Submit typical cross section(s) details indicating overall joint width critical to the proper placement and installation. Provide complete details and joint layout for all locations with installation requirements.

D. Samples: Submit sections of materials showing actual size of the required joint width and cross section, and if a miter is to occur, demonstrate technique.

E. Certificate: Submit certificate of completion of manufacturers training program and letter of approval from the manufacturer that completed installation complies with warranty requirements.

F. Warranty: Submit copies of the manufacturers warranty for review by the Architect, jointly signed by the manufacturer and the (contractor / applicator / installer) indicating agreement between both parties to provide a joint and several warranty upon completion of the work. Conditions of the warranty will be used in evaluating / accepting the specified product and the reviewed submittal.

1.05 REQUIREMENTS

A. Expansion joints shall not be placed until the structure has undergone its short term anticipated post tensioning shortening and creep. Drawings indicate the design intent of the expansion joint system in its final configuration. Contractor placing expansion joints prior to the time the structure undergoes its short term movement shall replace the expansion joint with the proper sized system without additional cost to the Owner. Coordinate with the Architect prior to execution.

B. All components specified herein are to be of a single manufacturer, part of a standard, proven expansion joint sealing system and qualifying for the warranty requested.

C. Areas where expansion joint systems are to be caulked are to be sealed with a urethane sealant compatible with the joint system and approved by the manufacturer. Coordinate with Section 07 92 00, Sealants and Caulking

1.06 QUALITY ASSURANCE

A. Products specified/selected must conform to the material requirements, testing procedures and results as established by American Society for Testing and Materials (ASTM) in conformance with ASTM - D2628.

B. Furnish manufacturers Certificate of Compliance confirming that alternate materials proposed have been tested and will meet the requirements as established in manufacturers current literature.

1.07 PRODUCT DELIVERY STORAGE AND HANDLING

A. Delivery products in manufacturer's original intact labeled container.

B. Store off the ground, protected from weather and construction activities.

C. After installation, protect seals from damage until completion of structure.

1.08 WARRANTY

Expansion joint system shall be free of defects and shall remain watertight for a period of three (3) years after project acceptance.

2.00 PRODUCTS

2.01 MANUFACTURE

'Inverseal' expansion joint system as designed and manufactured by Watson Bowman Acme Corp., 800-253-9226, locally represented 909-698-5617
Iso-Flex Foamflux, manufactured by LymTal, and as distributed by Camp Sales & Consulting 562-438-4343, or approved equal.

2.02 SYSTEM

The joint seal shall be extruded from a preformed flexible closed cell cellular neoprene expanded rubber with a relatively dense layer of skin at the surface and shall be held in place by a two component 100% solids epoxy adhesive. The design of the seal shall accommodate movements and variations in joint widths through compression and tension of its shape. Serrated sidewalls shall be extruded to ensure an effective and quality surface for adhesion.

2.03 MATERIALS

A. Seal Profile: The profile shall be preformed and manufactured from closed cell

polychloroprene (neoprene). The profile shall meet the requirements of the properties listed in the table below unless specified otherwise.

Physical Properties of Neoprene Seal Element:

Property	Requirements	ASTM Method
Tensile strength, min.	125 psi	D412
Elongation @ break min.	200%	D412
Compression Deflection	5-9psi	D-1056
Hardness, Shore >00'	35-65	D-2240
Water Absorption (by weight)	5%	D-1056
Density (pcf) Average	12-25	D-1056
Compression Set (Average %) - 2" Compressed 50%, 22 hrs 70 deg.F - 24 hr recovery	15-25	D-1056

B. Two Component Epoxy Adhesive: The adhesive shall be two-component, epoxy based adhesive, which shall have the following properties:

Tensile Strength	4000 psi
Compressive Strength	8000 psi
Solids Hardness	5 MOHS
Pot Life	40 minutes at 68 deg.F
Flash Point	Greater than 200 deg.F
Initial Cure	24 hours
Full Cure	7 days at 68 deg.F

2.04 FABRICATION

A. Seal profiles shall be shipped in the longest practical continuous lengths in manufacturers standard shipping carton. Seals shall be cut to length on jobsite where required. Miter cut or bend seal (depending on size) in the field to conform to directional changes unless otherwise contracted with expansion joint manufacturer.

B. Epoxy Adhesive: Ship in manufactures labeled containers.

3.00 EXECUTION

3.01 GENERAL

Field Conditions: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to Architect any conditions which prevent proper execution of this work.

3.02 PREPARATION

A. Concrete (New Construction)
1. Forming materials should be carefully removed to avoid edge spalling of the concrete.
2. Joint gap edges should be chamfered to help prevent small fractures and spalling.
3. Edge spalling conditions should be repaired and allowed to properly cure prior to installation.
4. The concrete side walls must be sound and free of all contaminants.
5. The preferred method of surface preparation to produce laitence free roughened side walls is abrasive blasting. Where abrasive blasting is not permitted, disc grinding will be employed. Care should be taken to insure that coarse disc is used so as to produce an abraded surface.
6. The gap openings should be blown out with clean air to remove dust.

3.03 JOINT PROFILE INSTALLATION

A. Install the seal expansion joints in strict accordance with the manufacturers' published installation procedures and typical details.

B. Install the seals in a neat, workmanlike manner. All surfaces to receive seals shall be free from dirt, water and any other loose foreign debris which may be detrimental to effective joint sealing.

C. Prior to installation, the profile shall be uncoiled from shipment packaging and allowed to reach a relaxed condition. Lay out joint material next to its joint opening to check for appropriate length and width. Joint should be oversized the manufacturers recommended amount for the joint opening. Heat weld all directional changes and field splices. All welds shall be allowed to cool before mixing adhesive.

D. Mask the areas adjacent to the joint opening. Be sure that the tape does not actually go into the joint opening but back approximately 1/8" from the joint edge.

E. Apply approved epoxy adhesive continuously to both joint interfaces immediately prior to seal installation to provide watertight assembly. Begin at one end or at or at an intersection / corner. Coat the sidewalls of the joint interface with adhesive starting at the top surface, to a depth equal to the lowest point of the joint profile. Apply the epoxy adhesive to both sides of the concrete substrate surfaces to approximately 40 mils. Apply the epoxy bonder on both surfaces working it in the direction ahead of the joint material, not more than 20 feet ahead.

F. Next, apply the epoxy adhesive to both sides of the joint material. Apply enough to coat the entire joint profile, approximately 40 mils thick. Install the coated material at the curb, intersection, or corner where the epoxy was initially applied on the substrate.

G. The profile should then be inserted into the joint gap using a blunt tool to position it to the proper depth. The joint material should be installed 1/8" below the joint edge and should not protrude above the joint edge.

H. Continue in the same direction as the epoxy was initially applied. Do not push at an angle or pull the material, which will stretch the material.

3.04 JOINT SEALANT

A. Preparation: All oils, grease, dirt, waxes, existing coatings and epoxy from previously placed expansion joint, curing compounds, heavy laitance and sharp edges or protrusions must be removed. New concrete should cure 80% of the design strength. A thorough wire brushing, grinding, or sandblasting of surfaces is recommended to expose clean, sound surfaces.

B. Mixing: Separately mix all of the components thoroughly in conformance with the manufacturer's instructions. Mix as required until completely blended and uniform in color. Avoid entrapping air bubbles during the mixing by keeping the paddle below the surface level. Minimum mixing time to be 6 minutes. The entire contents of all containers must be mixed for proper chemical cure.

C. Application: The minimum width of joint should be 4 times the anticipated movement, but not less than 1/4". Fill the joint completely and tool immediately to insure firm, full contact with the interfaces of the joint. Immediately remove all excess sealant and smears adjacent to joints.

3.05 CLEANING

A. Protect system from damage during construction.

B. Clean the epoxy left on the surface of the material as soon as it is pushed into the desired depth. Do not allow the epoxy to cure before removing it. Use a clean trowel or a putty knife tilted at an angle opposite the direction of movement.

C. After work is complete in adjacent areas, clean exposed surfaces of joint seal with suitable cleaner that will not harm or attack the seal profile or bonding epoxy, or joint sealant, as recommended by manufacturer.

END OF SECTION

SECTION 07 95 13 – EXPANSION JOINT SYSTEM

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Aluminum floor and floor/wall seismic expansion joint assembly(s) used for pedestrian applications for use as construction joint cover plates. Pedestrian expansion joint assemblies are to have:
      a. Surface mounted assemblies that would not require developing block-outs.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 04 22 00: Concrete Masonry Unit
B. Section 05 50 00: Miscellaneous Metals
C. Section 07 92 00: Sealants and Caulking

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   ASTM A209 - Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
   ASTM A221 - Standard Specification for Aluminum and Aluminum Alloy, Extruded Bars, Rods, Wire, Shapes and Tubes.

B. Aluminum Association (AA)

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Shop Drawings: Indicate each different seismic system / type (s) required. Indicate finishes of assembly surfaces to the concrete deck and of the cover plate. Fully detail the system design anchorage to the structure as well as between the system components, overall assembly size and overall profile dimensions, fabricated lengths and splice details at aluminum extrusions and at the gutter system, profile and mounting of centering bar and cover plate, gutter and downspout systems, specific locations within the structure of each different type of system, as applicable and relationship of assembly to adjacent construction affected by installation of this system (deck angles, etc.)

C. Samples: Submit one complete 12" long section of each different type of expansion joint assembly specified. Include all components of the system as well as mounting hardware and the gutter and downspout system materials for the deck joints. The submitted cover plate for each deck system is to exhibit the specified finish, as required for the complete system(s) specified.

1. Samples will be reviewed for conformance to project specifics and design intent. Manufacturers standard assemblies, either as specified herein, or as indicated on the drawings are required to be modified at the manufacturers expense to meet all requirements listed herein, to be considered acceptable.

D. Certification:
   1. Installer is to provide evidence of completing other installations by use of the same system and of the same manufacture, which is similar in size and scope of the work of this project, and was observed / supervised by a representative of the manufacturer, and that said installation complied with all manufacturers requirements.

E. Manufacturer is to submit document that the cover plate size, thickness and bearing on base extrusion of each side of the throat opening conform to the joint openings.

F. Warranty: Submit copies of the 'Joint and Several' manufacturer/installers warranty for review by the Architect, at the same time as for the product submittals. Conditions of the warranty and acceptance of any requested revisions will be used in evaluating/accepting the specified system(s)/product(s) submitted.

1.05 QUALITY ASSURANCE

A. Expansion joint systems / components / materials specified herein by make or model, are to conform to all of the listed performance and warranty requirements specified, to meet the intent of this project, whether indicated on the drawings or not. Contractor and manufacturer are to verify that the correct expansion joint system as specified, meets all of the required criteria.
   1. If there is conflict between what is specified, what is required and what is standard manufacture by the listed manufacturer, question should be raised for clarification from the Architect.
   2. It is the intent of the listed system by make and model, to be a base system from which the manufacturer is to then incorporate the additional design requirements listed to arrive at the modified product that conforms to all of the specified requirements for this project.
   3. The Architect will not accept submittals from manufacturers that do not provide a system that meets all of the performance criteria listed in a design that is acceptable in the opinion of the Architect
   4. Installed work shall conform to the specified requirements, the contract documents, the selected manufacturer's recommendations, to applicable building codes having jurisdiction and to referenced standards. In all cases the most stringent shall govern. Any conflicts between these documents shall be brought to the Architects attention in writing. Failure to document any conflicts will be determined as acceptance of all conditions.
   5. Contractor and manufacturer shall both review the 'Joint and Several' 'No Cost To Owner' warranty requirements specified herein to agree to the terms / extent of the coverage. Failure to document any conflicts or objections to the requirements will be determined as acceptance of all conditions.

B. Obtain all expansion joints assemblies of the same type / function for this project from one manufacturer throughout the project, unless indicated otherwise by the Architect.

C. Installation shall be performed by a manufacturer trained or approved installer or be a certified installation by the Contractor/Manufacturer in conformance with the paragraph of criteria requirements specified under the Submittal sub-paragraph 1.04D, hereinbefore.

D. Pre-construction Meeting: Contractor, Manufacturer's Representative and Certified Contractor will conduct a pre-construction meeting to discuss joint gap settings and construction phasing. This meeting shall be held prior to any concrete placement at the expansion joints and may be held in conjunction with the concrete pre-pour meeting.

E. Joint Opening Adjustment: Project Engineer shall provide calculations to the concrete subcontractor to adjust the nominal joint opening the day of the concrete placement through the use of a "temperature adjustment table" with expansion joint openings calculated in five (5ºF) degree increments based on a temperature range of -20ºF to 120ºF.

F. Pre-installation Inspection: Contractor, Manufacturer's Representative and Certified Contractor will conduct a pre-installation project site inspection. Contractor shall provide a field report that summarizes the project conditions and any remedial action necessary to correct field conditions (substrate, joint size, vertical offsets, etc.) that may affect expansion joint system performance.

1.06 PERFORMANCE REQUIREMENTS

A. Design Movement: System is to be designed to accommodate a maximum seismic lateral movement of not less than 50% maximum movement of the structural joint width throat opening. Allow additional clearances to prevent the assembly from binding or being limited by the width/thickness or movement of its centering bar design, if used.

B. Expansion joints / cover plate assemblies shall not be placed until the structure has undergone its maximum anticipated short term post tensioning shortening and creep. Drawings indicate a size based on the design intent of the expansion joint system in its final configuration after deck shortening. Contractor placing expansion joint(s)/cover plate assemblies prior to the structure experiencing its short term shortening shall replace installed assemblies with properly sized systems that allow for the full range capability required without additional cost to the Owner. Coordinate the required width of joint criteria with the drawings details, construction means and methods and actual deck shrinkage calculations, prior to forming decks.

C. Cover plates are to be extruded or sheared to the required widths and fabricated or machined to produce a pedestrian slip resistant, textured surface finish in conformance with applicable codes.

D. Gutter systems are to be serviceable / replaceable by bolted or screwed fastenings without the need for complete removal of the entire joint assembly and nosing material, if provided. Riveted attachment is not permitted. Moisture / vapor barriers that are the accordion type are not considered substitutions for a 1/2 round continuous flow design. Systems that utilize a snap in or slide into extruded receivers are not considered a securely fastened gutter system and require additional mechanical attachment. Assemblies are to have factory prepared outlet tube downspout connections for dealing with collected water run off.

E. Systems manufactured from 6005-T6 or 6063-T5 alloys that are in contact with concrete must have a chromate protective coating in order to be considered acceptable. Systems manufactured from 6061-alloy are not required to have the required coating. To eliminate this requirement manufacturer must provide a letter from a metallurgist attesting to compatibility of contact. All aluminum system components in contact with dissimilar metals shall have isolation between the contact surfaces to prevent corrosion.

1.07 PROJECT CONDITIONS

A. Coordinate work of other trades to insure cast-in anchor systems, recesses and mounting hardware to be placed into decks are properly formed / placed to correct size / location and requirements needed for compliance with manufacturers installation recommendations and as specified herein.

B. When the cover plate assemblies between the structural components are required to be water tight, provide the manufacturers standard weather back seal, unless indicated otherwise. Where the cover plate assemblies are off set and not completely inline then adjustments shall be made within the assembly to accommodate for the modification so that integrity of the seal can be maintained.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handle to protect finished surfaces from damage before, during and after placement.

B. Deliver materials ready for use, fabricated in as large sections and assemblies as practical. Assemblies shall be identical to submitted and reviewed shop drawings and samples.

C. Remove damaged materials / components from the site and replace with new product.

1.09 WARRANTY

A. Manufacturers providing bid for this project must agree to the conditions of the warranty requirements set forth herein, otherwise are excluded from supplying materials / products and assemblies for this project. Whether specified as an approved system or not.

B. Manufacturer shall warrant to the Owner, upon and subject to the terms and conditions of its standard full written / limited warranty and as revised herein without exclusion. Manufacturer warrants its expansion joints to be free from manufacturing and material defects for a period of two (2) years from the date of installation. Manufacturer warrants that the expansion joint assembly will function as designed / required. The liability of the manufacturer under this warranty shall be joint and several, limited to repair or replacement, materials and labor.
   1. No exclusions shall be made as to installation based on quality assurance requirements listed above.
   2. No exclusions shall be made as to Owners requirement to maintain and use in a manner consistent with manufacturers specifications. Assemblies are to be maintenance free and function as designed for seismic and thermal cycling of the structure.
   3. No exclusions shall be made as to type, weight and speed of the vehicle passing over the joint, with its ability to function as designed.

2.00 PRODUCTS

2.01 MANUFACTURE

A. Floor: Provide a surface mounted pedestrian floor/deck-to-deck expansion joint system of the design specified for the location and application indicated complete, inclusive of all components and anchorage connectors that make up the total system that is to be installed into the Work, as manufactured by one of the following manufacturers:
"HSC Series", manufactured by MM Systems, distributed Specialty Building Components (562) 945-8951;
"Model XX", manufactured by M.H. Powell & Co. Inc. (323) 687-0037;

"FXE-Series", manufactured by Watson-Bowman Acme Corp. (716) 691-7566;
Or equal.

2.02 MATERIALS

A. Aluminum: ASTM B209 6061-T6 alloy or ASTM B221 6063-T5 alloy. Extrusions shall be supplied in minimum 10 ft lengths.

B. Aluminum Conversion Coating: Protect aluminum surfaces in contact with cementitious substrate materials with a zinc chromate primer, chromate conversion or bituminous coating on the contacting surface, unless of an alloy certified in writing by an independent testing lab to not be affected. Protect dissimilar metal surfaces with an isolating grommet.

C. Centering Bars (if used): Provide extruded aluminum bar stock, cast aluminum or rolled stainless steel bar or plate designs that incorporate positive mechanical attachment of the receiver shoe guides. Include all other integral movement enhancing components necessary to meet the performance criteria requirements.

D. Accessories: Provide J-bolt or washer headed hex bolt cast-in anchor bolts of either stainless steel type 613 or galvanized steel with a minimum yield strength of 70,000psi. Include all set screws, spacers, flexible gutters, downspouts and vapor seals, adhesive and other accessories required for a complete installation to meet the specified requirements, and as reviewed by the Architect.

E. Finish: Brushed aluminum with clear anodized finish-AA-C22A41, medium matte etched finish with 0.7 mils minimum thick anodic coating. Provide one of the specified cover plate finishes to conform to the requirements for a friction coefficient / slip resistance factor greater than 0.060

F. Gutter System: Provide a minimum 60 mil continuously reinforced uncured neoprene or EPDM seal system with solvent welded closed end design that meets the requirements listed above. Include a system outlet tube solvent welded to the gutter for connection of a flexible polyethylene downspout tube and required attachment and slice connector(s) required to take the water to the ground or to the applicable deck in a fashion to redirect the discharge, for a complete system of dealing with collected water. At deck-to-wall/column gutters, bring the wall side up to terminate behind to the top of the 4" upturned cover plate.

G. Slide Bearing / Isolation Gaskets: Provide a solid extruded, high shore hardness, non-moisture absorption, high impact strength thermoplastic material that is abrasion resistant, has a low coefficient of friction, is UV- resistant, and has a self lubricating surface. Attachment shall be secured so that the gasket does not move or become dislodged from its original point of placement, due to individual or contributing factors of temperature, compression stress / tension or function. (Polyethylene UHMW-Tivar UV resistant / Curbell 888.287.2355)

3.00 EXECUTION

3.01 INSTALLATION

A. Install joint assemblies in conformance with the manufacturers recommendations, as indicated on Contract Drawings and in accordance with these specifications. Any discrepancies with site conditions or conflict between requirements are to be brought to the Architects attention.

B. Coordinate installation requirements of the cast in place components, where required, with sequencing and scheduling of construction operations / concrete operations, for accurate placement of the cast in-place base extrusions or placement of templates required to accurately set / align anchor bolts prior to deck pour, for subsequent mounting of base extrusion assemblies.

C. Coordinate location(s) of cast-in anchors, where required, at intervals recommended by the manufacturer; but not less than 3 inches from each end and not more than 18 inches on center. Verify that assemblies are fabricated to conform to the same cast in anchor requirements.

D. Provide all embedded anchorage bolts (where required), washers and fasteners for securing expansion joint assemblies, and all drilled-in fasteners for concrete where anchoring members are not embedded (side fastening where approved by the Engineer, prior to execution). Provide fasteners of metal, type and size to suit type of construction indicated.

E. Perform cutting, drilling and fitting required. Install component assemblies in true alignment with adjoining finished surfaces measured from established lines and levels.

F. Maintain continuity of expansion joint cover assemblies with end joints held to a 1/8" minimum and 3/8" maximum. Cut and fit ends to produce joints that will accommodate anticipated thermal expansion and contraction of the type and alloy of metal used to avoid buckling.

G. Install gutter system / vapor barrier systems per manufacturers recommendations and as reviewed by the Architect. Membrane seams and gutter end closures are to be heat or solvent welded as approved by the manufacturer. Drain run-off water to the building perimeter and provide gutter downspout outlet tubes to channel to a lower level or to the storm drain system. Deal with the water runoff as approved by the Architect. Detail proposed conditions on the shop drawing submittal.

H. Fasten cover plates to centering bars, if used, per manufacturers recommended torque requirement. Do not tighten beyond that required which would limit the function or durability of the assembly.

I. Contractor shall witness pedestrian traffic over the completed installation to verify that the assembly functions properly and that the system does not make noise created by contact or vibration. Do not try to remedy the apparent problem by over-tightening the cover plate screws beyond the manufacturers recommended capacity. Consult with the manufacturer and Architect for solution.

J. Contractor shall provide properly formed concrete expansion joint openings constructed to the dimensions and elevations shown on manufacturer’s standard system drawings or as shown on the contract drawings. Any edge or area in need of repair shall utilize structural concrete repair materials that provide a solid and square expansion joint opening. Deviations from these dimensions will not be allowed without the written consent.

K. Contractor shall insure that the joint opening sidewall interfaces run parallel to each other for the entire length of the joint. Sidewalls should be plumb and interfaces must be continuously equidistant from each other across the joint width to accommodate the proper installation of the expansion joint system.

L. Surface areas on each side of the expansion joint opening shall be parallel creating flush slab-to-slab transition. Elevations on each side shall be identical.

3.02 CLEANING

A. Do not remove strippable protective assembly materials until adjacent work is complete.

B. Upon completion of work and removal of the protective wrap, clean exposed metal surfaces per manufacturer's instructions.

END OF SECTION

SECTION 08 10 00 – HOLLOW METAL DOORS AND FRAMES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Hollow metal doors.
2. Pressed steel frames for doors.
3. Installation of hollow metal doors, pressed steel frames and finish hardware.
4. Hollow metal windows
5. U.L. labeled construction, where required.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 04 22 00: Concrete Masonry Unit
B. Section 05 40 00: Light Steel Framing
C. Section 07 92 00: Sealants and Caulking
D. Section 08 70 00: Finish Hardware
E. Section 08 80 00: Glass and Glazing

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)
ANSI A115 Door and Frame Preparation

B. American Society for Testing and Materials (ASTM)
ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A366 Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality
ASTM A526 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A568 Standard Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet
ASTM A569 Standard Specification for Steel, Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
ASTM E152 Standard Methods of Fire Tests of Door Assemblies
ASTM E2010-01 Standard Test Method for Positive Pressure Fire Tests of Window Assemblies

C. National Fire Protection Association (NFPA) - NFPA 80 Fire Doors and Windows
NFPA 252 Standard Methods of Fire Tests of Door Assemblies
NFPA 257 Standard Methods of Fire Tests of Window Assemblies

D. Underwriters Laboratories (UL)
UL 9 Fire Tests of Door Assemblies
UL 10 B Fire Test of Window Assemblies

E. Steel Door Institute (SDI)
SDI 100 Standard Steel Doors and Frames
SDI 105 Recommended Erection Instructions for Steel Frames

F. Hollow Metal Manufacturer's Association (HMMA)

G. National Association of Architectural Metal Manufacturers (NAAMM) - NAAMM 861Guide

H. CCR Title 24 and ADA Requirements

I. American National Standards Institute (ANSI)
ANSI A17.1 Safety Code for Elevators, Dumbwaiter, and Escalators

J. State Fire Marshal Standard Std. 12-7-4

1.04 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames".

B. Fire-Rated Assemblies: Provide fire-rated doors and windows in strict accordance with the requirements of Underwriter's Laboratories or Warnock Hersey Inc., investigated and tested as fire door and window assemblies, complete with type of hardware to be used. Identify each fire door and window with recognized testing laboratory labels, indicating applicable fire rating of steel doors and windows. Construct and install assemblies to comply with NFPA Standard No. 80.

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements, indicating construction, dimensions, hardware preparation, core, label compliance, galvanized coating, etc.

C. Shop Drawings: Detail each different frame section type, door and frame fabrication and method of installation. Indicate dimensions, types of metal, gages, core, frame reinforcement, and details of joints and connections, preparation to receive hardware. Detail conditions at openings. Include all window frame and louver conditions.

D. Provide a schedule relating the type of door and frame to be installed in each scheduled door opening or place of installation, using the same reference numbers for details and openings as those on the Contract Drawings. Indicate and be responsible for fire ratings / label, at each penetration.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver doors, window, and frames palleted, wrapped or crated to provide protection during transport and job storage.

B. Store doors, windows, and frames at the building site under cover, in a dry location on minimum 4 inch high wood blocking. Provide 1/4 inch space between stacked doors to promote air circulation. Cover stacked units to avoid dampness or other wet construction work, to protect from rusting.

C. During and after installation, protect doors, windows, and frames from damage from construction activities. Damaged doors, windows, and frames will be rejected and must be replaced with new doors and frames without additional cost to Owner.

1.07 GUARANTEE

Provide a written guarantee in approved form that all defective materials or workmanship reported within a period one year after final acceptance will be promptly repaired or replaced to the satisfaction of the Owner.

2.00 PRODUCTS

2.01 MANUFACTURE

Products as manufactured by Amweld, Americraft, J-Door, Overly Manufacturing Co., Krieger Steel Products Co., Reliable, Steelcraft, Security Metal Products Corp. or approved equal are acceptable upon Architect's review of shop drawings.

2.02 MATERIALS

A. Cold-Rolled Steel Sheets: Commercial quality level carbon steel, complying with ASTM A366.

B. Hot-Rolled Steel Sheets and Strips: Commercial quality carbon steel, pickled and oiled, complying with ASTM A569, free of scale, pitting or surface defects.

C. Galvanized Steel Sheets: Zinc coated carbon steel sheets of commercial quality, complying with ASTM A526 and ASTM A525 with A60 galvannealed alloyed coating designation, with minimum .0005 inch average coating thickness per side.

D. Supports and Anchors: Fabricate of not less than 16 gage sheet metal. Galvanize after fabrication units to be built into walls, complying with ASTM A153, Class B.

E. Inserts, Bolts and Fasteners: Manufacturers standard units, except hot-dipped galvanize items to be built into exterior walls, complying with ASTM A153, Class C or D as applicable.

F. Shop Applied Paint: Provide a chemical pretreatment followed by a rust inhibitive, air dried primer, compatible suitable as base for specified finish paints or steel coatings on steel surfaces. Refer to Section 09 97 13.

2.03 DOORS

A. General: Provide flush design doors, 1-3/4 inch thick, seamless hollow construction meeting NAAMM Standard HMMA 861, ANSI/SDI-100, unless otherwise indicated.
   1. For single acting swing doors, bevel both vertical edges 1/8 inch in 2 inches. For double acting swing doors, round vertical edges with 2-1/8 inch radius.
   2. Reinforce doors with rigid tubular frame where stiles and rails are less than 8 inches wide. Form tubular frame with 16 gage steel, welded to outer sheets.

B. Doors: Fabricate doors of 2 stretcher leveled galvanized steel sheets not less than 18 gage in conformance with ASTM A653A/653M-98, A60 coating. Construct doors rigid, with smooth, flush surfaces, neat in appearance, without visible joints or seams on exposed faces or stile edges, except around glazed or louvered panel inserts, and free from defects, warp or buckle. Provide weep hole openings in the bottom of doors to permit escape of trapped moisture. All doors shall be considered exterior unless indicated otherwise.
   1. Reinforce inside of doors with vertical galvanized steel sections not less than 22 gage. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot weld at not more than 5 inches o.c. to both face sheets.
   2. Reinforce top and bottoms of doors with 18 gage horizontal steel channels welded continuously to outer sheets. Close top and bottom edges to provide flush, waterproof weather seal, as integral part of door construction or by addition of inverted steel channels.

C. Hardware Reinforcements: In accordance with ANSI/SDI 100, Table IV, Hardware reinforcing gages and Table V Hardware Locations, and per templates furnished by hardware supplier. Conform to approved hardware schedule and templates.
   1. Mortise, reinforce, drill and tap doors at factory for fully recessed hardware.
   2. Where surface mounted hardware is to be applied, doors shall have reinforcing plates only; drilling and tapping shall be done in the field, by installer.
   3. Minimum gages for hardware reinforcing plates:
      a. Hinges and Pivots: 8 gage thick by 12 inch wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
      b. Lock Face, Mortise, Flush Bolts, Closers and Concealed Holders: 14 gage.
      c. All Other Surface Mounted Hardware: 18 gage.

D. Non Rated Louvers: Louvers shall be stationary sightproof type. Construct of minimum 20 gage galvanized steel, 1" deep inverted "V", chevron pattern, with extended vanes and flush moldings. Provide 18 gage galvanized steel screen set in steel frames. Build into doors without use of applied moldings. Products as manufactured by Airolite, Construction Specialties, Overly, Ventilouver or equal.

2.04 PRESSED STEEL FRAMES

A. Meet requirements of NAAMM Standard HMMA 861, and ANSI/SDI-100 for doors, unless otherwise indicated.

B. Fabricate frames of minimum 16 gage galvanized steel in conformance with ASTM A526 A60 coating, fully welded one piece welded unit construction with corners mitered, reinforced continuously welded full depth and ground smooth, to a true plane, flush with surfaces of base metal and free of defects impairing strength, durability and appearance. Surfaces shall be free of warp, wave, buckle and other defects, with edges, angles and corners square, clean and sharp. All frames are to be considered exterior unless indicated otherwise. Knock-down type frames are not acceptable.

C. Finish Hardware Reinforcement: Minimum gages of steel reinforcing plates for the following hardware shall be:
   1. Hinges and Pivots: 8 gage thick by 12 inch wide by 6 inches longer than hinge, secured by not less than 6 spot welds, cut out, drilled and tapped.
   2. Locks, Strikes, Mortise, Flush Bolts, and Closers: 14 gage.
   3. Surface Mounted Hold-Open Arms: 14 gage.

D. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at top for grouting.

E. Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction, formed of not less than 18 gage galvanized steel, space not exceeding 24" o.c.
   1. Masonry Construction: Adjustable flat, corrugated or perforated, T-shaped to suit frame size with leg not less than 2 inches wide by 10 inches long. Arrange anchors to provide vertical adjustment to coincide with horizontal masonry joints. Furnish at least 3 anchors per jamb up to 7'-6" height; 4 anchors up to 8"-0" jamb height; one additional anchor for each 24 inches or fraction thereof over 8'-0" height.

F. Floor Anchors: Attach 14 gage galvanized steel floor clips, spot welded to each jamb, and punched for anchorage to floor for each jamb and mullion that extends to floor formed of not less than 14 gage galvanized steel. Provide clip type anchors with 2 holes to receive fasteners, welded to bottom of jambs and mullions.

G. Head Anchors: Provide 2 anchors at head of frames exceeding 42 inches wide for frames mounted in steel stud walls.

H. Spreader Bars: Provide removable spreader bar across bottom of frame, tack welded to jambs. Do not remove steel spreader until frames are securely anchored in place, square and plumb.

I. Rubber Door Silencers: Except on weather stripped doors, drill stop in strike jamb to receive 3 silencers on single door frames and drill head jamb stop to receive 4 silencers on double door frames. Install plastic plugs to keep holes clear during construction.

J. Plaster Guards: Provide 24 gage steel plaster guards or dust cover boxes, welded to frame at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.05 FABRICATION

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously; grind fill, dress and make smooth, flush and invisible.

B. Exposed Fasteners: Provide countersunk holes for exposed screws and bolts.

C. Finish Hardware Preparation:
   1. Prepare doors and frames to receive finish hardware, including cutouts, reinforcing, mortising, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 series specifications.
   2. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.
   3. Locate finish hardware in accordance with governing codes and in conformance with "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames," published by Door and Hardware Institute.

D. Shop Priming: Clean, treat and prime exposed surfaces of steel doors and frames, including galvanized surfaces.
   1. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of primer.
   2. Apply pretreatment to cleaned metal surfaces, using cold phosphate solution (SSPC-PT2), or hot phosphate solution (SSPC-PT4). No zinc chromate-vinyl butyryl solutions.
   3. Apply shop coat of primers within the time limits recommended by pretreatment manufacturer. Apply a smooth even coat of primer for a uniform dry film

thickness of not less than 0.7 mils. Comply with primers and/or intermediate coats in conformance with Section 09 97 13.

3.00 EXECUTION

3.01 GENERAL REQUIREMENTS

Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect all conditions which prevent proper execution of this work.

3.02 FRAME INSTALLATION

A. Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames and in accordance with NAAMM Standard HMMA 840 and 861

B. Install frames and accessories in accordance with manufacturer's instructions, approved shop drawings, and in conformance with all reference standards and as required by these Specifications.

C. Install work complete, accurately in position, straight, plumb, level, in true alignment, without warp or twist securely anchored and weather-tight and close fitting.

D. Installation in Masonry Walls: Erect frames in position, plumbed and securely braced, with clip angles attached to floor or sill. Provide at least 3 adjustable masonry anchors per jamb with sufficient adjustment to permit placing anchors in joints without bending. Install horizontal spreaders to keep jambs from bowing as frames are being filled with grout or mortar where required. Adjustable anchors include masonry wire anchors and masonry T-shaped anchors. Erect masonry after frames are installed and fill frame with grout mortar as erection of wall progresses.

E. Floor Anchors: Use masonry anchorage devices and machine screws. Powder actuated fasteners may be used, where approved in advance by the Architect.

3.03 DOOR INSTALLATION

A. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
   1. Jambs and Heads: 3/32 inch.
   2. Meeting Edges, Pairs of Doors: 1/8 inch.
   3. Bottom: 3/8 inch where no threshold.

B. Place fire-rated doors with clearances as specified in either UBC Section 713 or NFPA Standard No. 80.

C. Install doors and frames complete with all finish hardware specified under Section 08700, Finish Hardware. Install labeled doors in compliance with testing agencies requirements for the indicated class.

3.04 HARDWARE

A. All heights and locations shall be in compliance with applicable handicap codes of jurisdiction including CCR Title 24 Amendments to the Building Code and Americans with Disabilities Act of 1990 (ADA). Consult the Architect of any discrepancies prior to installation. Non-conforming work shall be replaced at no additional cost to Owner.

B. Location of Hardware:
   1. Door Latch Sets: Centered 38" above floor.
   2. Cylinder Deadlocks: 44 " above floor.
   3. Top Hinge: Top edge 5" below head of frame.

4. Bottom Hinge: Lower edge 10" above floor.
5. Intermediate Hinges: Equidistant between top and bottom hinges.

3.05 SEALANT

Seal and caulk perimeter of door frames and window frames where shown or required to fill space between frame and adjoining material. Sealant materials and applicable requirements of Section 07 92 00 apply to this work.

3.06 FINAL ADJUSTMENTS

A. Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and replace defective work, including doors and frames that are warped, bowed or otherwise unacceptable.

B. All materials and quality of work is subject to review by inspectors retained by the Owner.

3.07 TOUCH UP

Immediately after erection, touch up abraded surfaces by sanding smooth any rusted or damaged areas of prime coat and apply touch up with the same material used for shop priming.

END OF SECTION

SECTION 08 41 13 – ALUMINUM-FRAMED STOREFRONTS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to the work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Aluminum storefront window wall framing system complete, including rails, furring block and shims, accessories, reinforcements, etc.
2. Brackets, clips, attachments, fasteners and anchorage devices needed for support of work of this Section.
3. Complete design, (drawings / calculations), fabrication and installation responsibility.
4. Protection of metal against galvanic action.
5. Caulking and sealants.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 01 35 00: Special Project Procedures
B. Section 04 22 00: Concrete Masonry Unit
B. Section 05 50 00: Miscellaneous Metal
C. Section 07 92 00: Sealants and Caulking
D. Section 08 80 00: Glass and Glazing

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
- ASTM A36 Standard Specification for Structural Steel
- ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A446 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical Quality)
- ASTM B136 Method of Measurement of Stain Resistance of Anodic Coatings on Aluminum
- ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes
- ASTM B244 Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instrument
- ASTM E283 Standard Specification for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors
- ASTM E330 Standard Specification for Standard Test Method for Structural performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- ASTM E331 Standard Specification for Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
- ASTM E783 Standard Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

B. National Architectural Aluminum Materials Manufacturers (NAAMM).

C. American Architectural Manufacturers Association (AAMA).

D. California Building Code (CBC) – Chapter 24 A, Section 2404 and CBC Chapter 35 reference to Uniform Building Code Standards.

1.04 SUBMITTALS

A. Submit to the Building Department the drawings with calculations as required for the deferred approval. Refer to Section 01 35 00.

B. Provisions: Comply with Section 01 30 00.

C. Product Data: Manufacturers standard details and fabrication methods, data on finishing, hardware and accessories and recommendations for maintenance and cleaning of exterior surfaces.

D. Shop Drawings:
1. Complete fabrication and erection details showing the construction of all items furnished including system component sections, dimensions, components within assembly, framed opening requirements and tolerances, anchorage, fasteners, provisions for expansion and control joints, glazing details, installation, connections to adjacent work and details where adjoining construction abuts or penetrates the system. Where items must fit spaces previously constructed, take measurements at the site, not from drawings.
2. Draw elevations, plans, wall layout, extrusions and other detailed conditions, profiles, moldings, dimensions and reinforcements. Indicate weep hole locations and anticipated isolation of dissimilar material.
3. Provide dimensioned die drawings for all aluminum extrusions. In the event that extrusion profiles are not finalized, provide die drawings for the profiles contemplated at that time. If profiles are revised, provide revised die drawings with the first calculations or shop drawing submittal that follows the revision. Die drawings shall show all profile dimensions, metal thickness, alloy and temper.

E. Structural Calculations: Submit engineering calculations verifying the structural performance of the framing support system, verifying the framing assembly's ability to meet or exceed design and code requirements. Structural calculations shall be sealed by a licensed professional engineer in the State of California, prepared in compliance with referenced documents and these specifications. Test reports are not an acceptable substitute for calculations. Calculations shall include the following:
1. Analysis for all applicable loads on framing members and analysis of attachment to structure.
2. Analysis for all applicable loads on anchors, including anchors.
3. Section property computations for framing members.
4. Indicate that anchorage and structural sections have been designed to withstand stresses specified hereinafter under Article 1.06 "Design Criteria". The Engineer may use standard tables of the manufacturer for the aluminum sections being used, subject to review by the Architect.
5. Coordinate and provide glass manufacturers wind and thermal stress analysis, and center deflection calculations showing that specified maximum probabilities of breakage are not exceeded.

F. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum framing systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

G. Samples:
1. Submit samples 12 inch in length of approved section demonstrating aluminum extrusions, plates and sheets in specified finish. Submit sufficient quantity of samples to demonstrate the extreme limits of color range within which the production materials will be prepared.
2. Glass, refer to Section 08 80 00 Glass and Glazing.
3. Sealant in specified color.
   a. Sealants used between window framing and building unit, refer to Section 07 92 00, Sealants and Caulking
   b. Sealants used for glazing work, refer to Section 08 80 00, Glass and Glazing.

1.05 QUALITY ASSURANCE

A. Manufacturer shall be regularly engaged in the engineering, manufacturing, fabrication, finishing and installation of window work and accessories of the same magnitude as required for this project. When requested provide proof for finishing and installing this type of work for at least five (5) years. Selected manufacturer shall not subcontract the work.

B. Comply with the requirements and recommendations and all standards by NAAMM, AAMA and ASTM.

C. Framing systems shall be designed, fabricated and installed so that component materials are able to withstand structural loading, thermal movement, wind loads and deflection without buckling, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, stress on glass or other detrimental effects.

D. Single Source Responsibility: Obtain aluminum framing systems from one source and from single manufacturer.

1.06 DESIGN CRITERIA

A. Design Responsibility: The contractor / manufacturer is responsible for methods and means of joining, fabrication, assembly, structural strength, erection and for compliance with all design criteria, including structural performance, air infiltration and water penetration requirements indicated. This responsibility includes compliance with requirements of this Section and with applicable portions of Section 07 92 00, Sealants and Caulking.
1. Architectural drawings are diagrammatic. The architectural details shown are intended as a guide for the aesthetic and interfacing requirements of the various components of the wall to and with other work. The requirements shown by the details are intended to establish basic dimensions of the module and the sight lines, jointing and profiles of members. The Contractor is responsible for the design and engineering of the system within these aesthetic parameters. The drawings are not to be construed as engineering design, or adequate to meet the engineering design requirements.
2. It is recognized that the architectural design details do not cover some conditions or modifications, which may be required. It is, however, intended that conditions not detailed shall be developed through the Contractor's shop drawings to the same level of aesthetics and in compliance with performance criteria as indicate for detailed areas and as stipulated in these specifications. The Contractor, by accepting a contract for the work, acknowledges this and agrees that the

Architect shall have the final say as to all matters whether detailed or not on the architectural design details.

3. Proprietary section profile(s) drawn shall not be considered as an exclusion right of the manufacturer detailed. Alternate manufacturers from that drawn or those listed will be considered acceptable if their system design conforms to indicated design intent / profiles and meets all design and load criteria specified and other conditions of usage anticipated.
4. Internal reinforcing details indicated / suggested shall not act to limit design. If manufacturer normally uses other means to accomplish purpose, with equal or better performance, manufacturer's standard procedure is preferred, if approved.
5. Manufacturer's innovative detailing to accommodate difficult conditions shall not act to relieve manufacturer of responsibility to conform to code and design requirements.
6. System design adequacy shall be demonstrated by complete framing and glazing calculations. Incorporate glass thickness, methods of glazing with indication of proposed dimension of glazing rebate, framing anchors, framing sections, supports, etc.
7. Submit design calculations for approval in accordance with the Aluminum Association's, Aluminum Construction Manual, Specifications for Aluminum Structures, specific for the proposed pertinent framing alloy, and as specified herein.

8. Meet or exceed all applicable code requirements, including CCR Title 8 - CBC requirements demonstrating compliance therewith.

B. Design Wind Loads

		Design Pressure - (lb./ft.)	
		Inward	Outward
1.	All levels	20	20

2. Provide assemblies capable of withstanding wind pressures of inward and outward acting normal to plane of wall. Wind load design shall meet or exceed the CBC code requirements. Design wind load shall incorporate a safety factor of 2.5 for glass.

C. Structural Tolerances: Design framing systems to provide component materials to accommodate thermal expansion and contraction movement resulting from metal surface temperature range of 180 deg. F. (100 deg C) when building structure is maintained at constant temperature.

D. Performance Requirements:
1. Deflection: 1/175th of span of any member, but not to exceed 1/2", for wind loads both parallel and normal to the plane of the wall. Accommodate 3/8" differential vertical live load movement of floors.
2. Uniform Wind Load: Deflection of framing members to comply with ASTM E330 with safety factor of 1.5 times design wind pressure (positive and negative). Deflection of any member carrying its full dead load shall not exceed amount that will reduce glass bite below 75 percent of design dimension and shall not reduce edge clearance between member and fixed panel, glass or other fixed member above to less than 1/8 ".
3. Uniformity of Surface: Offset from true alignment between consecutive components in line shall not exceed 1/16", except that at abutting materials, offset shall not exceed 1/32".
4. Water Penetration: Provide framing systems with no uncontrolled water penetration (excluding operable door edges) as defined in the test method when tested in accordance with ASTM E331 at inward test pressure differential of 6.24psf. Drainage system to be complete with weeps, baffles and gutters to prevent accumulation of water.
5. Air Leakage: Rate of air infiltration to be not more than 0.06psf of fixed area (excluding operable door edges) when tested in conformance with ASTM E283,

based on static pressure differential and wind velocity, at an inward test pressure differential of 6.24psf.

6. Condensation Resistance: Where framing members are "thermal-break" construction, provide units tested for thermal performance in accordance with AAMA 1503 showing condensation resistance factor (CRF) of not less than 45.
7. Thermal Transmittance: Provide framing systems that have overall U-value of not more than 0.65 BTU/(hr.x sq. ft. x deg F) at 15 mph exterior wind velocity when tested in accordance with AAMA 1503.
8. Glazing Rebate: Provide 1/8" thick glazing bead or gasket each face of glass; minimum depth 1/2" deeper than glass thickness. Comply with California Building Code Chapters 24 and 35 with Uniform Building Code standards.

E. Drainage System:
1. Provide complete system with weeps, baffles and gutters to prevent accumulation of water.
2. Design to resist pumping action of design temperature variations and wind pressures.

1.07 PROJECT CONDITIONS

A. Verify openings by accurate field measurements before fabrication. Record measurements on shop drawings. Coordinate fabrication schedule with construction progress/operations to avoid delays in the work.

B. Where necessary, proceed with fabrication without field measurements and coordinate fabrication tolerances to ensure a proper fit.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect system components and assemblies so as to prevent damages at all times.

B. All materials delivered to the site shall be stored in spaces provided. Materials shall be stored neatly, properly stacked and protected from damage.

C. Deliver other materials, except bulk materials, to project site in manufacturers unopened containers with name, brand, type, grade and color fully indicated. Store bulk materials to protect against effects of weather, soiling or contamination.

D. Provide wrapping to protect pre-finished aluminum surfaces.

1.09 GUARANTEE/WARRANTY

A. Contractor shall furnish an unconditional guarantee on all portions of window walls, against evidence of abnormal deterioration, leakage of water or air, structural failure of components, deterioration or discoloration of finish in excess of normal weathering and aging, improper installation and failure of the work to fulfill specified performance requirements, and any other defects for a period of two (2) years after final acceptance of building. Make good any defects during said guarantee period without cost to Owner.

B. Provide manufacturers extended warranty for glazing components and aluminum performance coatings, as specified. Provide manufacturers standard twenty (20) year warranty (Kynar) against evidence of abnormal discoloration or deterioration of finish in excess of normal weathering and aging.

2.00 PRODUCTS

2.01 MANUFACTURE

A. Glazing Support and Framing: System materials detailed establish design intent, basic sizes, types and profiles. Products as manufactured by Arcadia, Architectural Products, Guaranteed Products, Kawneer, PPG Industries Inc., Sun Valley Products, United States Aluminum Corporation, Inc., Vistawall or approved equal will be acceptable, provided manufacturers meet the design criteria specified herein and as required by elevator / building codes.

1. Provide aluminum center glazed framing sections. Fabricate to dimensions and shapes as indicated with any modifications as detailed.
   - Center glazing section to be 2" x 4-1/2". Arcadia AR450 Series (Non-Thermal), or equal.
2. Provide aluminum inboard glazed framing sections. Fabricate to dimensions and shapes as indicated with any modifications as detailed.
   - Elevator Storefront System using captured face offset framed and glazed in-board / reverse mounted glazing system incorporating 2" x 4-1/2" aluminum sections in conformance with drawing details and elevator codes. Arcadia AF450+ Series (Non-Thermal), or equal.

2.02 MATERIALS

A. Aluminum Members: Provide 6063 T5 alloy and temper, or as recommended by the manufacturer for strength, corrosion resistance and base for specified finish. Comply with ASTM B221 for aluminum extrusions, ASTM B209 for aluminum sheet or plate, and ASTM B211 for aluminum bars, rods and wire. Not less than 0.125 inches thick for framing and not less than 0.050 inches thick for glazing moldings.

B. Steel Reinforcement:
1. Carbon steel for reinforcement of aluminum framing members shall comply with ASTM A36 for structural shapes, plates and bars, ASTM A611 for cold rolled sheet and strip, or ASTM A570 for hot rolled sheet and strip. Sizes as required to meet structural requirements for their use.
2. Embeds: Designed and furnished by the Contractor for placement in surrounding conditions per layout and placement drawings furnished by the Contractor. Installation of embeds shall be by others per these drawings. All embeds shall be galvanized.

C. Fasteners: Aluminum, nonmagnetic stainless steel, zinc plated steel or other material warranted by the manufacturer to be non-corrosive and compatible with aluminum components, hardware, anchors and other components.
1. Reinforcement: Where fasteners screw-anchor into aluminum members less than 0.125 inches thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in-splined grommet nuts.
2. Exposed Fasteners: Do not use exposed fasteners. Use Phillips flat head machine screws that match the finish of member or hardware being installed.

D. Concealed Flashing: 0.0179 inch (26 gage) minimum dead-soft stainless steel or 0.026 inch thick minimum extruded aluminum of alloy and type selected by manufacturer for compatibility with other components.

E. Brackets and Reinforcements: Provide high-strength aluminum brackets and reinforcements where use of aluminum is not feasible provide nonmagnetic stainless steel or hot dip galvanized steel complying with ASTM A123.

F. Gaskets and Weather Stripping: All gaskets and weather stripping shall be neoprene, complying with ASTM D2000 or molded PVC complying with ASTM D2287. All gaskets, weather stripping and spacers shall have continuous mechanical engagement to framing

members. All weather strips and gaskets shall be continuous with vulcanized/molded corners.

1. Sponge gaskets and weather stripping or spacers shall be extruded black neoprene with a hardness of 40"5 duro-meter Shore A and conform to ASTM C509. Sponge gaskets shall be compressed 20% to 35% in the final installed position.
2. Dense gaskets and weather stripping shall be extruded black neoprene conforming to ASTM C864 with a hardness of 75"5 duro-meter Shore A for hollow profiles and 60"5 for solid profiles.

G. Glass and Glazing: Comply with Section 08 80 00.

H. Perimeter Sealant: Comply with Section 07 92 00, Sealants and Caulking.

1. All exterior sealants shall be silicone. Colors shall be as selected by the Architect from manufacturer's standard palette with the choice of custom colors.
2. Internal sealants that contact exterior perimeter sealants must be compatible and adhere to the perimeter sealant. Internal sealants used to seal glass pockets, end dams and gutters shall be silicone. Splice details shall be silicone and / or a non-curing, non-hardening, non-skinning butyl. Splice details to accommodate the anticipated movement of the joint.

2.03 FABRICATION

A. General:

1. Fabricate aluminum components to designs, sizes and thickness indicated and to comply with indicated standards. Sizes and profile requirements are indicated on the drawings. Variable dimensions are indicated with maximum and minimum dimensions required to achieve design requirements and coordination with other work.
2. Fabricate in complete units, where possible. Provide stiffeners when required and locate them inside extrusions. Conceal all welds, fasteners and anchors. Provide for weep drainage to the exterior. Framing / panels shall have no uneven surface, no waves or oil-canning with sawed edges hand filed.

B. Thermal Break: Fabricate framing systems with an integrally concealed, low conductance thermal barrier located between exterior materials and exposed interior members to eliminate direct metal-to-metal contact.

C. Prefabrication: Complete fabrication, assembly, finishing, hardware application and other work to the greatest extent possible before shipment to the project site. Disassemble components only as necessary for shipment and installation.

1. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces. Complete these operations for hardware prior to application of finishes.
2. Do not drill and tap for surface mounted hardware items until time of installation at project site.
3. Fabricate frames allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.
4. Rigidly fit and secure joints and corners with screw and spline. Make joints and connections flush, hairline and waterproof.
5. Handle glazing stops carefully to prevent damage or marking and secure accurately in place. Glass and glazing work shall be done in accordance with procedures recommended in Glazing Manual of Flat Glass Marketing Association.

D. Welding: Comply with AWS recommendations. Grind exposed welds smooth to remove weld spatter and welding oxides. Restore mechanical finish. Welding behind finished

surfaces shall be performed in such a manner as to minimize distortion and discoloration on the finished surface.

E. Reinforcing: Install reinforcing as required for hardware and as necessary for performance requirements, sag resistance and rigidity.

F. Dissimilar Metals: Comply with NAAMM minimum standards for "Protection of Metals." Where aluminum materials are placed in contact with, or fastened to dissimilar metals or where aluminum materials are placed in contact with, or built into, concrete or masonry, apply one coat of alkali resistant bituminous paint or a suitable sealant, or a non-absorptive plastic or elastomeric tape, or a gasket between the surfaces to conceal aluminum and steel surfaces in contact with cementitious or dissimilar materials.

G. Fasteners: Conceal fasteners wherever possible.

2.04 FINISHES

A. It is the intention of this specification that the color variation between adjacent parts of the same finish be imperceptible to the naked eye under normal daylight conditions. To this end, the Contractor shall submit range samples defining the maximum variation of color that can be anticipated in the work. Samples shall be on lengths of extrusions not less than 12" and on sheet/plate/panels not less than 24" square. Pieces abutting or within 6" of each other in the construction shall not vary in color by more than 2 the range so as the variation to be imperceptible to the naked eye under normal daylight conditions. Parts shall be carefully inspected in the shop and graded for assembly compatibility and marked for installation location.

B. Kynar Finish – 3 Coat System:
1. Finish aluminum with Pennwalt Corporation "Kynar 500" "Duranar 500", or approved equal with fluorocarbon resin (Vinylidene Fluoride) minimum 70% resin content. Apply organic coating in factory and artificially cure in baking ovens. Provide organic coating manufactured by licensed formulator and applied by licensed applicator of formulator.
2. Pre-treat and prime aluminum extrusion substrate in conformance with licensed formulator's specifications and licensed applicator's procedures.
3. Gloss, texture and color as selected by Architect.

B. Structural Steel Shapes: Supports, stiffeners, reinforcement, attachments and anchorage, if required, shall comply with ASTM A36, primed with one coat zinc-chromate alkyd primer after welding and cleaning of welds. Zinc Chromate primer shall conform to Federal Specification No. TT-P-645, Formulation No. 84/47 alkyd green zinc-chromate primer.

3.00 EXECUTION

3.01 EXAMINATION

Examine substrates and supports for compliance with code requirements, installation tolerances and other conditions that effect installation of the aluminum framing. Do not proceed with installation until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install framing and anchorage in accordance with manufacturer's instructions, approved shop / erection drawings, in conformance with reference standards and as required by these specifications.

B. Install work of this section complete, straight, plumb, level, true to line and in proper alignment, without warp, twist or rack, securely anchored and weather tight. Set frames with all joints drawn up tight, close fitting and securely in place. Provide templates for setting anchors and for holding critical erection dimensions.

C. Supporting brackets shall be designed to provide three-dimensional adjustment for accurate location. Once properly positioned all connections shall be rigidly fixed by welding or other positive mechanical means.

D. Welding shall be by certified welders. Welds shall be ground smooth and primed with a zinc rich primer. Protect adjacent surfaces from damage.

E. Expansion anchorage shall be so designated to provide for thermal and building movements. Anchorage design shall provide for unrestricted movement. Nylon slip pads or washers shall be used at all thermal or dynamic anchors.

F. Pack fibrous insulation in shim spaces around perimeter of assembly to maintain continuity of thermal barrier. Install seal / vapor barrier flashing membrane materials and sill flashings where applicable.

G. Isolate aluminum from other metal surfaces to protect against corrosion or electrolytic action at points of contact.

H. Set sill members in a bed of sealant to provide weather-tight construction. Allow 3/8 inch for caulking between system and adjacent construction at heads, jambs and sills of system. Before applying sealant, clean contact surfaces. Sealant shall be tooled to fill the joint and provide a smooth finished surface adhered to both sides of the joint. Three-sided adhesion is not permitted. Install in accordance with Section 07 92 00, Sealants and Caulking.

I. Refer to Section 08 80 00, Glass and Glazing for installation of glass indicated to be site glazed into framing and not pre-glazed by manufacturer.

3.03 FIELD QUALITY CONTROL

A. Tolerances:
   1. Variation from plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.
   2. Offset from Alignment: Maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
   3. Diagonal Measurements: Maximum difference in diagonal measurements shall not exceed 1/8 inch.
   4. Offset at Corners: Maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.

3.04 CLEANING

A. Clean the completed system, inside and out promptly after installation, exercise care to avoid damage to coatings. Remove protective material from pre-finished aluminum surfaces.

B. Wash exposed surfaces using a solution of mild detergent in warm water applied with soft, clean wiping cloths. Take care to remove dirt, mastic and smears from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

D. Repair scratched surfaces using the manufacturers supplied materials to match specified factory finish. Touch-up procedure is to be acceptable to the Architect with repairs not visible from a distance greater than five feet.

END OF SECTION

SECTION 08 70 00 – FINISH HARDWARE

1.00 GENERAL

1.01 SCOPE

A. Requirements of General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Finish hardware, including hinges, lock cylinders, lock and latch sets, closers, stops, seals, silencers, flush bolts, etc.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 05 50 00: Miscellaneous Metal
B. Section 08 10 00: Hollow Metal Doors and Frames
C. Section 32 31 13: Chain Link Fences and Gates

1.03 REFERENCE STANDARDS

A. California Building Code (CBC) 2016 Edition.

B. National Fire Protection Association (NFPA) Fire Doors and Windows Code 80.

C. California Code of Regulations (CCR), Title 24 State Building Code and Accessibility requirements.

D. California Code of Regulations (CCR) Title 19 - Public Safety.

E. California State Fire Marshall Regulations.

F. Americans with Disabilities Act of 1990 (ADA) requirements and ADASAD Standards for Accessible Design.

G. Underwriters Laboratories (UL) and Warnock Hersey Industries (WHI)

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Submit manufacturer's technical product data for each item of hardware. Show compliance with requirements.

C. Hardware Schedule: Contractor shall submit prior to delivering hardware to the site a hardware list and schedule together with catalogue cuts 6 copies, listing each different item required, for review per Division I. Show all finishes, sizes, catalog numbers. Explain fully all abbreviations. Approval of the hardware schedule by the Architect does not relieve the hardware supplier from the responsibility of furnishing the job complete. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function, finish of hardware and code conformance. The hardware

schedule and groups listed herein are to be used only as a guide and not pressured to be accurate and/or complete.

1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Separate hardware sets shall be used for doors of different sizes or where hinges, closers or locks are different. No labeled openings shall be combined with non-labeled openings. Include the following information:
   a. Type, style, function, size and finish of each hardware item. All finishes shall be uniform for each door and group of visually related doors.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of hardware set cross-referenced to indications of Drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
   f. Mounting locations for hardware.
   g. Door and frame sizes and materials.
   h. Keying information.
2. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.
3. Keying Schedule: Final instructions on master keying of locks as instructed by Owner.
4. Samples: When so requested by the Architect and prior to submittal of the final hardware schedule, submit one sample of each type of exposed hardware unit, furnished as required, and tagged with full description for coordination with schedule.
5. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.
6. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper locations and installation of hardware.

D. Tools and Maintenance Instructions: Furnish as part of contract closeout, instructions for installation and for maintenance of operating parts and finishes. Include a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, removal and replacement of finish hardware.

1.05 REQUIREMENTS

A. All hardware and installation shall comply with the State of California architectural barrier laws, CCR Title 24, and American with Disabilities Act.
   1. Thresholds in the path of travel shall be in conformance with Section 11B-404.2.5.
   2. Closer effort shall be 5 lbs. at exterior / interior doors per Section 11B-404.2.9.
   3. The authority having jurisdiction may increase the maximum effort to operate fire doors to achieve positive latching, but not to exceed 15 lbs. maximum.
   4. Door closer delay time shall comply with 11B-404.2.8.1.
   5. Flush bolts in the path of travel must be accessible / automatic flush bolts.

6. Hand activated hardware between 30” and 44” AFF per Section 11B-404.2.7; shall be level type hardware, panic bars, push-pull activating; lever

B. Include all finish hardware required for completion of the work except as otherwise specified as included as a part of equipment to be installed. When taking off quantities, check drawings, details, and specifications (hardware groups) carefully to see that all items are included/correct, including brackets, hangers, etc. Contractor shall furnish all items of finish hardware required for the entire project, even though some items may have inadvertently been omitted from the Drawings and schedules of this Specification. Any such omitted finish hardware items shall be furnished of a quality equal to similar scheduled items or lacking similar scheduled items. All items exposed to the public shall be secured with vandal-proof fastenings.

C. Drawings show direction of swing of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Exit doors, including but not limited to doors of equipment, toilet and storage rooms, shall conform to the requirements of Title 24 CCR and CBC Section 1008.1.3.

E. Exit doors shall be operable from the inside with non-grip operable hardware that does not require the use of a key or any special knowledge or effort.

F. Panic hardware shall comply with CBC Standards and shall be mounted above 36” to 44” above finished floor surface. Panic hardware shall comply with CBC Chapter 11B-309.4.

G. All exterior doors shall have a dead bolt with 1" throw and hardened steel inserts unless otherwise required by building codes and ordinances.

1.06 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware as differentiated in this Sections' "Manufacturers" list from a single manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: Must be a direct factory contract finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project's vicinity for a period of not less than 5 years. The supplier must employ an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

C. Substitutions shall be made in conformance with requirements of Division 1. Substitution requests shall be accompanied with substantiating data to support equivalency of design, quality, function and service.

1.07 PRODUCT HANDLING

A. Tag each item or package separately, with identification related to final hardware schedule. Hardware shall be scheduled according to opening references showing direction, hand and type of door and frame. Also room and number where opening is located. Deliver all hardware to the job site. Include basic installation instructions with each item or package.

B. Hardware shall be assembled with each package distinctly marked for contents and intended opening and use as indicated on the Hardware Schedule. Upon each delivery, furnish a check list in duplicate to the Contractor. Checking shall be by labeled content. No package shall be opened except at time and place of installation.

C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the work will not be delayed by hardware losses, both before and after installation.

1.08 WARRANTY

All hardware shall be warranted for a period of two (2) years after date of Substantial Completion. Defects in materials and workmanship occurring during the warranty period shall be corrected to the complete satisfaction of the Owner. Furnish a 30-year warranty for door closers.

2.00 PRODUCTS

2.01 MANUFACTURE

A. Requirements for design, grade function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Schedule at the end of this section.

B. Manufacturer's Product Designations: One or more manufacturers are listed for each hardware type required. Provide either the product designated, or where more than one manufacturer is listed, the compatible product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.

2.02 MATERIALS

A. Base Metals: Produce hardware units of metal and forming methods indicated as manufacturers standard metal alloy, composition, temper and hardness, but in no case of lesser quality than specified for applicable ANSI A156 series standard for each type hardware item and finish designation indicated. Do not furnish optional materials or forming methods for those indicated, except as otherwise specified.

B. Fasteners: Provide hardware manufactured to conform to published templates prepared to machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
   1. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws for non-public fastenings, except as otherwise indicated. Finish exposed screws to match hardware finish, or if exposed in surface of other work, to match finish of such other work as closely as possible, including prepared for paint in surfaces to receive painted finish.
   2. Provide sex nuts and bolts for all door closers.
   3. Provide machine screws and anchors for all thresholds to be installed over concrete floors.

2.03 HINGES

A. Number of Hinges: Provide number of hinges indicated but not less than 2 hinges for door leaf for doors 60" or less in height and one additional hinge for each 30" or less in door heights over 60". Use heavy weight hinges for doors over 41" wide.

B. Provide continuous stainless steel pin and barrel hinges where specified.

C. Furnish 4-1/2" x 4-1/2" heavy weight hinges for doors up to 3’-0” in width. Provide 5” x 4-1/2” heavy weight hinges for doors over 3’-0” in width.

D. Furnish hinges of sufficient width to permit maximum door swing.

2.04 LOCK CYLINDERS AND KEYING

A. All locks shall be factory master-keyed and grand master-keyed as directed by the Owner. Secure sample key from Owner's representative. Master keys shall be released only to proper authorities as designated by the Owner. Provide three (3) keys each lock set or cylinder.

B. All cylinders for cylindrical locksets shall be removable with the use of a key. Locksets that require removal from door to remove the cylinder will not be acceptable. Coordinate with hardware schedule for interchangeable core usage, where applicable.

C. All cylinders shall be furnished master keyed as directed by the Owner. Develop key system according to the requirements of this section. Provide (3) three individual change key for each lock which is not designated to be keyed alike with a group of related locks.

D. Equip locks with 6-pin cylinders. Do not stamp cylinders. Use removable decals or gummed label identification only.

E. All mortise cylinders used to trip switches in electric locks shall have closed keyways at the rear of the plug to prevent objects from passing through the cylinder.

2.05 LOCKS, LATCHES AND BOLTS

A. Mortise Locksets and Latch sets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Latch bolts: 3/4 inch throw stainless steel anti-friction type.
3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
    a. Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever’s hub works to gain wrongful entry.
4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
5. Thumb turns: accessible design not requiring pinching or twisting motions to operate.
6. Deadbolts: stainless steel 1-inch throw.
7. Electric operation: Manufacturer-installed continuous duty solenoid.
8. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Scheduled Lock Series and Design: Schlage L series, 06A design.
10. Certifications:
    a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
    b. ANSI/ASTM F476-84 Grade 31 UL Listed

2.06 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 latch bolts.
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 per California State
8. Where devices span over door lite frame and the face of the selected lite manufacturer's frame is raised from the face of the door, furnish panic hardware manufacturer's fitted shims or glass-bead kits at no additional cost to the project.
9. Comply with CBC Section 1003.3.1.9.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.
3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.

2.07 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, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. 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.

7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.

8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.

9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

10. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.

11. Non-flaming fluid, will not fuel door or floor covering fires.

12. Pressure Relief Valves (PRV) not permitted.

B. Provide adjustable closer units complying with ANSI A117.1 and ADA provisions for door opening force and delayed action closing. The sweep period of the door closers shall be adjusted so that from an open position of 70 degrees the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door per Section 11B-404.2.8.1.

C. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the persons with disabilities, provide adjustable units complying with ANSI A117.1 and Title 24 provisions for door opening force and delayed action closing.

2.08 STOPS

A. All door stops shall be wall or floor mounted as conditions indicate.

B. Where specified floor or wall stop would present a pedestrian hazard or cannot be used, furnish overhead stop or provide closer with integral stop as appropriate.

C. Floor stops shall not be located in the path of travel and 4” maximum from walls.

2.09 SILENCERS

A. Furnish silencers at hollow metal or wood door frames that are without seals in quantities as follows:
1. Single Doors: 3 silencers
2. Pairs: 2 silencers

2.10 SEALS

A. Provide continuous seals each edge of every exterior or fire-rated door leaf, except as otherwise indicated. Provide type, sizes and profiles shown or scheduled. Provide stainless steel fasteners for extruded seals.

B. Door Sweeps: Provide brush sweep seals.

2.11 TEMPLATE HARDWARE

Furnish template for hardware where required. Proper templates shall be furnished to the manufacturer of the material affected and sufficiently in advance to avoid delay in the work.

2.12 KEYING

A. Furnish a Grand Master, mater keyed alike or keyed different system as directed by the

Owner or Architect. Locks are to be keyed to the Owners request / standards.

B. Provide construction keying for doors requiring locking during construction. Remove temporary cores or inserts immediately prior to Owner occupancy. Furnish permanent keys (and cores if applicable) directly to Owner.

C. Key Blanks: Schlage original "Everest "6" pin" "Primus "6" pin" bow key blank with each tagged for identification.

D. Supply keys and blanks as follows:
1. Supply 2 cut change keys for each different change key code.
2. Supply 1 uncut key blank for each change key code.
3. Supply 6 cut master keys for each different master key set.
4. Supply 3 uncut key blanks for each master key set.

2.13 HARDWARE FINISHES

A. The designations used in schedules to indicate hardware finishes are those listed in ANSI A156.18 'Materials & Finishes Standard', including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

1.	Satin Chrome Plated	(US26D, 626)
	Aluminum	(US28, 628)

B. All hardware on both exterior and interior of the building shall be stainless steel US 32D (630), unless specified otherwise.

2.14 MANUFACTURERS

A. The following manufacturers establish the standard of quality and function required, or as listed on hardware list:

1.	Locks and Latches	Schlage Lock Co.	Owner Standard
2.	Panic Devices	Von Duprin	Owner Standard
3.	Butt Hinges	Ives	Hager, Stanley
4.	Door Closers	LCN	Owner Standard
5.	Flush Bolts, Strike	Ives	Owner Standard
6.	Coordinators	Ives	Owner Standard
7.	Seals	Zero	ZER
8.	Stops	Ives	IVE

3.00 EXECUTION

3.01 INSTALLATION

A. Inspect each door frame for proper installation and squareness, fit and preparation for installation of finish hardware.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations.

C. Install all finish hardware items furnished by hardware supplier. All hardware shall be accurately fitted in every instance and with the exception of butts, all surface applied hardware, such as escutcheons, door catches, etc, shall be removed by the Contractor before the painters' finish is applied. After completion of painters' finish, permanently reinstall all such hardware, and leave in perfect working condition upon completion of the entire work. Use only fasteners as supplied by manufacturer.

D. Door opening hardware shall be centered between 30 and 44 inches above the floor.

3.02 ANCHORAGE

A. All hardware shall be secured with suitable screws for proper application and shall harmonize with the hardware as to material and finish. All hardware fastened to masonry, cement, or tile wall and floors, shall be secured with expansion shields. All hardware fastened to metal or metal covered work shall be made to template and furnished with machine screws.

B. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

C. Set thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant.

3.03 ADJUST AND CLEAN

Adjust and clean each operating item of hardware and each door to ensure proper operation or function of each/every unit and clean grease, dirt and marks, leaving finishes in factory new condition.

3.04 INSPECTION

A. The installation shall be inspected by an accredited Architectural Hardware Consultant to confirm the proper installation and operation of hardware per the approved schedule, and corrections made as required.

B. The Architect will not accept the job until written approval of hardware installation and operation is received from the hardware consultant.

3.05 HARDWARE SCHEDULE

A. See door schedule in drawings for hardware set assignments.

B. No hardware shall be ordered until Finished Hardware has been reviewed and approved by Architect's hardware consultant.

C. Provide Factory order numbers for all products supplied on this project as part of close out documents for Owner's warranty records.

D. Miscellaneous Material:

SpeXtra 412501

HDW 01

1 SGL Door 101 STORAGE ROOM
3'-0" x 7'-0" x 1 ¾" x HMD x HMF x NONRTD
Each Assembly to have:

2	EA	Hinge	5BB1HW SH 4.5 X 4.5	652	IVE
1	EA	Electric Hinge	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	EU Mortise Lock	L9092TEU 06A RX	626	SCH
1	EA	Conventional Core	23-030 EV C	626	SCH
1	EA	Surface Closer	4040XP-62H	689	LCN
1	EA	Floor Stop	FS18L	BLK	IVE
1	SET	Seals	328AA-S (Head and Jambs)	AA	ZER

1	EA	Door Sweep	39A	A	ZER
1	EA	Door Contact	679-05HM	BLK	SCE
1	EA	Power Supply	PS902	LGR	SCE

NEW CYLINDER TO MATCH EXISTING HOSPITAL STANDARD – CONSULT HOSPITAL LOCKSMITH.
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM
Install Head Seal before Closer or Holder.
Outside lever electrically unlocked (fails secure) by 12 or 24V DC. Outside key allows manual retraction of latchbolt. Inside lever always free for immediate egress. Auxilary latch deadlocks latchbolt when locked.
The RX switch signals the use of that opening to security systems.
Enclosure with 22 position terminal blocks to provide termination of multiple electrified hardware for ease of installation

HDW 02

1 SGL Door 102 ELECTRICAL ROOM
4'-0" x 7'-0" x 1 ¾" x HMD x HMF x NONRTD
Each Assembly to have:

2	EA	Hinge	5BB1HW SH 5 X 4.5	652	IVE
1	EA	Electric Hinge	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	Electric Fire Exit Hardware	RX-EL-AX-99-L-NL-F-06	626	VON
1	EA	Conventional Core	23-030 EV C	626	SCH
1	EA	Surface Closer	4040XP-SHCUSH	689	LCN
1	SET	Seals	328AA-S (Head and Jambs)	AA	ZER
1	EA	Door Sweep	39A	A	ZER
1	EA	Door Contact	679-05HM	BLK	SCE
1	EA	Power Supply	PS914 900-2RS		VON

NEW CYLINDER TO MATCH EXISTING HOSPITAL STANDARD – CONSULT HOSPITAL LOCKSMITH.
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM
Install Head Seal before Closer or Holder.
Outside lever electrically unlocked (fails secure) by 12 or 24V DC. Outside key allows manual retraction of latchbolt. Inside lever always free for immediate egress. Auxilary latch deadlocks latchbolt when locked.
The RX switch signals the use of that opening to security systems.
Enclosure with 22 position terminal blocks to provide termination of multiple electrified hardware for ease of installation

HDW 03

1 SGL Gate 103 BICYCLE STORAGE
3'-0" x 7'-0" x CLG x CLF x NONRTD
Each Assembly to have:

1	EA	Mortise Lock	L9080T 06A	626	SCH
1	EA	Conventional Core	23-030 EV C	626	SCH
1	EA	Hardware	Remaining Hardware by Chain Link Fence Supplier		

NEW CYLINDER TO MATCH EXISTING HOSPITAL STANDARD – CONSULT HOSPITAL LOCKSMITH.

HDW 04

1 SGL Door 104 I.T. ROOM
3'-0" x 7'-0" x 1 ¾" x HMD x HMF x NONRTD
Each Assembly to have:

2	EA	Hinge	5BB1HW SH 4.5 X 4.5	652	IVE
1	EA	Electric Hinge	5BB1HW 4.5 X 4.5 TW4	652	IVE

1	EA	EU Mortise Lock	L9092TEU 06A RX	626	SCH
1	EA	Conventional Core	23-030 EV C	626	SCH
1	EA	Surface Closer	4040XP-62H	689	LCN
1	EA	Floor Stop	FS18L	BLK	IVE
1	SET	Seals	328AA-S (Head and Jambs)	AA	ZER
1	EA	Door Contact	679-05HM	BLK	SCE
1	EA	Power Supply	PS902	LGR	SCE

NEW CYLINDER TO MATCH EXISTING HOSPITAL STANDARD – CONSULT HOSPITAL LOCKSMITH.
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM
Install Head Seal before Closer or Holder.
Outside lever electrically unlocked (fails secure) by 12 or 24V DC. Outside key allows manual retraction of latchbolt. Inside lever always free for immediate egress. Auxilary latch deadlocks latchbolt when locked. The RX switch signals the use of that opening to security systems.
Enclosure with 22 position terminal blocks to provide termination of multiple electrified hardware for ease of installation

HDW 05

1 SGL Door 201 ELEVATOR CONTROL ROOM
3'-0" x 7'-0" x 1 ¾" x HMD x HMF x NONRTD
Each Assembly to have:

2	EA	Hinge	5BB1HW SH 4.5 X 4.5	652	IVE
1	EA	Electric Hinge	5BB1HW 4.5 X 4.5 TW4	652	IVE
1	EA	EU Mortise Lock	L9092TEU 06A RX	626	SCH
1	EA	Conventional Core	23-030 EV C	626	SCH
1	EA	Surface Closer	4040XP-62H	689	LCN
1	EA	Floor Stop	FS18L	BLK	IVE
1	SET	Seals	328AA-S (Head and Jambs)	AA	ZER
1	EA	Door Sweep	39A	A	ZER
1	EA	Door Contact	679-05HM	BLK	SCE
1	EA	Power Supply	PS902	LGR	SCE

NEW CYLINDER TO MATCH EXISTING HOSPITAL STANDARD – CONSULT HOSPITAL LOCKSMITH.
CARD READER AND WIRING BY ACCESS CONTROL SYSTEM
Install Head Seal before Closer or Holder.
Outside lever electrically unlocked (fails secure) by 12 or 24V DC. Outside key allows manual retraction of latchbolt. Inside lever always free for immediate egress. Auxilary latch deadlocks latchbolt when locked. The RX switch signals the use of that opening to security systems.
Enclosure with 22 position terminal blocks to provide termination of multiple electrified hardware for ease of installation

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SECTION 08 80 00 – GLASS AND GLAZING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Glass and glazing of elevator core curtain wall system and elevator cabs.
2. Glass and glazing of storage room
2. Protective window film

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 07 92 00: Sealants and Caulking.
B. Section 08 41 13: Aluminum-Framed Storefronts

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
ASTM C509 Specification for Cellular Elastomeric Preformed Gasket
ASTM C864 Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks and Spacers.
ASTM C998 Test for Glass Under Static Loads by Non-Destructive Methods
ASTM C1036 Specification for Flat Glass
ASTM C1048 Specification for Heat-Treated Flat Glass-Hs, Ft, Coated and Uncoated.

B. American National Standards Institute (ANSI), Z97.1 Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings.

C. Architectural Aluminum Manufacturers Association (AAMA), CWS-12, Structural Properties of Glass

D. Underwriters Laboratories, Inc. (UL)
UL 10(b) Fire Tests of Door and Window Assemblies
UL 752 Standard of Safety for Bullet Resistant Equipment.

E. Glass Association of North America Guidelines (GANA); (formerly the Flat Glass Marketing Association (FGMA))

F. CPSC 16CFR 1201 - Consumer Product Safety Commission Standard on Architectural Glazing Materials.

G. State of California Elevator Safety Construction Code Safety Glazing in Elevator Shafts (Part 7, Title 24, CCR) and local elevator code.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Manufacturer's technical product data for each item proposed. Provide test data needed to prove compliance with the CCR Title 8 and other specified requirements. Include manufacturers' recommended installation procedures.

C. Samples: Provide 12 inch by 12 inch samples of each type of glass and protective window film, 6 inch samples of each gasket proposed and at least 3 inches long, of each type of sealant proposed to be used, installed between samples of the material to be glazed, fully cured.

D. Shop Drawings: Show details of each type of glazing system indicating sizes, shapes, materials and quantities. Show details indicating sealant thickness and profile, bite on glass, glass edge clearance, depth of rabbet and thickness of glass. Identify gasket materials, side spacer blocks and setting blocks. Show weepage system in glass pockets. Details shall be full scale and fully drawn.

E. Structural calculations to justify thickness required to comply with code requirements for size and wind loading.

1.05 QUALITY ASSURANCE

A. Each piece of glass shall be of domestic manufacture, labeled with the manufacturer's name, strength, grade, thickness, type and quality for each type of glass used. Mark tempered, heat strengthened and laminated glass with permanent identification labels. Leave labels intact until removal is directed.

B. Comply with all building, fire and safety codes relating to the work and ASTM C1048. Safety glazing shall conform to the requirements of Federal rules and regulations titled "Safety Standards for Architectural Glazing Materials" (16 CFR Part 1201), and ANSI Z97.1. Use tempered glass for safety glazing unless shown otherwise. Provide certification that the glazing used conforms to the referenced standards.

C. Each glass type shall match the approved samples, be uniform in appearance, free from irregularities and differences in appearance when viewed from exterior. Glass not complying with this requirement shall be replaced with conforming glass at no additional cost.

D. Assume undivided responsibility for the glass and glazing and coordination with the components of related work. Demonstrate not less than five (5) years successful experience at work similar to the work of this project. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with the referenced standards and the requirements of this work, and who shall personally direct all installation performed under this Section.

1.06 RESPONSIBILITY

A. The glazing details / sizes shown on the drawings or indicated herein are intended as a guide for the aesthetic and interfacing requirements of the glass and glazing to and with surrounding framing work. The requirements shown by the details are intended to establish basic minimum dimensions, locations of glass panels and locations of different glass types. Contractor is responsible for the design, engineering and code compliance

of the glass and glazing work within these minimum physical and aesthetic parameters. The drawings are not to be construed as engineering design.

B. Architectural design does not cover all conditions or modifications which may be required. It is intended that conditions not detailed shall be developed through the shop drawings to the same level of aesthetics and in compliance with performance criteria as indicated for detailed areas and as stipulated in these specifications. Contractor acknowledges and agrees that the Architect shall have the final approval to all matters whether detailed or not on the design details.

1.07 IDENTIFICATION

Required on each lite, until final cleaning, showing quality, grade, manufacturer's label designating type and thickness of glass, name and brand as per California Building Code requirement.

1.08 DELIVERY AND STORAGE

A. Deliver glass to the jobsite with manufacturers labels showing thickness, quality and type, floor location and/or other denotations which identify where glass is to be used.

B. Deliver glazing compounds, gaskets, blocks, spacers, tapes and other glazing items in manufacturers original unopened packages or containers.

C. All delivered items, whether F.O.B. job site for unloading and installation by others or whether fabricated and installed by the Contractor shall be properly crated. Crates shall be marked with installation location, fabrication numbers and shop drawing references as applicable.

D. Store glass in dry, well-vented location at a temperature maintained above dew point. Minimize the handling of glass and protect from soiling, atmospheric condensation and other moisture.

E. Remove from the job site and replace with acceptable material all cracked, broken, chipped or otherwise damaged glass, and all glazing and sealing materials unfit for use.

1.09 WARRANTY

A. Submit signed copies of written warranty to repair or replace defective materials and workmanship in conjunction with this work during warranty period.
   1. Defective materials and workmanship include evidence of abnormal deterioration, aging or weathering of the work, leakage of water or air, structural failure of components (including glass breakage) resulting from exposure to normal loads and forces, failure of operating parts to function normally, deterioration or discoloration of finish in excess of normal weathering and aging, and failure of the work to fulfill specified performance requirements for a period of five (5) years after acceptance by Owner.
   2. If and where the need for fully tempered glass is required, due to safety glazing or loading effects that can not be compensated for by increasing the glass thickness or other means, then the glass shall be heat soaked. To waive this heat soaking requirement, the Contractor and glass manufacturer shall provide the labor, equipment and materials necessary to replace all spontaneous glass breakages for a period five (5) years after completion of installation. In addition, the Contractor and glass manufacturer shall be responsible for other property damages or personal injury liabilities caused by such breakages for the same five (5) year period.

2.00 PRODUCTS

2.01 MANUFACTURE

Domestic manufacture as produced by Viracon, LOF Glass Inc., PPG Industries, Interpane Glass Company, AFG Industries, Guardian Industries, Pilkington, or equal.

2.02 GLASS

A. General:
   1. Provide and certify that the type and thickness of glass shown on the Drawings or as specified herein is in conformance with reference standards and code requirements. Glass thickness indicated are minimum required.
   2. Where type or thickness, or both, are not shown on the Drawings or specified herein, provide type and thickness directed by the Architect. Provide glass thickness required to withstand design wind pressures per applicable codes.
   3. Fire knock-out lites where required, shall be identified with logos, decals, stickers, etchings, fired on frit or other means as required by the governing code where the project is located. All glass at knock-out lite locations shall be fully tempered.

B. Plate or Float Glass: Comply with Federal Specification DD-G-452, ASTM C1036 Type I, Class 1, Quality q3, and shall be 1/4" minimum, unless otherwise noted or required thicker by glass manufacturer. Where plate glass is called for, plate glass or float glass may be used.

C. Sheet Glass: Provide ASTM C1036 Type II, Class 1, Quality q5.

D. Tinted Glass: Tint over clear, as required to match existing standards. Label "air" side and "tint" side of glass.

E. Laminated Glass: Glass shall be marked as required by ANSI Z97.1 or 16 CFR, Part 1201, Section 1201.5.
   1. Elevator Hoistway Curtain Wall Glazing: Provide tinted laminated safety glass, as selected by Architect, conforming to ASTM, Type I, Class 2, as shown on the Drawings, consisting of a 1/4" inside face and a 1/4" outer face of float glass laminated under heat and pressure to a inter-layer of clear plastic vinyl inner core 0.060" thick, to form a minimum 9/16" thickness. Provide calculations indicating compliance with Elevator Construction Code, Part 7, Title 24, CCR. Use minimum thickness for each lite as required per calculations, but in no case less than 5/16" thick. For larger sizes, provide thickness as required by prevailing codes.
   2. Elevator Cabs: Provide laminated fabrication of 1/4" inner and 1/4" outer layer of clear annealed lites with a 0.060" pvb interlayer, min. 9/16" thick. Interior side of cab glazing to receive protective window film coating specified herein.

F. Heat-Strengthened Glass:
   1. Heat treated float glass shall be 1/4" thickness minimum, unless otherwise noted or required thicker due to thermal stress or structural considerations by glass manufacturer for code or fabrication, meeting ASTM C1048, Federal Standard 16 CFR 1201, Federal Specification DD-G-1403 and ANSI Z97.1
   2. Glass shall be treated using a horizontal process to increasing flexural strength to not less than twice the strength before treatment. Permit minimum warpage practicable. No tong marks allowed. Glass shall be tempered as required to meet code requirements.
   3. The orientation of the inherent roller marks in the heat strengthened shall be horizontal, not vertical when glass is in installed position.

G. Fire rated Glass: Provide clear wireless and virtually distortion free fire rated, impact safety rated and protected against radiant and conductive heat transfer glazing materials, that are both barrier to fire and smoke. Manufacture products in conformance with applicable standards. Conform to composition, glass thickness, fire rating, impact safety resistance. Conform to all applicable codes governing product usage. Products manufactured by Technical Glass Products 'Pyrostop' (800) 397-FIRE (3473) distributed by Pilkington/LOF; SAFTI Specialty Architectural & Fire Technology International distributed by Okeeffee, 'Vetrotech' by Saint Gobain, or equal.

2.03 GLAZING MATERIALS

A. Glazing Gaskets: Gaskets, resilient clips, snap in type or other such glazing devices provided by glass or window manufacturer, sizes required for glass thickness. Provide profiles and hardness as required for watertight construction.
   1. Cellular Glazing Gaskets: Molded or extruded closed cell integral-skinned neoprene gaskets for watertight construction, complying with ASTM C 509, Type II, black.
   2. Elastomeric Compression Glazing Gaskets: Extruded flexible gaskets of EPDM, complying with ASTM C 864.
   3. Vinyl Compression Glazing Gaskets: Nonrigid vinyl chloride polymer and copolymer molding and extrusion compounds, complying with ASTM D2287.

B. Setting Blocks: Extruded neoprene of 80-90 Shore A durometer hardness, minimum 4" long sized per GANA guidelines or as recommended by the manufacturer.

C. Spacer Shims: Extruded neoprene of 60 Shore A durometer hardness, sized and profiled for intended use, or as recommended by the manufacturer.

D. Glazing Sealants and Tapes:
   1. General:
      a. Where a wet seal is required, use a one part non-acidic moisture-curing, neutral curing silicone sealant complying with F.S. TT-S-001543, Class A.
      b. Provide black, exposed glazing materials, unless specified otherwise by the Architect.
      c. Provide hardness of materials as recommended by the manufacturer. Provide only sealants and tapes which are proven fully compatible with surfaces contacted, including glass products and glazing channel surfaces.
   2. One-Part Non-Acid Curing Medium Modulus Silicone:
      (Use for exterior glazing)
      a. Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to uses indicated, 0; and complying with tensile strength of not less than 45 nor more than 75 psi at 100 percent elongation when tested per ASTM D 412 after 14 days at 77 degrees and 50 percent relative humidity.
      b. Products: Provide one of the following:
         "Dow Corning 791; Dow Corning Corp.
         "Silpruf," "SCS1000" "Ultra-Glaze 400"; General Electric Corp.
         "Spectrum 2"; Tremco, Inc.
         "Rhodorsil 70"; Rhone-Poulenc.
         "Tremco Spectrum 1"
         Or equal
   3. Preformed Butyl Rubber Glazing Tape: Extruded tape (coiled on release paper) of solvent-free butyl-polyisobutylene based formulation with 100 percent solids, reinforced type, complying with AAMA A804.1, non-staining and non-migrating in

contact with porous surfaces, with or without continuous spacer rod as required for proper glazing installation. Tremco Manufacturing Company "440 Tape"; Parr, Inc. "Aluminlastic Tape"or equal; minimum 1/16 inch by 1/2 inch size.

E. Glazing Tapes: Use preformed macro-polyisobutylene with a continuous integral shim of a Shore A of 40-60. Tape shall comply with AAMA 807.1. Tape shall compress to the shim without excessive force being required, as recommended by the glass manufacturer to avoid pressure points or breakage.

F. Compressible Filler Rod: Use closed-cell, synthetic rubber or plastic foam proven to be compatible with sealants used, flexible or resilient with 5-10 psi compressive strength at 25 percent deformation.

G. Cleaners, Primers and Sealers: Use type recommended by sealant or gasket manufacturer.

2.04 OTHER MATERIALS

A. Protective Window Film: Provide on the interior of each glass backed elevator cab, a minimum 7 mil clear vandal resistant security film meeting the performance specifications of the selected manufacturer/product. Product to be SEC07, as manufactured by Johnson Window Films, Inc. (800) 448.8468 / (310) 631.6672, or equal.

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

3.00 EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions where glass and glazing are to be installed and notify in writing the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

B. Field Conditions: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces including any frame irregularities.

3.02 STANDARDS AND PERFORMANCE

A. Conform to glazing procedures per printed instruction of Glass Association of North America (GANA) (formerly FGMA) and SIGMA.

B. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing system and with recommendations of GANA except where more stringent requirements are indicated by the specifications or the framing system.

C. Watertight and airtight installation of each glass product is required. Each installation must withstand normal temperature changes, wind loading and impact loading for operating sash and doors without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

D. Glazing channel dimensions as shown on shop drawings for the glazing systems are intended to provide for necessary bite on glass, minimum edge clearance and adequate

sealant thickness with reasonable tolerances. Adjust as required by job conditions at time of installation, conforming to the minimum bite as detailed in the shop drawings, specified herein and GANA guidelines.

E. Ensure watertight installation without rattling. Verify glass sizes before cutting and fit within tolerance of 1/32 inch per 1/8 inch thickness. Provide tight and true installation within glazing members. Set glass without springing and with convex side to exterior.

3.03 PREPARATION

A. Thoroughly clean glazing channels, stops, and rabbets to receive the glazing materials, making free from all foreign matter such as dirt, oil, grease, debris, obstructions and deleterious substances which might impair the work.
   1. Remove protective coatings which might fail in adhesion or interfere with bond of sealants using solvents that leave no residue. Use only clean lint free towels for wiping of surfaces.
   2. Comply with manufacturers' instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.
   3. Mask, or otherwise protect, surfaces adjacent to installation of sealants.

B. Do not glaze when the ambient temperature and weather conditions cause frost or moisture/condensation on framing, or during damp weather unless approved measures to eliminate these conditions are used. Clean glass free from dust, oil, etc., and wipe clean immediately before installation.

C. Set, remove and later reset glazing stops so as to avoid marking or defacing any portion of the frames, stops, settings, etc. Prime surfaces of openings properly where recommended by the sealant manufacturer. Prime surfaces to receive glazing compounds in accordance with manufacturers' recommendations.

D. All glazed openings shall be checked prior to glazing to make certain that the openings are square, plumb and secure in order that uniform face and edge clearances are maintained. Inspect all framing joint intersections to insure that the offset in the joinery will not inflect undue edge pressure on the glass in accordance with GANA guidelines.

3.04 INSTALLATION

A. Inspect each piece of glass immediately prior to start of installation. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other way. Do not remove labels from glass until so directed by the Architect.

B. Set all glass in a true plane, tight and straight with proper and adequate clearance, firmly anchored to prevent rattling and looseness, with all edges cleanly cut. Set glass in a manner which produces the greatest possible degree of uniformity in appearance. Install glass so distortion waves or roller marks, if present, run in the horizontal direction. Mixing of the direction will not be acceptable. Maintain minimum face distances on both sides of glass per GANA guidelines.

C. Cut glass at factory to exact size with proper edge clearance so that glass will not contact frame at any point. Do not nip or seam the edges.

D. Install setting blocks at quarter points or at location as recommended by GANA or glass manufacturer. In no case shall edge of block be closer than 6" to the vertical edge of the

glass unless specifically approved otherwise. Setting blocks shall be restricted from lateral movement. Setting blocks at laminated glass shall support both lites of glass.

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 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 6" to corner.
   b. Place spacers opposite one another.
   c. Make bite of spacer on glass 1/4" or more.

E. Glazing Channels:
1. Do not use two different glazing materials in the same joint system unless the joint used is approved in advance by the Architect.
2. Install with tightly fitted corners and joints, flush with stops and edges, in full tight contact with glass and frames.
3. Install steel channel stops and retainer sizes as indicated on Drawings. Secure to frames with screws at 3" from ends and 2 foot o.c. maximum.

F. Gasket Glazing: Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide anchorage to ensure gasket will not "walk" out. Subject gaskets at corner conditions per gasket manufacturer's recommendations to prevent pull away at corners. Seal corner and butt joints with sealant.

G. Set glass in exterior openings with glazing tape and sealant. Glaze other interior openings with glazing channels, glazing sealant, or glazing tape. Prime and seal rebates with compatible material before installing glass.

H. Glazing Tape:
1. Cut glazing tape to length and set against permanent stop 3/16 inch below sightline. Butt tape at corners and daub joint with butyl sealant.
2. Rest glass pane on blocks and push against tape to attain full contact with glass perimeter.
3. Place glazing tape on glass and install removable stop.

I. Sealant Glazing:
1. Apply masking tape where required by glazing operation, in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled.
2. Apply glazing sealants under pressure with hand or power actuated gun or other appropriate means. Use gun having nozzle of proper size and provide sufficient pressure to completely fill joint. Neatly point or tool all joint surfaces to provide the proper contour.
3. Apply cap bead of medium modulus silicone sealant along exterior and interior void to uniform line. Force sealants into channel to eliminate voids and ensure complete "wetting" with "wash" away from glass. Tool or wipe sealant with solvent for smooth appearance, eliminating stains and discoloration.
4. Dry tool joints. Do not use water-wet tool or tooling solution.

3.05 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, masking tapes, streamers, ribbons, or other items directly to the glass except as specifically directed by the Architect.

B. Exercise extreme caution and care to protect exposed non-coated surfaces from scratching or abrading until Owner occupies the building. Any and all scratched, abraded or otherwise damaged glass shall be removed and replaced with new damage-free glass at no expense or cost.

3.06 CURING

Cure glazing sealants in compliance with manufacturers instructions and recommendations to obtain high early bond strength, internal cohesive strength, and surface durability.

3.07 WINDOW FILM CLADDING

A. Installation technique with regards to cleaning, prepping windows and installation / application of the approved film shall comply with manufacturers recommendations.

B. Methods of hanging / mounting of the film, positioning solution, and technique in squeegeeing, cutting / scribing, etc., shall render a professional installation that in no way damages the underlying glazing. Finished application shall be fully adhered without air bubbles, contamination, lint, marks, or any other visible imperfections.

3.08 CLEANING AND POLISHING

A. Upon completion of the glazing, thoroughly wash glass on interior and exterior of building to remove sealants, paint or other foreign matter. Clean glass only with a mild detergent and water recommended by the glass manufacturer. Do not use abrasive materials.

B. Protective window films shall be cleaned in conformance with the manufacturers recommendations. Provide Owner with list of approved products acceptable for cleaning of window film.

C. Remove and replace broken, scratched, chipped, cracked, abraded or otherwise defective or damaged glass. Be responsible for damage caused during construction period, including natural causes, accidents and vandalism at Contractor's expense. Replace with new materials and leave the entire installation in a neat, clean acceptable condition. Dispose of excess materials, containers and debris from site.

3.09 FIELD QUALITY CONTROL

A. Certify by water testing the completed installation, that the completed glass and glazing has been installed as required and that installation conforms / complies to ASTM reference standards of testing and measuring of air and water penetration through installed exterior windows.

B. Verify by field water testing the completed installation that the installed glazing gaskets, sealants, etc. are installed properly and that there is no loss of adhesion/cohesion and they are undamaged and intact at the time of testing and are to remain watertight for the life of the structure.

END OF SECTION

SECTION 08 91 19 – STATIONARY METAL WALL LOUVERS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1 apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Stationary pre-finished wall louvers at top of Elevator Tower.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 04 22 00: Concrete Masonry Unit
B. Section 05 50 00: Miscellaneous Metals
C. Section 07 60 00: Sheet Metal Work
D. Section 07 92 00: Sealants and Caulking

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

B. American Institute of Steel Construction (AISC)

C. American National Standards Institute (ANSI)

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Materials list of items proposed including specifications and other data to prove compliance with the specified requirements.

C. Shop drawings fully detailing fabrication, indicating sizes, gages and types of metal, frame design welding, anchorage and installation.

D. Certification for surface preparation, priming materials and finish.

1.05 QUALITY ASSURANCE

A. Owner selected testing laboratory will inspect finished steel welds and bolted connections and will field test any welds showing deviations from accepted standards. Defective work shall be corrected or replaced as directed by the Architect.

B. Qualification of Welders: Welders shall be properly certified per AWS D1.1 in compliance with code requirements. In the absence of code certification, welders shall be certified by the Testing Agency.

C. Continuous inspection of all welding and structural design to meet windloads shall be provided as required by California Building Code.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect items from damage during shipping, storage and handling. Work showing dents, creases, deformating, scratches in the finish, or other defects are not acceptable. Deliver to site in unbroken packaging or protective wrap and store off ground.

1.07 GUARANTEE

A. Provide a written guarantee agreeing that all defective materials, finishes or quality of work reported within a period two (2) years after final acceptance shall be promptly repaired or replaced to the satisfaction of the Owner at no additional cost.

B. Guarantee finish coated surfaces shall, under normal usage and conditions, not fade, chip, crack, rust, blister, chalk or spall for a period of two (2) years after final acceptance of work by the Owner, and that any defects discovered during this period, whether due to faulty workmanship or to incorrectly applied materials, shall be replaced without additional cost to Owner.

2.00 PRODUCTS

2.01 MANUFACTURE

Products as manufactured by C/S Group (619) 744-0300, Airolite, Industrial Louvers, Ruskin or equal.

2.02 MATERIALS

A. Furnish and install where indicated on the Drawings extruded aluminum horizontal louver Model 4080 with 'A' Frame as manufactured by Construction Specialties, Inc. or equal. Frame and blades shall be 6063-T52 alloy, minimum .081" (2.06mm) thick. Head, sill and jamb sections shall be one-piece structural sections with caulking slot and retaining bead. Mullions shall be sliding interlocked type with provision for expansion and contraction. Screen rear face of louvers Model 4080 with 1/2" mesh No. 18 gage min. aluminum mesh hardware cloth welded to a 5/16" x 1" bar frame, tap screwed in place at no more than 8" intervals. Grind all welds smooth and clean in preparation for surface preparation and finish. Fabricate louvers to angle / reflect standard outward design. Coordinate with drawing details and project requirements.

B. Stock materials, patterns, products and standard methods of fabrication will be approved if they conform to specified requirements. Metals for various items shall be kind indicated, true to design pattern profiles, finished as noted and of the following quality:

C. Fasteners:
1. Provide stainless steel fasteners, finish shall match color of screen.
2. Provide fasteners of type, grade, and class required for the particular use.
3. Furnish lugs, clips, bolts, nuts, screws, washers, concrete inserts, anchors and any other fastenings necessary for proper erection of various items. All fastenings shall be designed to alleviate vandalism and theft.

2.03 OTHER MATERIALS

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

2.04 FINISH

A. High Performance Organic Coating Finish: Provide a chemical conversion coating and acid chromate-fluoride-phosphate pretreatment. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating and resin manufacturers instructions. Fluorocarbon 3 coat thermocured system shall be composed of specially formulated inhibitive primer, fluorocarbon color coat and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin ("Kynar 500","Hylar 5000" or equal) by weight, in compliance with AAMA 605.2. Custom color and gloss as selected by Architect.

B. Where shop finish paint is specified, touch up any damaged finish coating immediately after installation to match finish coating.

C. Where any prefinished member is cut, paint surface matching the specified color for that member.

3.00 EXECUTION

3.01 FIELD CONDITIONS

Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect all conditions that prevent proper execution of this work.

3.02 DESIGN AND FABRICATION

A. Design and fabricate work to support any normally imposed loads. Conform to requirements of AISC. Allow for required assembly tolerances.

B. Construction and size of blade units shall conform with the required free field noise reduction required to meet the acoustical requirements specified.

C. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners whenever possible. Miter all corners and angles of frame members, unless otherwise shown. Miter all corners and angles of frame members, unless otherwise shown.

D. Welding:
1. Make welds which are watertight, continuous and free from voids or cracks. Take precautions when welding to prevent heat blisters, burn-throughs, and surface distortions.
2. Use electric shielded-arc process in strict accordance with welding specifications of American Welding Society. Use only welding operators properly trained and highly skilled in arc welding and qualified as per AWS. Grind smooth surface welds exposed to view.
3. Bolt with proper size bolts; draw nuts tight and upset threads. Counter sink heads of rivets and bolts or space rounded head fasteners neatly and accurately.

3.03 PREPARATION FOR FABRICATIONS

A. Verify hardware requirements to provide proper cutouts, fittings and attachments.

B. Coordinate metal work with adjoining work for details of attachment, fittings, etc. Do any required cutting, drilling, punching, threading or tapping. Drill or punch holes; do not use cutting torch.

3.04 ASSEMBLY

A. The assembly of louvered screens shall be performed by manufacturer trained workers. The resulting work shall be plumb, level and true.

B. All connections involving dissimilar metals shall be made to prevent electrolytic action. All dissimilar materials shall be separated with bituminous coating per manufacturers printed instructions

3.05 CLEANING

Finished surfaces shall be left free from grease, dirt or other foreign material.

END OF SECTION

SECTION 09 22 16 – METAL FRAMING AND FURRING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to the work of this section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Channel framing.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 05 50 00: Miscellaneous Metal
B. Section 06 16 43: Exterior Sheathing

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).

ASTM A446	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
ASTM A525	Standard Specification Requirements for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process.
ASTM C645	Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
ASTM C754	Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum
ASTM C955	Standard Specification for Load Bearing (Transverse and Axial) Steel Studs, Runners (Track) and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Base.
ASTM C1007	Standard Specification for the Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

B. American Iron and Steel Institute (AISI).
Specification for the Design of Cold Formed Steel Structural Members.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit manufacturer's technical product data indicating all materials, gages, sizes, strength and protective finishes as applicable. Include ICBO research approval or current test data and manufacturers recommended load table charts for each different section profile proposed. Manufacturers recommended installation procedures will become the basis for accepting or rejecting actual installation procedures.

C. Test Reports: Certified laboratory test reports confirming performance characteristics of manufactured units proposed for use.

D. Shop Drawings: Indicate selection of framing components and accessories, shop coatings and steel thickness. Indicate details of fabrication, details of attachment,

fasteners, spacing and installation of accessories.

E. Samples: Framing component parts and accessory pieces shall be 12 inches long and tagged with name of part and manufacturer.

1.05 REQUIREMENTS

A. Installation of steel framing shall meet ASTM C754 and C840 standards.

B. Taping and finishing must meet ASTM C840 and GA-216 standards.

C. Steel studs, tracks and accessories shall be manufactured by a SSMS member. See ICC ER 4943-P for allowable stud heights, load characteristics and general framing requirements.

1.06 QUALITY ASSURANCE

A. Anchors may not be shot or drilled into post tensioned concrete slabs and beams without the prior written permission by the Architect/Structural Engineer, as to type and location.

B. Framing tolerances in excess of 3/16 inch in 10'-0" from true square are not acceptable.

C. Metal framing system must conform to AISI Specifications. Coordinate information with drawings for limiting height and span tables and structural properties for design data.

D. Provide a system which provides for a positive attachment (Cyclic Anchoring Method ASTM C754) of studs to upper track, and of track to overhead fluted deck, while permitting up to 1 inch of vertical movement. System shall be in accordance with UL 2079, ASTM E119 & E184, conforming to requirements of 1 and 2 hour fire resistive rated construction.

E. Metal framing system design and installation must conform to AISI Specifications and in conformance with CBC Sections 1612 A/1613 A, 2217A/2218A Amendments and 2219A. Coordinate referenced design data and tables for structural properties and strength determination considerations for load, shear, tension, spacing, bracing and fastening criteria. Nominal shear values shall be multiplied by the appropriate strength reduction factor, to determine design strength or divided by the appropriate safety factor to determine allowable shear values as set forth in Section 2219A.3

F. Steel studs shall be installed plumb and true, with full bearing, of the proper gage, size and spacing as designed in conformance with drawings and calculations. Framing tolerances in excess of 3/16 inch in 10'-0" from true square are not acceptable.

G. Bearing of studs, use of reinforcement clip angles, stiffeners, bridging, bracing, etc. shall be aligned, anchored, fastened, connected, etc., to insure that proper uniform distributed concentrated, compressive, axial or lateral and construction loads are anticipated and specifically addressed in the design calculations.

H. All fasteners shall be as designed for the specific applications. Verify number and size of fasteners. Connections shall be accomplished with self-drilling screws or welding so that the connection meets or exceeds the design loads required at that connection.

I. Welding shall be in conformance with CBC Section 2204A .8. Field abrasions and welds shall be touched-up, with approved galvanizing repair

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials with manufacturers identifying labels intact, affixed and legible. All steel sections shall have permanent recognized labeling.

B. Store materials off ground in dry and well ventilated areas, covered and otherwise protected from physical damage. Support in a manner which will prevent a deflection set.

C. Remove rejected items from the site that are bent, warped, dented or otherwise damaged and/or units exhibiting rusting or other damage to the finish not repairable by minor and conventional field touch-up procedures.

2.00 PRODUCTS

2.01 STEEL STUDS

A. Products of Angeles, California Metal Systems, Cemco, Dietrich, Inland Steel Products, Penmetal, United Construction Supply or equal.

B. Studs: Corrosion resistant roll-formed "C" wide flanged, punched channel steel studs with 1d inch flanges with returns, depths as shown. Knurled flanged faces. Comply with ASTM A653/A653M and C645 and hot-dip zinc coated per ASTM A525.

1.	Exterior Studs:	Refer to Section 05 40 00. 16 gage, unless shown otherwise. Exterior studs are considered as load bearing.
2.	Interior Studs:	18 gage minimum where steel backing plates are required.
3.	16 gage and heavier:	Cold-formed steel conforming to Grade D specification with a minimum yield point of 50,000 psi.
4.	18 gage and lighter:	Cold-formed steel conforming to ASTM A446, Grade A, with a minimum yield of 33,000 psi.

C. Runner Tracks: Stud manufacturer's matching units (unpunched) of the type indicated and hot-dip zinc coated per ASTM A525.

D. Top Runner Slotted Track: Provide a deep legged slotted track with slots that allow for both upward and downward overall movement (minimum 1 inch, 2" plus/ 2" minus) of the structure without adversely affecting the positive attachment of the framing members up to one inch of deflection. Member shall be used in lieu of a double track system. Track shall be provided in standard widths and gage sheet steel thickness as required by project conditions. Downstanding legs shall be nominally 2-1/2 inches and shall be provided with 1/2" slots at 1 inch on center. Fire tested assemblies shall have U.L. and Warnock Hersey report approvals and conformance with reference standards. Manufactured by Slip-Track Systems, Inc., Fire Trak Corp. or approved equal.

E. Backing Plates: Galvanized 3/16" thick steel, of proper size to accommodate fastenings, welded to steel studs. Verify exact requirements with appropriate trades.

F. Screws and Fasteners: Provide cadmium plated steel type complying with Federal Spec. FF-S-111, stainless steel or other non-corrosive metal. Type or size as required for specific usage.

3.00 EXECUTION

3.01 ISOLATION

Where metal furring and lathing abuts (shaft framing) building horizontally or vertically, isolate the work (to prevent the transfer of loading and structural movement into the furring and lathing), so that slip on cushion-type joints will absorb the deflections or movements.

3.02 STEEL STUDS

A. Set steel studs and fasten in place in accordance with the manufacturers specifications and recommendations and as required by applicable codes. Provide ceiling runners, floor runners and necessary anchoring devices as required for adequate and proper installation.

B. Set floor runners in a bead of sealant compound or compressible sealing tape. Seal ceiling runners, except where drawings call for studs to extend through ceilings.

C. Accurately align runner track to the partition layout at both floor and at ceilings and secure at 42" minimum intervals. Secure runner track at each side of openings.

D. Butt runner tracks, except leave clearance where base course of gypsum board is to run through at perpendicular planes.

E. Friction fit studs to runner tracks by positioning and rotating into place. Provide positive attachment to tracks for studs located at partition corners and intersections and adjacent to openings, and for jack studs located above and below openings.

F. Secure each stud to runner track at 16" o.c. with the proper number of stud shoes at top and bottom with either self-tapping screws, wired or crimped to stud, at both flanges or tack-welded to runner track.

G. Reinforce and stiffen partitions with 3/4" (or larger as necessary) steel channels placed horizontally not more than 4'-0" apart. Wire-tie or bolt stiffeners to inside surfaces of studs.

H. Install steel studs plumb, true to line.

I. Place tracks as required for compliance with referenced standards, to give proper support for the covering material and as indicated on the drawings. Provide 1/2" minimum deflection space at top of partition and underside of structural slab, using a slotted top track, slotted. Install partition so slab may deflect without undue loading of studs.

3.03 METAL FURRING

A. Space furring members 16 inches on center, except as otherwise indicted.

B. Frame both sides of expansion and control joints with metal furring, do not bridge the joint with runners, furring, or lathing.

C. Install additional framing, furring and runners, as required to form openings and frames for other work as indicted.

D. Splice continuous running members by overlapping and interlocking. Lap runner channels 12 inches and furring members 8 inches.

3.04 FASTENING AND ATTACHMENTS

A. Anchorage of the tracks to the structure shall be with methods designed for the specific application. Size, penetration, type and spacing of anchorage shall be determined by design per CBC Chapter 19 A, Section 1923 A. Sizing and gage of stud tracks to comply with approved shop drawings in conformance with CBC Chapter 22 A.

B. Welds to conform to AWS requirements and CBC Chapter 22 A, Section 2231 A. Welds may be butt, fillet, spot or groove type, determined by design calculations. All welds shall be touched up using zinc rich paint.

C. Steel drill screws shall be of the minimum diameter indicated by design. Penetration through joined materials shall not be less than 2 full diameter exposed threads.

D. Screws shall have a protective coating equivalent to cadmium or zinc plating ASTM A165 - Type NS for use in exterior assemblies.

END OF SECTION

SECTION 09 65 19 – RESILIENT FLOORING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to the work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
1. Vinyl composition floor tile in elevator cab.
2. Cleaning, polishing and protections.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 14 21 23: Electric Traction Passenger Elevators

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
ASTM D2047 Test Method for Static Coefficient of Friction of Polish Coated Floor SuAces. Resilient flooring shall have a coefficient of friction of at least 0.6.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit shop drawings, manufacturer's technical data and material specifications, as applicable, for all products specified for review prior to start of work.

C. Samples: Submit samples of each flooring material, 3" square.

1.05 REQUIREMENTS

Provide Owner with unopened containers of each type, size, and color of material installed for future use. Quantity to be provided shall be a minimum of 2% of area installed, but not less than one (1) standard size container of each color.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

Use all means necessary to store, handle and protect the materials of this Section before, during and after installation.

2.00 PRODUCTS

2.01 GENERAL

A. All materials shall be of new stock of the highest grade available, free from defects and imperfections, of recent manufacture and unused. Materials shall be of the same manufacture and same lot number. Where model numbers are indicated, if the specified models are discontinued, the Contractor shall furnish the manufacturers' updated model at no additional cost to the Owner.

B. All flooring shall be delivered in sealed cartons, plainly labeled or marked to indicate color, pattern, gauge, lot number, and sequence of manufacture within the lot. All flooring shall have been manufactured within the 6-month period previous to installation.

2.02 MATERIALS

A. Elevator Cab Flooring: Provide 12" x 12" x 3/16" thick vinyl/marble chip tile, Marble Mosaic Classic Series 600 by Fritz Chemical Co., or equal. Colors to be Field Tile #CL697, Dapple Gray and a 4" x 12" Accent Border Tile #CL621, Raven Black at cab perimeter, and a 4" black rubber base. Conform to detailed layout as directed by the Architect.

B. Adhesive shall be as recommended by manufacturer.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine floor substrates to assure that tolerances are level within 1/8" in 10'-0".

B. Do not proceed with installation of resilient flooring until such deficiencies have been corrected.

3.02 INSTALLATION

A. Fill all cracks and low spots with a floor leveling cement. Remove all dirt and any other matter that would prevent adhesion or cause bumps, depressions, or other defects in the appearance or durability of this finish floor covering and make surface smooth, level, and uniform.

B. Maintain a temperature of not less than 70 deg. F. in the locations for not less than 48 hours before installation and for ten (10) days after installation. Allow flooring to condition in the locations for at least 24 hours before installation.

C. Cement and lay flooring in a manner that will result in a complete and first-class installation.

D. Layout of Floor Tile:
1. Lay tile with center of tile or joints of tile on the center lines of the cab, with borders equal in size. Match tile for color and pattern by using tile from cartons in the same sequence as manufactured.
2. Tile shall be laid with grain pattern running the long way of cab and in only one direction

E. Allow no open cracks or voids, and no raising or puckering at joints. Roll floor covering to assure a tight bond and eliminate any trapped air.

F. Installation of Base: At elevator cabs, base material is to be cut from floor tiles. Make all cuts straight and true to dimension at both ends.

3.03 PROTECTION

During installation operation, the entire areas shall be closed to traffic and work of other trades. Where traffic is unavoidable, floors shall be protected with building paper and also boards or plywood, where trucking is being done over the installed area.

3.04 CLEANING

After completion, all resilient floor covering shall be protected from the work of other trades by covering with non-asphaltic building paper. After the work of all other trades has been completed, the temporary protections shall be removed, the surfaces washed with a neutral cleaner and all heel and scuff marks removed so that the resilient floor covering is ready to be waxed. One coat of wax shall be applied and polished with a polishing machine.

END OF SECTION

SECTION 09 90 00 - PAINTING

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:

1. Exterior Painting:
   a. Concrete columns including returns.
   b. Concrete spandrels and parapet from top interior surface to drip at bottom.
   c. All concrete structure including the returns.
   d. All exterior metal, including miscellaneous flashings, exposed miscellaneous iron items, etc.
   e. Exposed pipes, vents, etc. including at roof.

2. Interior Painting:
   a. All beams and slab soffits.
   b. Ramp walls
   c. All concrete structure including the returns.
   d. All columns.
   e. Exterior surfaces of all rooms within structure including but not limited to electrical, storage, etc. masonry walls.
   f. Exposed pipes, conduits, sheet metal items, etc.
   g. Miscellaneous flashings/metal, except galvanized items unless specified
   h. Elevator interior shaft walls, framing members, and backsides of lobby entrance doors.
3. Carefully examine other sections of these specifications and drawings to ascertain scope and extent of painting work that is required.

1.02 RELATED WORK IN OTHER SECTIONS

A.	Section 03 30 00:	Concrete and Concrete Finishes
B.	Section 04 22 00:	Concrete Masonry Unit
C.	Section 05 50 00:	Miscellaneous Metal
D.	Section 07 60 00:	Sheet Metal Work
E.	Section 09 96 23:	Graffiti Resistant Coatings
F.	Section 09 97 13:	Steel Coating System
G.	Section 23 05 00:	Mechanical
H.	Division 26:	Electrical

1.03 SURFACES NOT TO BE PAINTED

Painter's finishes are not required on the following:

A. Stainless steel, anodized aluminum, bronze, copper, chrome-plated metals except piping and conduits.

B. All factory prefinished items.

C. Items as finished under Steel Coating System Section.

D. Finish hardware, except prime coated hardware.

E. Galvanized steel cables and galvanized steel supports.

F. 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.

G. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.

H. Sealants and caulking.

1.04 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.

1.05 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Submit Following Product Data
1. Materials list of items proposed to be provided under this section. Written approval of this list must be obtained from Architect before any painting is started.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Samples
1. Following the selection of colors and glosses by the Architect, as described under "Color Schedules: in Part 2 of this section, submit samples for the Architect's review.
   a. Provide three samples of each color and each gloss for each material on which the finish is specified to be applied.
   b. Except as otherwise directed by the Architect, make samples approximately 8" x 10" in size.
   c. If so directed by the Architect, submit samples during progress of the work in the form of actual application of the approved materials on actual surfaces to be painted.
2. Revise and resubmit each sample as requested until the required gloss, color, and texture is achieved. Such samples, when approved, will become standards of color and finish for accepting or rejecting the work of this Section.
3. Do not commence finish painting until approved samples are on file at the job site.

1.06 QUALITY ASSURANCE

A. Manufacturers: Catalog names and system numbers of paint types listed herein are based on products of Dunn-Edwards, ICI/Dulux, Sherwin Williams and Vista, and is the standard of quality against which the Architect will judge equivalency. The quality of titanium dioxide, the use of clays, aluminum silicate, talc and the purity of acrylic materials are a few of the criteria which will be used by the Architect in determining equivalency of materials.

B. Paint Coordination
1. Provide finish coats that are compatible with the prime coats actually used.

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 non-compatible 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.
6. Coordinate with Architect for color scheme of exterior painting. Verify whether reveals are to be field color or if painted a contrasting color.

B. Acceptance of Work of Others
1. Inspect surfaces to which materials of this section are to be applied to ascertain that they are suitable for painting. Correct any defects or other unsatisfactory conditions prior to painting.
2. Applications of any materials of this section over respective surfaces shall be construed as acceptance of surfaces in satisfactory condition. Excuses for failure of painting work due to improper sub-surfaces will not be acceptable.

C. Comply with state and local regulatory agencies regulations governing the use on paint materials.

1.07 PROTECTION

A. Provide dust-stops required for protection and temporary heating if required. Do no painting in dusty rooms or in rooms where other work is being performed that might raise dust or cause other disturbances that would damage painted surfaces. Isolate sections of the building as necessary to prevent dust circulation.

B. Protect or mask finished work during progress of painting and make good any damage done to adjacent work or surfaces. Cover and protect finished work of other trades and clean items of paint splatterings.

C. Do not store or mix paint materials on or adjacent to finished floors and walls, unless surfaces are protected from splatterings. Handling and application of materials of this trade shall be at sole risk of Contractor. Replace or make suitable repair of any damaged portions of work at Contractor's expense.

D. Provide adequate barriers, "Fresh Paint" signs or other devices including temporary barriers for temporary heating during paint application if it becomes necessary to protect paint work during its application and to conform with manufacturers recommended paint application instructions until acceptance of entire job. Repair or replace (as directed) damaged work at no additional cost to Owner.

E. Hardware that is not primed for painting and electric switch plates and similar items that are not to be painted shall be removed, and after applicable surface has been painted, reinstalled. If hardware, service cover-plates and screws are required to be painted, match adjacent surfaces. Repairs and replacement required due to damage shall be at Contractor's sole expense.

1.08 JOB CONDITIONS

A. Do not apply paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 50 deg. F., unless otherwise permitted by the manufacturers' printed instructions and as acceptable to the Architect.

B. Weather Conditions

1. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces, unless otherwise permitted by the manufacturers' printed instructions and as acceptable to the Architect.
2. Applications may be continued during inclement weather only within the temperature & weather limits specified by the paint manufacturer as being suitable for use during application and drying periods. When required, provide temporary heat and barriers to comply with manufacturers instructions for a durable and warrantable paint application.

1.09 REQUIREMENTS

A. Contractor shall paint all items included within paragraph 1.01, and all other intended adjoining materials and surfaces whether or not indicated of this section within the list shown. Items that are in question shall be brought to the Architect's attention during 'Bid' period. If requests for clarification and extent are not received during that time, it shall be presumed that the Contractor agrees to paint adjoining surfaces as requested by the Architect, without additional cost to the Owner.

B. Elevator shaft framing shall include all surfaces whether or not exposed to view through the glazed curtainwall. Shaft interior shall be considered all concrete elevator pit walls, steel tube and infill framing with sheathing, divider, separator and hoistway beams, miscellaneous metal supports and angles, back sides of elevator doors at each level, flashings, etc.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to jobsite in original cans or packages, sealed, and bearing names of manufacturer, numbers and kind of paint contained. Paint shall be mixed at the factory with primers, under-coaters, and enamels in separate containers. Bulk paste shall not be used.

B. Take precautions to prevent fire, as required by codes, rules, and as directed. Remove rags and waste, soiled with volatile paint, from premises at end of each day's work. Store in metal containers with metal covers.

C. A "NO SMOKING" sign shall be placed over the door and inside of each paint storage or mixing room and maintained there at all times. Keep open cans of volatiles away from paint storage area. Supply good ventilation.

1.11 GUARANTEE

Furnish a manufacturer's written guarantee to the effect that painted surfaces shall under normal usage and conditions, not fade, chip, crack, rust, blister or spall for a period of ten (10) years from final acceptance of work by the Owner, and that any defects discovered during this period, whether due to faulty workmanship or to incorrectly applied materials, shall be replaced (labor and materials), without additional cost to Owner.

2.00 PRODUCTS

2.01 MATERIALS

A. Materials necessary to complete the painting as herein specified and listed by manufacturer and material number are standards for kinds, quality and function, to establish types and quality, and are taken from the stock list of high performance architectural finishes of the ICI / Dulux Paint Company, Sherwin-Williams Company and Dunn-Edwards.
   1. Equivalent high performance materials from the architectural product line of Tnemec Tnemecrete will be acceptable, subject to Architect's concurrence.

2. Except for specialty items or as otherwise specified, all materials shall be by one manufacturer.

B. Materials for undercoats and finish coats of paint shall be ready-mixed, except field catalyzed coatings, and shall not be changed, except thinning of undercoats (when required), or coloring, any of which shall be in strict accord with the recommendations of the manufacturer. Paints of different manufacturers shall not be mixed. Pigments shall be fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixture. Paints shall have good flowing and brushing properties and be capable of drying or curing free of streaks and sags.

2.02 COLOR SCHEDULES

A. Colors shall be selected from color chip samples provided by one of the approved manufacturers. Match approved samples for color and coverage. The Architect will prepare a color schedule with samples for guidance in painting from the selected manufacturer's color key systems.

B. Requirements of the Steel Coating Section 09 97 13, with regards to colors selected are in addition to that specified herein for work of this section, and therefore adds to the total number of possible colors available for Architect's selection and usage

2.03 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 as acceptable to the Architect.

B. Prior to use of application equipment, verify that the proposed equipment is actually compatible with the material to be applied, and that integrity of the finish will not be jeopardized by use of the proposed equipment.

2.04 OTHER MATERIALS

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

3.00 EXECUTION

3.01 SCAFFOLDING

Furnish and maintain scaffolding and similar temporary work necessary for execution of work. Scaffolding not to interfere with work of other sections. Shift between coats, if necessary, to allow installation of other work, and remove promptly when no longer needed.

3.02 QUALITY OF WORK

Apply materials by skilled workers. Do not assign workers to any work requiring special finishing if they have not had previous experience in that type of work. Evenly spread and smoothly flow on materials without runs, sagging, brush marks, skips, undercoats showing through, or other defects.

3.03 SPECIAL SUPERINTENDENCE

Finish painting must be first-class in every respect. Repaint and refinish work not to highest standards of trade at no additional cost to Owner. Improper work or materials shall be removed, replaced and refinished.

3.04 PREPARATION FOR PAINTING

A. General
1. Surfaces shall be clean and dry when paint is applied. Rooms in which painting is to be started shall be swept clean, dusted and then all surfaces wiped with a damp cloth to remove dust and dirt.
2. No painting is permitted until surfaces are dry and fully cured. New masonry or concrete shall have aged at least 30 days under good drying conditions prior to painting. Use moisture meter to ascertain moisture content recommended by applicable paint manufacturer.
3. See Mechanical and Electrical for cleaning and preparatory work specified to be performed in these Divisions.
4. Mask adjoining surfaces and protect adjacent areas not to be painted.

B. Metal Surfaces: Comply for items not finished under the Steel Coating System Section.
1. Wash metal surfaces with mineral spirits to remove any dirt or grease, before applying paint materials. Where rust or scale is present, use wire brush, or sandpaper, clean before painting. Clean shop coats of paint that have become marred. Touch-up abraded parts with primer.
2. Work includes touching up shop prime coats, as required.
3. Etch exposed galvanized metal with ICI/Dulux 7113 Vinyl Wash Primer, Dunn-Edwards" vinyl wash pretreatment 42-36, Sherwin-Williams' Galvanized Iron Primer B501A, or equal, before priming and painting.

C. Concrete/Masonry/Plaster
1. Surface shall be dry before any sealer or paint is applied. Use moisture meter to ascertain moisture content of surfaces to be painted.
2. Clean surfaces of dirt, laitance, encrustations and foreign matter. Ensure concrete surfaces that are to be painted are free of oil or other form release agents that are non-compatible with the paint. Fill cracks, holes, pits, and other imperfections in paint surfaces flush and smooth. Chemically treat surfaces as required to counteract lime and alkali burns, "hot spots" and other inherent unacceptable properties.
3. Treat stains and spots where surface is touched up, owing to minor defects, to prevent stains coming through paint. Completed finish shall be free from alkali burns and dull spots and shall be uniform in color and sheen.

D. Drywall: Surfaces shall be cleaned of dust and grease. Correct defects in taping and finish of joints prior to application of paint.

3.05 PRIMING AND BACKPAINTING

A. Carefully prime finish lumber and millwork with applicable primer and back paint as specified. Back paint immediately upon delivery of millwork to jobsite.

B. Apply first coat of paint or other finish immediately after woodwork has been fitted, erected, sanded and approved. Touch up shop coats of paint prior to application of required priming.

3.06 THINNING

Thin only as directed by printed instructions of manufacturer of applicable paint. Paint thinners to be exact type recommended by manufacturer of paint brand used and shall bear same brand name.

3.07 PAINT APPLICATION

A. General
1. Touch-up shop applied prime coats that have been damaged. Touch-up bare areas and "spot" touch-up undercoats as necessary prior to start of finish application. After spot touch-up of shop applied prime coat finely sand down and apply a field primer coat as specified over shop prime coat before proceeding with finish coating.
2. Slightly vary the color of succeeding coats.
   a. Do not apply additional coats until the completed coat has been inspected and accepted by Architect.
   b. Only the inspected and accepted 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.

B. Number of Coats: Number of coats specified are minimum. Insure acceptable paint finishes of even, uniform color, complete opacity, free from cloudy or mottled appearance in surfaces and evident thickness of coatings. Upon completion of work, painting which does not show uniform color and textures are deemed incorrectly thinned or applied and Contractor shall apply additional coats at no cost to Owner until uniform results are obtained.

3.08 PAINT SCHEDULE

Finish surfaces in accord with the following procedure for the surface and finish desired thereon. Numbers used to identify paint indicates the paint in white. Same material shall be of color selected by the Architect.

A. EXTERIOR

		Dunn-Edwards	Dulux	Sherwin-Williams	Vista
1.	Plaster and Concrete:				
	1st Coat:	ESPR00	36	B42WW49	4600
	2nd Coat:	EVSH10	2200	A-100 (A6)	2800
2.	Concrete Block Masonry:				
	1st Coat:	SBPR00	3010	B25W25	040
	2nd Coat:	EVSH10	2200	A-100 (A6)	2800
3.	Metal - Ferrous:				
	1st Coat:	BRPR00	4160	B50NZ	9600
	2nd Coat:	9A	AT6300H	B55Z-600	9800
	3rd Coat:	9A	AT6300H	B55Z-600	9800

4.	Metal Non-Ferrous:				
	1st Coat:	GAPR00	4160	B50WZ30	4800
	2nd Coat:	9A	AT6300H	B55Z-600	9800
	3rd Coat:	9A	AT6300H	B55Z-600	9800
5.	Metal - Galvanized:				
	Pretreatment:	SC-ME01	Jasco or 88	B71Y1	Jasco
		GAPR00	4160	B50WZ30	4800
	1st Coat:	9A	AT6300H	B55Z-600	9800
	2nd Coat:	9A	AT6300H	B55Z-600	9800
	3rd Coat:				

B. INTERIOR

1. Concrete Surfaces: Surfaces include four sides interior columns and interior face of exterior columns including integral columns at shear walls. Interior surfaces include all slab soffits, sides and bottoms of beams, foundation and retaining wall surfaces.

		Dunn-Edwards	Dulux	Sherwin-Williams	Vista
1.	Concrete				
	1st Coat:	ESPR00	36	B42WW49	4700
	2nd Coat: (Flat)	SPMA10	1201	B30W200	5100
	2nd Coat: (Eggshell)	SPMA30	2402	B20W200	5300
2.	Concrete Block Masonry:				
	1st Coat:	SBPR00	3010	B25W25	040
	2nd Coat:	SPMA10	2200	B30W200	5100
3.	Metal - Ferrous:				
	1st Coat:	BRPR00	4160	B50NZ	9600
	2nd Coat:	AWLL50	SG 45	A40W15	9800
	3rd Coat:	AWLL50	SG 45	A40W15	9800
4.	Metal Non-Ferrous:				
	1st Coat:	GAPR00	4160	B50WZ30	4800
	2nd Coat:	AWLL50	SG 45	A40W15	9800
	3rd Coat:	AWLL50	SG 45	A40W15	9800
5.	Metal - Galvanized:				
	Pretreatment:	SC-ME01	Jasco or 88	B71Y1	Jasco
	1st Coat:	GAPR00	4160	B50WZ30	4800
	2nd Coat:	AWLL50	SG 45	A40W15	9800
	3rd Coat:	AWLL50	SG 45	A40W15	9800

2. Piping and Conduit: Paint finish all exposed piping, storm drain piping, Fire Department risers and controls, ductwork, conduit and other features not specifically designated, to match adjacent surfaces or as directed by Architect. Paint per Item 3 or 4 above as applicable.

3. Gypsum Wallboard - (enclosed interior spaces)

	Dunn-Edwards	Dulux	Sherwin-Williams	Vista
1st Coat:	VNPR00	1030	B28W400	5001
2nd Coat (Flat)	SPMA10	1201	B30W200	5100

END OF SECTION

SECTION 09 96 23 – GRAFFITI RESISTANT COATINGS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1, apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Non-sacrificial, (permanent) anti-graffiti coating to the entire perimeter elevation on all exposed painted concrete and CMU walls, of the elevator / stair core and perimeter, up to underside of second level or the level above that accessible at grade, and floor to ceiling of each floor level elevator lobby walls.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 04 22 00: Concrete Masonry Unit
B. Section 09 90 00: Painting

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM).

ASTM B117	Test Method of Salt Spray (Fog) Testing
ASTM D660	Test Method for Evaluating Degree of Checking of Exterior Paints
ASTM D661	Test Method for Evaluating Degree of Cracking of Exterior Paints
ASTM D714	Test Method for Evaluating Degree of Blistering Paints
ASTM D772	Test Method for Evaluating Degree of Flaking/Scaling Exterior Paints
ASTM E96	Test Methods for Water Vapor Transmission of Materials

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Samples of substrate 12 inch by 12 inch minimum (3), in specified color, treated with anti-graffiti coating for review of aesthetics, effectiveness and removal tests for approval by Architect. Provide a sample bottle of removal product. Each sample is to receive a minimum of 10 scrub cycles. Submission shall include all necessary components to allow for the complete testing cycle.

C. Manufacturer's technical product data with application instructions for each material proposed for use, material safety data sheets MSDS, application rates and product required for graffiti removal.

D. Manufacturer's certification that system complies with these specifications and those of the manufacturers. Base certificate on verification of coverage rates accompanied by copies of purchase orders and of manufacturer representatives field inspection reports and approval of substrate.

E. Maintenance: Provide the Owner with 1 case (12 - 16 oz. bottles) of recommended graffiti remover materials.

1.05 PERFORMANCE REQUIREMENTS

A. Anti-graffiti coating shall be a multi-component system permanent coating consisting of a base bonding/coating(s) and anti graffiti coat(s) topcoat(s).

B. Anti-graffiti coating shall show no signs of deterioration or change of appearance after graffiti has been removed during the ten (10) year warranty period, i.e. shadowing, ghosting, hazing or staining of coating or substrate.

C. Anti-graffiti coating shall be water clear, non-hazing, non-spalling, non yellowing and contain no waxes, urethanes or other yellowing agents. Coating shall not change the color of any substrate or painted surface, or cause any objectionable appearance characteristics.

D. Anti-graffiti coating product shall be non-toxic, nonflammable, biodegradable, and with a pH 7 to 8.5.

E. Anti-graffiti coating shall allow moisture vapor transmission.

F. Anti-graffiti coating shall have the capability of removing 100% of all types of graffiti on treated surfaces without damaging the coating or the substrate.

G. After graffiti removal is complete, no evidence of graffiti shall be present on the coated surface.

H. Anti-graffiti coating shall be capable of withstanding a minimum 100 cleaning cycles without measurable evidence of surface coating deterioration.

I. Graffiti treatment shall be resistant to all weather conditions.

J. Dirt pickup on the coated surface shall not be increased by the application of the anti graffiti system.

K. Anti-graffiti coating shall be APCD/VOC compliant.

L. Anti-graffiti coating shall conform to current City and State waste disposal regulations from date of installation.

1.06 QUALITY ASSURANCE

A. Use products (coatings and removal products) by manufacturers regularly engaged in manufacturing of this product and with a history of at least ten (10) successful commercial applications within the last three (3) years.

B. Manufacturer shall be selected on the basis of providing on site services, supervision/inspection during and after the application to guarantee compliance with project and manufacturers' specifications and warranty.

C. Use qualified workers who have been trained, certified and accepted by the manufacturer. Applicator shall have at least two (2) years experience spraying anti-graffiti coatings.

D. Allowable Tolerances and Coating Thickness: Minimum dry thickness for each application of base coat and finish coat of anti-graffiti system shall be 1 mil.

E. Base coatings, top coatings and removal agent shall be manufactured by the same manufacturer.

F. A representative of the manufacturer shall be notified 48 hours in advance and be present during job application. Manufacturers representative shall approve the substrate in which the coating is to be applied and that the product selected for use is compatible to obtain the desired performance and aesthetic results. Any recommended changes contrary to these specifications shall be brought to the Architects attention immediately. Start of work implies that the manufacturer agrees with product selection and execution and assumes responsibility for the application.

G. Verification:
1. Furnish duplicates of invoices of all materials purchased for the project.
2. Furnish certification which verifies the quantity of materials applied to the project and the method of application.
3. File "Application for Guarantee" with the manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Comply with applicable codes and regulations. All products shall comply with local governing authorities requirements and current VOC requirements for the Air Pollution Control District APCD, where application takes place. Where those requirements conflict with this specification, comply with the more stringent provisions.

B. Application shall be in conformance with code requirement that coverage be a minimum of 9 feet high or to the first architectural building break thereafter. Consult Architect with intent prior to execution.

1.08 PROJECT CONDITIONS

A. Apply water based coatings only when temperature of surface to be coated and surrounding air temperatures are between 40 degrees F and 100 degrees F, or when the relative humidity is more than 70 percent, unless permitted by coating manufacturers written instructions.

B. Do not apply coatings in snow, rain, fog, mist, wind or if any of the preceding will take place within twelve hours of application.

C. Do not apply when temperature is 50 degrees or less at time of application or four hours following treatment, or when temperature is expected to drop below freezing during the 24 hour period following application.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver in manufacturer's original, new and unopened containers with seals unbroken and labeled with manufacturer's name, title of material, batch/stock number, date of manufacture and expiration date. Submit in quantities required to allow continuity of application.

B. Store materials not in use, in tightly covered containers at normal room temperature, in compliance with manufacturer's printed instructions and out of direct sunlight. Do not store at temperatures of 85 degrees or higher. Store containers in an upright position.

C. Keep storage area for coating material(s) neat and orderly. Remove flammable rags and waste daily. Take all precautions to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application of the anti graffiti product.

D. Use all means necessary to protect work of other trades, including landscape and hardscape before, during and after installation of coating or surface treatments, whether

area is to be coated or not. In the event of damage, immediately make all repairs and replacements necessary to the approval of Architect and at no additional cost to Owner.

1.10 WARRANTY

A. Upon completion of the installation, and as a condition of its acceptance, deliver to Architect a written warranty that the anti-graffiti coating installed will remain effective against graffiti and remain unchanged in color (even when applied to painted surfaces) for a decreasing term / period of ten (10) years

B. The applicator shall guarantee the installation against poor workmanship for a period of two (2) years from the date of acceptance of the parking structure by Owner. Make all necessary repairs without charge to Owner during that period. Manufacturer shall guarantee material against moisture penetration for five (5) years, after date of acceptance.

2.00 PRODUCTS

2.01 MANUFACTURER

A. Provide multi coat, penetrating, non-sacrificial (permanent), coating(s) that will dry to a clear, translucent, colorless, non-gloss (matte) film, (semi gloss only upon prior approval of the Architect), and remain unchanged in appearance for the life of the material. Product shall be one of the following:
   1. Permashield Base and Permashield Premium, as manufactured by Monochem.
   2. Or approved equal as determined by the Architect.
      a. Contains no paraffins, urethanes or any compound creating yellowing or other undesireable color or gloss and that will be compatible with the substrate material.

B. Where applicable, provide coatings in a custom pigmented matte, (or semi-gloss) finish as required by the Owner/Architect. Coordinate with Section 09 90 00, Painting for 'Scope of Work'. Colors are to match the color systems of the manufacturers whose systems are listed therein.

2.02 EQUIPMENT

Medium or large capacity airless spray equipment set at normal painting pressures with tip sizes .015 to .025. Cup or pot equipment is inadequate.

3.00 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspect the installed work of other trades and verify that all such work is complete to the point where this installation may commence. Manufacturer's representative shall field inspect and verify that the anti-graffiti coating may be installed in accordance with the manufacturers recommended methods. In the event of discrepancy, immediately notify the Architect.

B. Surfaces shall be structurally sound, dry, clean and free of moisture, dust, dirt, grime, oils, scale, rust, silicones, curing or parting compounds, alkali, or acid residues. Surfaces shall be cleaned to such extent and by whatever manufacturers approved means, hat will accomplish the purpose without injuring the surface or cause damage to the prior waterproof coating and/or finished (painted) surface.

C. Starting of Work will be deemed acceptance of surfaces and conditions in which work of this section is to apply.

3.02 APPLICATION

A. Perform preparation and cleaning procedures in accordance with coating manufacturers instructions and as herein specified for each particular substrate condition.

B. Application shall be in conformance with manufacturer's recommendations. Use applicators and techniques best suited for type of material to be applied. Apply number of base and topcoats as required for substrate being applied.

C. Spray using a cross-hatched pattern at a rate as recommended by the manufacturer, applied at a saturation rate, avoiding runs or sags. Any runs or sags which may occur should be immediately brushed out using a clean soft brush. Coating should be dry to touch before application of the next coat. If spray difficulty occurs, consult manufacturer's recommendations.

3.03 TOUCH UP WORK

A detailed inspection of the coating work shall be conducted and surface areas determined to be un-coated or not consistent with the desired finish shall be repaired per manufacturer's instructions.

3.04 PROTECTION AND CLEAN UP

A. Protect all adjacent work from damage during application. Completely remove overspray and spills with detergent and water as soon as possible before curing.

B. During the process of work, remove from the site discarded coating materials, rubbish, cans, rags and related debris at the end of each day.

3.05 GRAFFITI CLEANER AND REMOVAL

A. Consult with manufacturer for recommended graffiti removal products compatible with system materials and type of defacement.

B. Remove graffiti as quickly as possible to avoid curing.

C. Follow manufacturers’ directions and warning cautions on the printed labels.

END OF SECTION

SECTION 09 97 13 – STEEL COATING SYSTEM

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to this Section.

B. Furnish all labor, materials, services, equipments and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:

C. Interior / Exterior Coating:
1. Steel pan stairs and stringers, complete, including supports and accessories.
2. Stair handrails / stair guardrails
3. Elevator lobby guardrailing
4. Steel pipe bollards
5. Supports for barrier beams
6. Standpipe and storm drain guard barriers
9. H.M. doors and frames
10. Elevator Doors

D. Carefully examine other sections of these specifications to ascertain scope of coating work which is required.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 05 50 00: Miscellaneous Metal
B. Section 07 60 00: Sheet Metal Work
C. Section 09 90 00: Painting

1.03 SURFACES NOT TO BE PAINTED

A. Stainless steel, anodized aluminum, bronze, copper, chrome-plated metals.
B. All paint finished items, refer to Section 09 90 00.
C. All factory pre-finished items.
D. Galvanized items, unless specified.
E. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
ASTM B117 Salt Spray
ASTM D520 Zinc Dust, Type II
ASTM D870 Immersion
ASTM D1653 Water Vapor Transmission
ASTM D2247 Humidity
ASTM D2794 Impact
ASTM D3363 Hardness
ASTM D4060 Abrasion
ASTM D4541 Adhesion

1.05 DEFINITIONS

Coating, as used herein, means manufacturer's coating system materials which may include surface preparation, zinc rich primers, shop coat primer touch-up, acrylic aliphatic polyurethane enamels or siloxane-epoxy, and other applied materials whether used as prime, intermediate or finish coats, as required to provide selected manufacturers complete system.

1.06 QUALITY ASSURANCE

A. Applicator Qualifications: Applicator shall have a minimum of five (5) years of experience and successfully completed coating system applications similar in material and extent to that indicated for this Project.

B. Single-Source Responsibility: Provide all primers, undercoating and finish coating materials produced by the same manufacturer that are compatible with one another and substrates indicated under conditions of service and application, and of the same production dates as noted on the sealed containers.

C. Coating Coordination
   1. Provide finish coats which are compatible with the prime coats actually used and base substrate material finish as provided.
   2. Review other sections of these specifications as required, verifying prime coats used, and assuring compatibility of the total coating system for the various substrata.

D. Acceptance of Work
   1. Inspect surfaces to which materials of this section are to be applied. Correct any defects or other unsatisfactory conditions prior to coating application.
   2. Application of any material of this section shall be deemed acceptance of substrate surfaces. Failure of coating work will be construed as improper application.

E. Requirements of Regulatory Agencies: Comply with state and local regulations governing the use of coating materials.

1.07 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data:
   1. Materials list of items proposed to be provided under this section. Identify each material by manufacturers catalog number and general classification. Written approval of this list must be obtained from Architect before any coating is used or work started.
   2. Manufacturer's specifications and product data needed to prove compliance with the specified requirements. Technical information shall include certification that the proposed products meet the reference standards. Data shall include chemical composition, weight/percent of each solids per gallon, pounds of zinc per gallon, etc. Pot life extenders shall be submitted for acceptance prior to usage.
   3. Certification by manufacturer that products supplied comply with requirements indicated that limit amount of VOC's in coating products.

C. Samples:
   1. Following the selection of colors and glosses by the Architect, as described under "Color Schedules: in Part 2 of this section, submit samples for the Architect's review.
      a. Provide three samples of each color and each gloss of the finish coating.
      b. Except as otherwise directed by the Architect, make samples approximately 8" x 10" in size.
      c. If so directed by the Architect, submit samples during progress of the work in the form of actual application of the approved coating materials on actual surfaces to be painted, and over actual prime coat used.
   2. Revise and resubmit each sample as requested until the required gloss and color is achieved. Such samples, when approved, will become standards of color and finish for accepting or rejecting the work of this Section.
   3. Do not commence finish coating until approved samples are on file at the job site.

D. Qualification Data: For firms and persons specified in "Quality Assurance" to demonstrate their capabilities and experience. Include lists of completed projects with names and addresses of the projects, Architect and Owner.

1.08 PROTECTION

A. Provide dust-stops required for protection of adjacent surfaces. Do no coating in dusty rooms or in areas where other work is being performed that might raise dust or cause other disturbances which would damage coated surfaces. Isolate section of the building as necessary to prevent dust circulation.

B. Protect finished work during progress of coating work and repair any damage done to work. Cover and protect finished work of other trades.

C. Do not store or mix coating materials on or adjacent to finished floors and walls, unless surfaces are protected from splatterings. Handling and application of materials shall be at entire risk of Contractor. Replace or repair any damaged portions of work at Contractor's expense.

D. Provide adequate barriers, "Wet Paint" signs or other devices necessary to protect coating work during application and until acceptance of entire job.

1.09 JOB CONDITIONS

A. Do not apply coating system when the temperature of surfaces to be painted and the surrounding air temperatures are below 45deg. F. or above 100deg. F unless otherwise permitted by the manufacturers' printed instructions and as acceptable to the Architect.

B. Weather Conditions:
   1. Do not apply coating in snow, rain, fog, or mist; or when the relative humidity exceeds 80%; or to damp or wet surfaces, unless otherwise permitted by the manufacturers' printed instructions and as acceptable to the Architect.
   2. Applications may be continued during inclement weather only within the temperature, weather and time limits specified by the coating manufacturer as being suitable for use during application and drying periods.

C. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry. Start of application is construed as applicators acceptance of surfaces within that particular area.

D. Coordination of Work: Review other sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates.
   1. Work of this contract is to be coordinated with the work of other sections, in order to get the correct surface preparation and correct primer.
   2. If potential incompatibility of surface preparation and/or primers applied by others exists, obtain confirmation of the primers suitability for expected service conditions and primers ability to be top coated with the material specified.
   3. Notify the Architect about anticipated problems before using coatings specified over substrates primed with non-specified materials.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to jobsite in original cans, sealed, and bearing names of manufacturer, product name, system number, kind of coating, date of production, thinning instructions, handling instructions and precautions. Coating shall be mixed per manufacturer's printed instructions.

B. Store materials not in use in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

C. Take precautions to prevent fire, as required by codes, rules, and as directed. Remove rags and waste, soiled with volatiles, from premises at end of each day's work. Store in metal containers with metal covers. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and applying the coatings.

D. A "NO SMOKING" sign shall be placed over the door and inside of each coating storage or mixing room and maintained there at all times. Keep open cans of volatiles away from coating storage area. Supply good ventilation.

1.11 GUARANTEE

Furnish a written guarantee to the effect that coated surfaces shall, under normal usage and conditions, not fade, chip, crack, rust, blister, chalk or spall for a period of one (1) year after final acceptance of work by the Owner, and that any defects discovered during this period, whether due to faulty workmanship or to incorrectly applied materials, shall be replaced without additional cost to Owner.

2.00 PRODUCTS

2.01 MATERIALS

A. Materials necessary to complete the coating system as herein specified and listed by material number and names are standards for kinds, quality and function, and are taken from the stock list of coatings complying with printed specifications of Tnemec Company, Inc., Compton, California as distributed by TPC Consultants, Inc. (310) 643-5191, Ameron distributed by Frazee Paint Company, Carboline distributed by Vista Paints, Devoe distributed by Dulux, IPC distributed by Dunn-Edwards, S-W by Sherwin Williams and PPG, to establish types and quality. Except as otherwise specified, all materials shall be by one manufacturer.

B. Materials for primers, intermediate and finish coats of paint shall be ready-mixed and shall not be changed, except for field mixing of parts "A" and "B" components, and thinning (when required), any of which shall be in strict accord with the printed instructions of the manufacturer. Coatings of different manufacturers shall not be mixed.

2.02 COLOR SCHEDULES

A. The Architect will prepare a color schedule with samples for guidance in coating.

B. Requirements of the Painting Section, with regards to colors selected, are in addition to that specified herein for work of this section, and therefore adds to the total number of possible colors available for Architect's selection and usage.

2.03 APPLICATION EQUIPMENT

A. For application of the approved coating, use only such equipment as recommended by the manufacturer and as acceptable to the Architect.

B. Prior to use of application equipment, verify that equipment is compatible with the material to be applied.

2.04 OTHER MATERIALS

Provide other materials, not specifically described, but required for a complete and proper coating system, as recommended by the manufacturer and as accepted by the Architect.

3.00 EXECUTION

3.01 SCAFFOLDING

Furnish and maintain scaffolding, masking, warning signage necessary for execution of work. Scaffolding and execution of work of this section is not to interfere with work of other sections.

3.02 QUALITY OF WORK

Apply materials by skilled mechanics experienced in this type of work. Apply materials with even spread and smooth flow of materials without runs, sagging, brush marks, skips, undercoats showing through, or other defects.

3.03 PREPARATION FOR COATING

A. Areas in which coating is to be applied shall be swept clean. Schedule cleaning so that dust and other contaminants from cleaning do not fall on wet, newly coated surfaces.

B. Remove plates and similar items already in place that are not to be coated. If removal is impractical, provide surface applied protection before surface preparation and coating.

C. Do not apply coating systems over dust, dirt, oil, grease, rust, scale, moisture, scuffed surfaces, or other detrimental conditions.

D. Architect shall accept the use of barrier coats over incompatible primers. Where required remove primers and reprime substrate with specified material.

E. Surface Preparation:
   1. Shop Preparation of Bare Metal: Commercial blast cleaning per (Steel Structure Painting Council) SSPC - SP6 of all metal surfaces, where shop priming in conformance with Steel Coating Section. Coordinate this work with related sections.
   2. Field Preparation of Galvanized / Aluminum Surfaces: Surface preparation SSPC-SPI solvent cleaning & etched, followed by 3.0-4.0 mils dry film of specified intermediate coat.
   3. Field preparation of weld areas and damaged specified shop primer: SSPC-SP11, Power tool clean to bare metal, in conformance with industry standards and touch up primed surfaces with the system used.

3.04 MIXING / THINNING

A. Stir materials before applying to produce mixture of uniform density and consistency. Stir additionally as required during application. Do not stir surface film into material. Remove film and if necessary, strain coating material before using.

B. Thin only as directed by printed instructions of manufacturer, using materials which do not effect color, sheen, adhesion and performance. Pot life extenders must be of type recommended by manufacturer.

3.05 COATING APPLICATION

A. After commercial blast cleaning, follow selected manufacturer's recommendations for application of specified two component zinc-rich primer to 3.0 - 3.5 dry mils thickness to all surfaces not shop primed, in accordance with Section 05 50 00, unless specified otherwise.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. After spot touch-up of shop applied prime coat and field application of the epoxy intermediate coat, when required, finely sand down and apply specified top-coat of two component acrylic polyurethane enamel coating to a min. dry film thickness of 2.5 mils., or siloxane epoxy to a minimum dry film thickness of 5 mils.

D. Sand between coats as required to remove defects visible to the unaided eye from a distance of five feet.

E. Number of coats specified are a minimum.
   1. Insure even, uniform color, complete opacity, free from cloudy or mottled appearance, with finish sheen without streaks, laps, runs, sags or missed areas.
   2. Upon completion of work, coating which does not show uniform thickness, color and finish will be deemed to have been incorrectly applied and Contractor shall apply additional coats at no cost to Owner until uniform results are obtained.
   3. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive dry film thickness equivalent to that of flat surfaces.
   4. The number of coats and film thickness required is the same regardless of the application method. Test for holidays using a non-destructive holiday tester.

F. Allow sufficient drying time between successive coats. Do not recoat until the coating has dried so it feels firm and does not deform or feel sticky under moderate thumb pressure and where applying another coat does not cause the undercoat to lift or loose adhesion.

G. Application Procedures: Apply coatings by brush, roller, spray, according to manufacturers written instructions.
1. Brush application: Use brushes best suited for material applied and of appropriate size for surface or item being coated. Work brush coats into surface in even film without streaks.
2. Rollers: Use rollers of carpet, velvet, or high pile sheeps wool for material and texture required.
3. Spray equipment: Use spray equipment with orifice size and application pressure recommended by the manufacturer. Apply each coat to provide equivalent hiding of brush or roller applied marks. Do not double back with spray equipment build up film thickness of 2 coats in 1 pass.

3.06 COATING SCHEDULE

A. Omit primer on metal surfaces that have been shop primed and touchup painted.

B. Finish surfaces in compliance with the following systems for the substrate indicated.

EXTERIOR – INTERIOR

1. Galvanized Metal
a. First Coat:
(1) Carbonline: Rustbond Primer

b. Second Coat: Intermediate – High-Build Epoxy or High Build Polyurethane. Dry film thickness of 4.0 – 6.0 mils
(1) Ameron: 385
(2) Carboline: 890 Carboguard VOC
(3) Devoe: 201 Devran
(4) IPC: 670 HS Interseal
(5) S-W: B67W300 Heavy Duty Epoxy / B58-400 Macropoxy HS Epoxy
B65-300 Hi-Solids Polyurethane
(6) Tnemec: Series 69 Epoxoline
(7) PPG: 97-Line Pitt-Guard All Weather DTR Epoxy

c. Third Coat: Finish – Aliphatic Polyurethane Enamel (Semi-Gloss). Dry film thickness of 2.0 – 4.0 mils.
(1) Ameron: 450HS / 450SA
(2) Carboline: 133MC / 134 MC Carbothane
(3) Devoe: 379 Devthane
(4) IPC 990 HS Interthane
(5) S-W: B65W300 Hi-Solids Polyurethane
B65-600 Acrolon 218 H.S.
(6) Tnemec: 10-74/75 Endurashield
(7) PPG: 95-8600 Series Pitthane

2 Shop Primed Metal
a. First Coat: Zinc rich epoxy or urethane. Dry film thickness of 3.0 – 4.0 mils. (All zinc-rich primers must be applied to a blasted metal surface prepped to meet SSPC-6 standard. These types of primers will not adhere to shop primers.)

(1) Ameron: 441 Amercoat
(2) Carboline: 11WB Carbozinc / 859 VOC Carbozinc (touchup)
(3) Devoe: 302H Catha-Coat
(4) IPC: 52 Interzinc
(5) S-W: B65G10 / B69D210 Corothane I – Galvapac Zinc Primer
(6) Tnemec: 90-97 Tnemec-Zinc
(7) PPG: 97-670 Aquapon Polymide Epoxy

b. Second Coat: Intermediate – High-Build Epoxy or High Build Polyurethane. Dry film thickness of 4.0 – 6.0 mils
(1) Ameron: 385 Amercoat
(2) Carboline: 890 Carboguard VOC
(3) Devoe: 201 Devran
(4) IPC: 670 HS Interseal
(5) S-W: B67W300 Heavy Duty Epoxy / B58-400 Macropoxy HS Epoxy
B65-300 Hi-Solids Polyurethane
(6) Tnemec: Series 69 Epoxoline
(7) PPG: 97-Line Pitt-Guard All Weather DTR Epoxy

c. Third Coat: Finish – Aliphatic Polyurethane Enamel (Semi-Gloss). Dry film thickness of 2.0 – 4.0 mils.
(1) Ameron: 450 HS Amercoat Gloss
(2) Carboline: 133 MC / 134 MC Carbothane
(3) Devoe: 379 Devthane
(4) IPC 990 HS Interthane
(5) S-W: B65W300 Hi-Solids Polyurethane
B65-600 Acrolon 218 H.S.
(6) Tnemec: 10-74/75 Endurashield
(7) PPG: 95-8600 Series Pitthane

3 Ferrous Metal

a. First Coat: Zinc rich epoxy or urethane. Dry film thickness of 3.0 – 4.0 mils
(1) Ameron: 441 Amercoat
(2) Carboline: 11WB Carbozinc / 859 Carbozinc VOC (touchup)
(3) Devoe: 302H Catha-Coat
(4) IPC: 52 Interzinc
(5) S-W: B65G10 / B69D210 Corothane I – Galvapac Zinc Primer
(6) Tnemec: Series 69 Epoxoline
(7) PPG: 97-670 Aquapon Polyamide Epoxy

b. Second Coat: Intermediate – High-Build Epoxy or High Build Polyurethane. Dry film thickness of 4.0 – 6.0 mils
(1) Ameron: 385 Amercoat
(2) Carboline: 890 Carboguard VOC
(3) Devoe: 201 Devran
(4) IPC: 670 HS Interseal
(5) S-W: B67W300 Heavy Duty Epoxy / B58-400 Macropoxy HS Epoxy
B65-300 Hi-Solids Polyurethane
(6) Tnemec: Series 69 Epoxoline
(7) PPG: 97-Line Pitt-Guard All Weather DTR Epoxy

c. Third Coat: Finish – Aliphatic Polyurethane Enamel (Semi-Gloss). Dry film thickness of 2.0–4.0 mils.

(1)	Ameron:	450HS / 450SA
(2)	Carboline:	133 MC / 134 MC Carbothane
(3)	Devoe:	379 Devthane
(4)	IPC	990 HS Interthane
(5)	S-W:	B65W300 Hi-Solids Polyurethane B65-600 Acrolon 218 H.S.
(6)	Tnemec:	10-74/75 Endurashield
(7)	PPG:	95-8600 Series Pitthane

4. Aluminum

a. First Coat: Not Applicable. Etched by chemical preparation.

b. Second Coat: Intermediate – High-Build Epoxy or High Build Polyurethane. Dry film thickness of 4.0 – 6.0 mils

(1)	Ameron:	385 Amercoat
(2)	Carboline:	890 Carboguard VOC
(3)	Devoe:	201 Devran
(4)	IPC:	670 HS Interseal
(5)	S-W:	B67W300 Heavy Duty Epoxy / B58-400 Macropoxy HS Epoxy B65-300 Hi-Solids Polyurethane
(6)	Tnemec:	Series 69 Epoxoline
(7)	PPG:	97-Line Pitt-Guard All Weather DTR Epoxy

c. Third Coat: Finish – Aliphatic Polyurethane Enamel (Semi-Gloss). Dry film thickness of 2.0–4.0 mils.

(1)	Ameron:	450 HS / 450 SA
(2)	Carboline:	133 MC / 134 MC Carbothane
(3)	Devoe:	379 Devthane
(4)	IPC	990 HS Interthane
(5)	S-W:	B65W300 Hi-Solids Polyurethane B65-600 Acrolon 218 H.S.
(6)	Tnemec:	10-74/75 Endurashield
(7)	PPG:	95-8600 Series Pitthane

3.07 RIGHT OF REJECTION

Do no coating work under conditions which would jeopardize appearance of work in any way. No work will be accepted which shows laps, stains, brush marks, or flat spots or imperfections in coating. Unsatisfactory work will be rejected and shall be replaced at no additional cost to Owner.

3.08 PROTECTION

Protect work of other trades, whether being coated or not, and adjacent facilities against damage from coating operation.

3.09 REFINISHING

Should finish coating be applied before other trades have completed their work, repair for any damage sustained to the final coating. Work under this section that has become marred or that has developed imperfections shall be refinished at no extra expense to the Owner.

3.10 CLEANING

A. At the end of each work day, remove rubbish, empty cans, rags and other discarded materials. Remove surplus materials and debris from the site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping or other non-defacing methods. Do not damage adjacent finished surfaces.

END OF SECTION

SECTION 10 14 36 – NON-ILLUMINATED SIGNS & GRAPHICS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. All non-illuminated signs, sign supports, posts, concrete bases, inserts and attachments required for signs, in place.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete & Concrete Finishes
B. Section 05 50 00: Miscellaneous Metal
C. Section 09 97 13: Steel Coating System
D. Section 09 90 00: Painting
E. Section 32 17 23: Parking Area Striping and Markings

1.03 REFERENCE STANDARDS

A. Braille Symbols Title 24, Section 11B-703.3
   1. Contracted Grade 2 Braille shall be used whenever California Braille symbols are specifically required in other portions of these standards.
   2. Dots spacing shall be 0.100 inch (2.5mm) on centers in each cell with 0.30 inch (7.6mm) space between cells.
   3. Dots shall be raised a minimum of 0.025 inch above the background.
   4. Dots shall be rounded or domed, each distinct and separate. Dots with straight sides and flat tops are not acceptable.

B. Signage and graphics:
   1. Character type: Characters on signs shall be raised 1/32 inch (0.794 mm) minimum and shall be sans serif uppercase characters accompanied by Grade 2 Braille.
   2. Character size: Raised characters shall be a minimum of 5/8 inch (15.9mm) and a maximum of 2 inches (51mm) high.
   3. Finish and contrast: Characters shall contrast with either light characters on dark background or dark characters on a light background and shall have a non-glare finish per Section 11B-703.5.1.
   4 Proportions: Character width, height, and stroke thickness shall be per Section 11B-703.2.4-2.6.

1.04 SYSTEM DESCRIPTION

A. Comply with the most stringent requirements of Americans with Disabilities Act Standards for Accessible Design (ADASAD) and CBC.

B. Parking Lot Entrance Signs and Accessible Parking Space Identification Signs:
   1. Parking lot entrance signs shall comply with CBC, warning that cars parked in parking spaces reserved for people with disabilities will be towed.
   2. Parking spaces reserved for people with disabilities shall be identified with a reflective sign featuring the ISA, which shall comply the CBC. Van accessible spaces shall be identified with the term “Van Accessible”. (CBC 11B-502.6).

3. Reserved parking spaces shall also be identified by the ISA at the foot of the space in compliance with CBC. (CBC 11B-502.6.4.1). Access aisles shall be striped as required (CBC 11B-502.3.3).

C. Circulation Path Signs: Circulation path signs leading from public right of ways, public transportation, and/or parking lots that are not accessible or do not lead to accessible entrances to the building, shall be located at decision points directing people with disabilities to the accessible routes and/or entrances. Signs shall include the ISA (ANSI 117.1. 703.7) such signs shall be installed so those steps will not have to be retraced. (CBC 111B-703.4). Accessible building entrances shall be identified with the ISA (CBC 11B-703.4) Inaccessible entrances shall have a sign, which includes the ISA, directing to the nearest accessible entrance this sign shall be placed at the last decision point before reaching the inaccessible entrance (CBC 11B-703.4).

1.05 QUALITY ASSURANCE

A. Qualification of Sign Fabricator: All signing and related work required under this Section shall be performed by specialists. The term "specialist" as used in this specification shall mean an individual or firm of established reputation, with a minimum five (5) years continuous operation, which is regularly engaged in and maintains a regular force of workers skilled in fabricating the items required herein.

B. Sign fabricator will participate in a pre-production conference with the Owner's representative and the Architect to review the contract requirements, clarify the scope and nature of the work as outlined in the Drawings and Specifications, and to establish clear lines of responsibility and checkpoints for the performance of the work.

C. Engineering: Responsibility for structural engineering of the signs and information devices is the responsibility of the sign fabricator. The Drawings provided are for the purpose of establishing design intent and desired visual appearance, and are not intended to restrict the fabricator if more suitable structural design or fabrication methods are suggested or required. Any such deviations from the Drawings or Specifications proposed must be approved by the Owner and Architect prior to commencing fabrication of the signs. Exterior signs to be engineered to withstand 100 mile an hour wind loads including foundation system. Submit calculations by a qualified state registered Engineer.

D. Provide signs for assuring access for persons with disabilities in accordance with state and federal regulations.
1. California Regulations: Comply with California Building Code
2. Federal Regulations: Comply with Americans with Disabilities Act Standards for Accessible Design (ADASAD).

1.06 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Samples of all materials and processes, including colors to be incorporated in the signs and graphics, shall be submitted by the sign fabricator, with review of such samples required before proceeding with fabrication of the actual signs and graphics.

C. A prototype of each different type of sign (one of the painted metal signs, one laminated plastic, one acrylic, and one of each type of aluminum), shall be fabricated and submitted for Architect's approval, unless waived by the Architect, prior to commencing fabrication of the remaining signs of these types. Each prototype shall include mounting mechanism and hardware.

D. Complete shop drawings indicating all sign styles, lettering, material specifications, color, dimensions, and assembly / installation details.

1.07 JOB CONDITIONS

A. Verify and be responsible for all dimensions and conditions for the work, especially those relating to placement of the signs in the finished localities. Notify the Architect of any variations from the dimensions and conditions shown on the Drawings that may result in an unacceptable installation. This stipulation may result in relocating signs that may otherwise be blocked by piping, landscaping, signs, lights, or other construction elements.

B. Powder-activated fasteners / anchors may not be shot or drilled into post tensioned concrete slabs and beams without the prior written permission by the Architect or Structural Engineer, as to type and location. Operators shall be certified in accordance with California Industrial Safety Orders.

1.08 GUARANTEE

A. Guarantee all workmanship and materials for the signage and graphics furnished for a period of one (1) year after the final acceptance of the signage and graphics and, if during the guarantee period any fading, defects or faulty materials are found, immediately, upon notification by the Owner or Architect, proceed at no expense to Owner or Architect to repair or replace same together with any damage to all finishes, fixtures, equipment and furnishings that may be damaged as a result of defective materials or quality of work. There shall be:
   1. No delamination of any of the parts of the signs or of the lettering from the sign face.
   2. No cupping, warping, or dishing in excess of the requirements stipulated in the specifications.
   3. No bubbling, crazing, chalking, rusting, or other disintegration of the sign face, of the messages or of the edge finish of the panels.
   4. No corrosion developing beneath any painted surface, except as the result of obvious vandalism or other external damage to those painted surfaces.
   5. No corrosion of the fastenings.
   6. No movement of the signs or components from their mountings. The signs must remain true and plumb, or as otherwise stipulated on the Drawings or in the Specifications, except as the result of obvious post-installation external damage.
   7. No fading of the colors when matched against a sample of the original color and material.

2.00 PRODUCTS

2.01 MATERIALS

A. General: Conform to the highest standards of the industry, and as shown on the Drawings and as herein specified.
   1. Typograph letters and size shall be as shown on Drawings, unless indicated otherwise on signage & graphic schedule. Alternative letterforms are not acceptable. Letter spacing shall be "normal".
   2. Margin Spacing Standard, unless shown otherwise.
   3. Interline Spacing Standard, unless shown otherwise.
   4. Arrows - Square shaft as indicated on drawings.
   5. Arrow/Symbol Placement and Spacing - as shown on drawings.
   6. Letters - vinyl/acrylic die-cut, premium reflective 3M 'Scotchlite' sheathing – "High Intensity Grade', or approved equal 5-year letters, 3.5 mils. thickness minimum and 6.0 mils. maximum.

7. All materials shall be new stock, free from defects which impair strength, durability or appearance. All signs and components shall be complete and free from visual, structural or mechanical flaws.
8. Concrete (for base mounted sign foundations) 2,500 psi concrete, minimum.
9. Rebar: Grade 60, conforming to ASTM A 615. Bars larger than 1/4" diameter shall be deformed.
10. Accessible Parking Sign Posts: Secure post-mounted signs to 2" x 2"x 1/8" wall thickness, square tubing, cold-formed carbon steel galvanized (conforming to ASTM A53, A120 seamless).

B. Sign and Graphics Schedule: All signs and graphics shown on the Drawings are referenced to the Signage and Graphics Schedule. Message indicates the exact wording, capitalization, punctuation, and symbols. Refer to Signage and Graphic Schedule for location of copy. The copy shown on the Sign and Graphic Schedule has precedence over that indicated on details, except where otherwise noted.

C. Metal Signs (AL):
1. Sign Panel: Minimum .125 inch aluminum sheet, as noted on the drawings.
2. Debur and ease all edges.
3. Apply vinyl wash primer followed by zinc chromate primer per Section 09 90 00 to be compatible with finish coat.
4. Finish Coat: Top quality semi gloss enamel manufactured especially for exterior use on metal. Apply 3 coats minimum for 5 mil dry thickness minimum (excluding primer), including post at PM.
5. Copy: Self adhering die-cut vinyl reflective, 3-M Scotchlite, or equal, compatible with sign face material, applied uniform in color, opaque and free from bubbles or other surface imperfections.
6. Mounting: Signs of this type shall be mounted in one of two ways, depending on location as indicated on Signage & Graphic Schedule
   a. Ceiling Bracket Hung - (C-BR-H): Refer to selection above, and as indicated on the drawings.
   b. Surface Mount (SM): Mechanically fastened into beam. Paint to match adjacent color background. Fasteners shall be approved prior to execution. Refer to 3.01F for additional information.

D. Laminated Plastic Signs (MPL):
1. Raised Plastic Signs: Signs shall be of the four-in-one construction style having the following characteristics:
   a. Tactile characters/symbols shall be raised 1/32 inch from sign plate face. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
   b. Text shall be accompanied by Grade 2 braille.
   c. Provide 1/32" raised perimeter border as detailed.
   d. All letters, numbers and/or symbols shall contrast with their background - either light character on a dark background or dark characters on a light background. Refer to Signage & Graphic Schedule. Character and background shall have matte finish.

2.02 PARKING SIGN SPECIFICS

A. An additional sign shall also be posted, in a conspicuous place, at each entrance to off-street parking facilities, or immediately adjacent to and visible from each stall or space. The sign shall be not less than 24 inches by 24 inches in size (see graphic details for actual size), which clearly and conspicuously states the following:

"Unauthorized vehicles parked in designated accessible spaces not displaying distinguishing placards or license plates issued for persons with disabilities may be towed away at Owner's expense. Towed vehicles may be reclaimed at ---or by telephoning".

White retroreflective background with black message and border

B. Health Warning Signage: An additional health warning sign shall also be posted, in a conspicuous place, at each entrance to off-street parking facilities. The painted aluminum sign shall not be less than 18 inches high by 19 inches wide. Size and spacing of lettering, typeface, placement and colors to be in conformance with drawings, which clearly and conspicuously states the following:

"Prop 65 Warning – This facility may contain chemicals known to the State of California to cause cancer or birth defects or other reproductive harm. This warning is made in pursuant to California Health and Safety Code, Section 25249.6."

Dark Green background with white message.

3.00 EXECUTION

3.01 FABRICATION AND ASSEMBLY

A. Furnish anchors, fastenings, attachment metals, and other miscellaneous metal items needed to accomplish the work, including fasteners embedded in concrete or building walls.

B. Carefully study the drawings and be responsible for the correct direction of arrows on all signs, and for requesting a change of spacing if required to fit on the intended sign panel or space.

C. Ensure that the design of all support structures and structural connections required for the performance of the work meet the requirements of the Contract Documents, including code requirements.

D. All bonded or fabricated panels shall have faces of such flatness that, when measured from corner to corner along the diagonal, the maximum deviation from the nominal plane of surface shall not exceed 1/16" for measured distances up to 5'.

E. Colors, materials, hardware and fittings actually used on the signs and structures shall match the approved samples.

F. Fastenings:
1. Fastenings on sign-face surfaces shall not be exposed, except where noted.
2. Sign-face surfaces shall not be penetrated during fabrication or installation of signs, except where noted.
3. Sign-face surfaces shall not be deformed, distorted, or discolored by attachment of concealed fastenings.
4. All fastenings shall be resistant to oxidation or other corrosive action because of their composition, completely through their cross sections.
5. All work shall be secured with fastenings of the same color and finish as the components they secure where they are exposed to view, except where noted.
6. Fabrication work with fastenings shall be utilized in strict accordance with their manufacturer's specifications, directions, recommendations, and as indicated on design intent drawings.

3.02 INSTALLATION

A. All signs shall be installed in the locations indicated on the Drawings, per design intent and approved shop drawings. Design intent drawings indicate minimum requirements only.

B. All signs and graphics shall be installed plumb and true to line, level with building components and adjacent elements.

C. Installation shall be done in a manner to withstand all actions imposed by wind, water and other environmental forces.

3.03 ACCESSIBLE PARKING SIGNAGE INSTALLATION

A. Wall Mounting: Mounting hardware shall be manufacturer's standard vinyl foam tape or silicone adhesive as noted and selected by Architect, centered at interior end of parking space with bottom of sign 80” inches above finished grade.

3.03 SIGNAGE AND GRAPHICS SCHEDULE
Refer to Drawings.

3.04 INTERIOR MASTER COLOR CODING SCHEDULE
Refer to Signage and Graphics Schedule.

END OF SECTION

SECTION 10 22 13 – WIRE MESH SCREENS AND PARTITIONS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Woven wire partition divider screen with framework in elevator pits.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 05 50 00: Miscellaneous Metal
B. Section 09 90 00: Painting

1.03 SUBMITTALS

A. Provisions: Comply with of Section 01 30 00.

B. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

D. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

Handle products manufactured before, during and after installation in a manner to prevent damage to the fabrication or finish.

1.05 DESIGN CRITERIA

Screen shall be supported and braced that when subjected to a pressure of 100 lb/ft^2 (4.79 kPa) applied horizontally at any point, the deflection shall not exceed 1 inch (25.4 mm) per California Code of Regulations, Title 8, Subchapter 6, Group 3.

2.00 PRODUCTS

2.01 MANUFACTURE

Products specified shall be manufactured and fabricated by manufacturers that are in good standing with the Woven Wire Products Association. Provide products by Acorn Wire & Iron Works Association (323) 665-5151, American Woven Wire (714) 630-5487, Cal-Wire California Wire Products, Inc. (909) 371-7730, King Wire Partitions, (323) 256-4848, or approved equal.

2.02 MATERIALS

A. Elevator pit screen panels shall be #10 gage (.1383) wire crimped and woven to 1" diamond mesh, so that a 1" sphere can not pass thru the opening. Galvanize frames of panels shall be 1-1/2" hot rolled steel channels with welded corners. The wires of the fabric shall extend through the channel frame and be clinched. Wire and frames shall be hot dip galvanized after fabrication.

2.03 FINISHES

Entire assemblies shall be hot dip galvanized after fabrication with 2.0 ounce zinc per sq. ft., (G90) per ASTM A123 and A653.

3.00 EXECUTION

3.01 GENERAL

A. Field Conditions: Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to the Architect any conditions which prevent proper execution of this work.

B. Do all cutting, drilling, fitting, etc., required for setting materials in place.

3.02 FABRICATION

A. Design and fabricate work to support any normally imposed loads. Design shall conform to requirements of AISC.

B. Fabricate work to shape and size with sharp lines and angles and smooth exposed surfaces. Installed elevator pit divider screen fabrication shall extend a minimum of 6'-0" above the pit floor as required per code. Securely weld or bolt connections. Provide rabbets, lugs and brackets so work can be assembled in neat, substantial manner. Provide thickness of metal and detail of assembly and support to give ample strength and stiffness. Exposed edges and ends of metal to be smooth.

C. Fabricate steel work in shop, including welding, as far as practical for transporting. Assemble at site with bolted connections or welding as indicated.

D. Miter corners of frames for woven wire partitions or infill screens.

E. All welds are to be ground smooth.

F. Touch up galvanizing finish.

3.03 INSTALLATION

A. Install in accordance with manufacturer's recommendations and in conformance to drawing details and code requirements.

B. Coordinate divider screens with elevator equipment requirements.

END OF SECTION

SECTION 10 44 00 – FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1 apply to work of this section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work complete the contract, including, but not limited to, these major items:
   1. Fire extinguishers, cabinets and accessories.
   2. Cabinet alarms with signage.
   3. Knox Box

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 05 50 00: Miscellaneous Metal.
B. Division 22: Plumbing

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

B. Underwriters Laboratories Inc. (UL)

C. National Fire Protection Association (NFPA) 10, Portable Fire Extinguishers

D. California Building Code and Standards (CBC)

E. Titles 8, 19, and 24, California Code of Regulations

F. State Fire Marshal

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Manufacturer's product data for all types of extinguishers, cabinets, and product options, proposed for use. Include rating and classification, rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, cabinet and door construction, panel size/style and materials.

C. Submit shop drawings indicating methods of supporting, details for anchorage and layout showing location of units in compliance with reference code requirements.

D. Samples: Submit samples of typical accessories showing construction and finish, as Architect may request.

1.05 REQUIREMENTS

A. As a minimum, locate fire extinguishers as shown on the drawings. However, the Contractor shall supply and install sufficient extinguishers to comply with the type, quantity and travel distance requirements of NFPA 10 and Titles 8, 19, and 24: CCR, whichever is the most restrictive, without additional cost to the Owner.

B. Contractor shall coordinate with State Fire Marshal to verify the number and classification of extinguishers required for the area to be covered at time of bid. No payment will be made during construction for assumptions contrary to California Fire Code and state jurisdictional requirements.

C. Ensure that the fire extinguisher cabinets are sized to accommodate fire extinguishers of the type and capacity indicated.

D. Provide multi-purpose extinguishers (ABC) in parking areas and either dry-chemical (BC) or carbon dioxide type in all mechanical, electrical, and elevator equipment rooms in conformance with governing requirements.

E. Coordinate with Fire Department and code requirements and with the Owner for the type, size, and location of the high-security key control lockbox prior to purchase.

1.06 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from single manufacturer.

B. UL Listed Products: Fire extinguishers shall be UL listed and labeled with UL Listing Mark for type, rating and classification of extinguisher.

C. Fire extinguishers and their placement shall comply with NFPA 10, "Standards for Portable Fire Extinguishers", Title 19, CCR, Division 1, Chapter 3 and Titles 8, and 24; California Code of Regulations, including all referenced standards.

2.00 PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

A. Manufacturer:
1. Larsens Manufacturing Company
2. J.L. Industries
3. Potter - Roemer, Inc.
4. Modern Metal Products
5. Standard Fire-West
6. Samson Metal Products, Inc.
7. Or equal

B. Cabinets:
1. Surface mounted, 18 gage steel cabinet with rolled-edge trim. Unit shall be free of oil canning otherwise increase thickness or laminate. Trim shall be fabricated into a single unit, with corners mitered, welded and ground smooth. Provide manufacturers standard two coat baked acrylic enamel finish, consisting of a prime coat and a thermosetting topcoat, color as selected by Architect.
2. Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, door material and style indicated. Provide either lever handle with cam-action latch, or door pull. U-shape pull and latch force shall be less than 5 lbs. Provide concealed or continuous type hinge permitting door to open 180 degrees.

3. Provide door with center glass door panel of tempered clear float glass or transparent Lexan panel 1/8" minimum thickness, with red vinyl die-cut lettering. In addition to FIRE EXTINGUISHER lettering, include manufacturer's sticker with the following text: "IN CASE OF FIRE ONLY – PULL FIRMLY ON HANDLE".
4. Roof top (weather exposed) cabinets shall be fabricated of aluminum with standard clear satin anodized finish.
5. All mounting holes shall be predrilled at the factory.
6. Coordinate cabinet selections, options and requirements prior to selection and submittal.
   a. Larsens - Architectural Series 2409-SM
   b. J.L. Industries - Ambassador 1013E20FE
   c. Potter - Roemer, Inc. - Alta Series 7024-E-VW
   d. Standard Fire-West - Series 4000 surface mounting, steel-SBG
   e. Samson Metal Products, Inc.
   f. Or equal

C. Wall Brackets: For use in Mechanical, Electrical, Storagea,d Elevator Equipment Rooms provide manufacturers standard, 16 gage red glossy polyester coated steel, wall bracket with spring - type band and retaining clip, designed to prevent accidental dislodgement of the extinguisher. Potter-Roemer Model #3903, or manufacturers approved equal. Identify bracket mounted extinguishers with FIRE EXTINGUISHER in red letter decals applied to wall surface. Use letter size, style, and location as selected by the Architect.

D. Extinguishers: Provide minimum 10 pound capacity rechargeable multi-purpose dry chemical suitable for use in fighting Class A, B, and/or C fires. Coordinate extinguisher size, layout and area coverage and also Fire Department connections. The extinguishers shall be red enameled steel, of the pressurized type equipped with a pressure gauge, discharge hose and nozzle, squeeze-grip lever handle, and all-metal head assembly. It shall be supplied with a mounting bracket (if not for installation in a cabinet). Halogenated (Halon) fire extinguishers shall not be used.

Throughout Parking Structure: A-B-C Type	Mechanical, Electrical and Elevator Equipment Rooms: B-C Type
10 lb. Multi-purpose A-B-C type, 4A:60BC Required	2A:10BC Min. Required 10 lb. Dry Chemical or Carbon Dioxide
1. Larsens - MP10, MP20	1. Larsens - CD 10
2. J.L. Ind. - Cosmic - 10E, 20E	2. J.L. Ind. - Sentinel 10
3. Potter - Roemer, Inc. - 3010, 3020	3. Potter – Roemer – 3310 / 3410
4. Modern Metal Products - Wing 10HK, 20HK	4. Standard Fire West C10
5. Standard Fire West - ABC 10, 20	5. Or Equal

2.02 HIGH-SECURITY CONTROL LOCKBOX

A. Heavy duty, medium capacity (10 key) surface mounted lockbox. Series 3200, (R) the Knox Company (949) 252-8181,or equal. Minimum requirements to include:
1. 1/4" steel plate steel housing with a 1/2" thick steel door.
2. Capacity: 30 cu. in.
3. Box shall have interior gasket seal of neoprene material and 1/8" stainless steel lock cover with tamper seal mounting capability.
4. Steel Finish: Pre-treat zinc-phosphate to Federal Standard TTC 490 Type II, with polyester powdered topcoat, color as selected by Architect.
5. Lock shall have double action rotating tumblers and hardened steel pins, accessed by a bias-cut key.

3.00 EXECUTION

3.01 INSPECTION

A. Verify actual field conditions. Inspect related work and adjacent surfaces. Report to Architect any conditions which prevent proper execution of this work.

B. Coordinate layout of work before beginning installation.

C. Verify servicing, charging and tagging of all fire extinguishers.

3.02 INSTALLATION

A. Install products of this Section in conformance with manufacturer's instructions and code requirements of agencies having jurisdiction, as approved by the Architect, using materials, methods and recommended fasteners. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with code requirements. Install all cabinets and/or extinguishers with the top of the extinguisher not more than 48 inches above the floor.

B. Fasten cabinets securely, rigidly plumb and level at locations and heights indicated.

C. Install extinguishers in cabinets or on brackets and adjust for sturdy top and bottom support.

D. Align hinges, latch, or miscellaneous hardware for proper operation and uniform clearance.

E. Clean and polish exposed surfaces prior to final inspection

F. Remove and replace damaged, defective or undercharged units.

END OF SECTION

SECTION 11 12 00 – PARKING CONTROL EQUIPMENT

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. The scope of work shall conform to plans and specifications and is to include, furnishing material, fabrication, delivery, installation, tools, freight, equipment, labor, supervision, insurance, taxes, fees, incidentals, engineering and support functions necessary for and/or related to the proper execution of the work described hereafter.

C. This Scope of Work document is not meant to give specific guidance for each and every task or to cover all that will be expected and required of the proposed Contractor. Contractor shall also include as part of its Scope of Work all other duties that are normal and customary and considered standard practice. Contractor shall perform its obligations in accordance with the highest standard of care applicable to the performance of services and work of the type required.

D. Furnish and install all parking control equipment for a complete and operable control system
   1. Equipment shall include:
      a. Card Access System consisting of computer, printer, software, controllers, card readers and supports.
      b. Revenue Control Equipment consisting of ticket dispensers, and fee indicators.
      c. Access Control Equipment consisting of gates, and loop detector assemblies.
      d. Ticket supplies, cards and barrier gates.
   2. Provide conduit and power wiring between power stub-up and equipment, and between equipment items at each control location.
   3. Provide conduit and control wiring between control conduit stub-ups and equipment, and between equipment items at each control location. Provide also control wiring in "home run" conduits furnished and installed by the Electrical Section.
   4. Provide any and all additional conduit with wiring and/or make required modifications necessary to install the make of equipment being furnished at each control location.
   5. Verify power supply and conduit stub-up locations provided by others, and confirm suitability for parking equipment system provided.
   6. Verify location of parking equipment protection posts to assure equipment protection and access.
   7. All equipment hardware shall be U.L. labeled.

E. Proposals must include the following information in this order:

   1. CRITICAL PATH: Comprehensive phasing plan, including detailed information regarding the critical path for the project execution and implementation.

2. SCHEDULE: Overall project schedule, highlighting key milestones. Project schedule, including dependencies shall be in Microsoft Project or similar program.

3. PRICING: Pricing must be turnkey and a description for each finished good such as Barrier gate, Entrance Column, Exit Column, Card Reader, POF, labor, low voltage cabling, etc. This shall be inclusive of labor, taxes, materials, freight, licensing, and other soft costs and create budgets and procurement processes.

4. METHOD OF OPERATIONS: Your proposal must detail the planned method of operations of the proposed systems as well as the interoperability of the various interfaced systems. A method of operation section must be provided for each of the following groups of parkers:
   a. Parkers:
      1) Tenant Monthly Parkers.
      2) Visitors of Medical Center Tenants. Highlight the procedural difference for both paid as well as validated visitors.
   b. Transient Parker: Self-Park
      1) Validated Visitor
      2) Non-Validated Visitor
      3) Procedure for collecting and reconciling manual cash collection from exit lane device. This is referred to as Roving Cashier Procedure.
      4) Describe the process for how “Lost Ticket” is handled. The Owner prefers this process to be as automated as possible. Indicate if your process requires an attendant to physically deal with this exception in the exit lane. Since a “bail-out-lane” does not exist, this operational procedure is of paramount importance.
   c. Validations & Rates:
      1) The system may require different rates as well as different validations for and within each of the groups listed above. The rates as well as the validations associated with various guests may differ based upon the purpose of the transient parker’s visit. The system must allow a single validation media form factor to dynamically point to a different validation and rate based upon the validation provider.
      2) Browser Based/Electronic Validations
         a) System must have this capability to allow anyone with a valid user account and a standard web enabled device to validate parking electronically. Provide pricing for this service and documented process for validating with all features available.
   d. Mobile Payments Interface Option
      1) Describe in detail the facility for your system to enable payment of non-validated transient parking tickets via smart phone mobile application. Detail must include all additional hardware and software required as well as the price associated with implementation of these items and this service. Pricing must include the optional initial and on-going price to implement such a program.

5. COMPLIANCE WITH SPECIFICATIONS:
   a. A detailed set of product specifications and requirements has been included with this Request for Proposals document. Please review this document in detail and list any exceptions to the requirements. Owner will assume that all requirements will be met unless specifically

addressed in the proposal. Any undocumented requirements exceptions will be resolved at the cost of the bidder.

6. PROJECT MANAGEMENT: Overview of the installation team, including specific background on the Project Manager. Please indicate whether any members of your team are certified by the Project Management Institute as a Project Management Professional (PMP). The Owner desires a PMP oversee the project in order to ensure it is executed smoothly and professionally.

7. SERVICE AND WARRANTY: Overview of service and warranty approach. Overview should include information regarding the service process for your organization. Be sure to include remote service diagnostic capabilities of your service organization (including steps taken to ensure remote service does not compromise PCI compliance). Additionally, be sure to include whether or not your warranty and service pricing includes insourced repair, outsourced repair, or advanced replacement of broken parts.
   a. For insourced repair, indicate the number of local technicians certified to make insourced repairs in your local office.
   b. For outsourced repair, indicate the range of lead-times for part repair for each of the primary component suppliers.
   c. For advanced replacement, indicate the steps your business takes in order to ensure inventory is available on the vehicle of the service technician responding to the service issue. Indicate what percentage of on-site service issues are able to be resolved in one call due to your advanced replacement program.

8. SUBMITTALS
   a. Include all cut sheets for every piece of hardware and software provided
      i. Provide Manufacturer's PCI Secure implementation guide
      ii. Digitally altered renderings of what the location will look like completed

The following section provides the summary and detailed specifications and requirement of each component of the PARCS. Any deviations from the specifications below must be explained in detail within the proposal document.

1.02 RELATED SECTION OF WORK

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 26 00 00: Electrical

1.03 PARKING OPERATIONS

A. Parking Control Concept:
   1. Visitors/Hourly Parkers (Patron Parkers): Ticket "IN"/TICKET & CREDIT CARD "OUT"
   2. Monthly Parkers (Employee Parkers): Card "IN/Card "OUT"

B. Level of Control: Revenue and card access system shall be "on-line" to central controller in a determined location and compatible with existing parking equipment, cards and software for online communications, data collection and hard copy. Provide following features:
   1. Revenue Control System shall be machine-readable mag-stripe technology. The system shall have the following features:
      a. Non-manned pay station.
      b. On-line with stand alone automatic fee calculation
      c. Serial number on issued ticket

d. Transaction and lane number, date and fee on processed ticket and receipt
e. On-line and interfaced with the Facility Management System to provide printouts of all or selected activity reports.

2. Gates shall be on-line and interfaced to the Facility Management System for remote operation, count functions and diagnostics. Provisions for gate remote operation function from a determined location shall not be utilized unless there is direct visual observation of the arm motion.

1.04 REFERENCE & CERTIFICATIONS

A. Design and operation of the proposed system shall conform to the following referenced codes, regulations, and standards as applicable:
1. National Electrical Code (NEC)
2. UL 294 and UL 1076 as required
3. FCC Rules and Regulations Part 15, Radio Frequency Devices
4. National Electrical Manufacturers Association (NEMA) Section 250 Enclosures for Electrical Equipment
5. Federal, State, and Local laws, regulations, and codes.
6. ISO 9001 quality assurance standards
7. Each manufacturer with components in the PARCS herein shall meet the following requirements:
a. Manufacturer shall have been continuously in operation for 5 full years
b. Equipment to be installed shall have been installed in at least fifteen previously installed locations

1.05 SUMMARY

A. General: Outline Parking Equipment for Tri-City Medical Center Parking Structure.

B. Equipment includes:
1. Facility Management System consisting of computer, printer, software and controllers.
2. Card Access System (capable of reading «Building Card Access Provider» cards with unlimited bit patterns and or site codes of any combination) consisting of a card reader interface for control of barriers. Revenue Control Equipment consisting of ticket dispensers, barrier gates and onsite validation creation capability.
3. Facility Management Software System that includes: Debit Card, Revenue Control, Count Monitoring, Credit Card Processing, System Alarm Notification, and Reporting, Variable Rate Control Function.
4. All other components for a complete and fully functioning system that meets the needs of the Parking Managers proposed parking management program and as defined in the following performance specification.

1.06 QUALITY ASSURANCE

A. System shall operate in accordance with industry standards under normal usage. Any piece of parking equipment, with any component that fails 3 times within 30 days before Owner acceptance or during the warranty period will require full replacement, not repair.

B. Contractor shall be able to prove system reliability showing system log activity.

C. Warranty period shall commence upon the successful completion of the system installation and Owner acceptance.

D. Use experienced mechanics and technicians and qualified supervision. Furnish workmanship in fabrication and installation of all items under this Section of the highest trade manufacturing standards.

E. Unless directed, specified or indicated otherwise, install all materials, equipment, etc. in accordance with the manufacturer's recommendations, the reviewed shop drawings, the project manager's instructions, these specified requirements and in accordance with the National Electrical Code.

1.07 PROJECT SITE CONDITIONS

A. Contractor shall be responsible for other trade coordination and shall do their part to work alongside trades to ensure timely project completion.

1.08 FACILITY OPERATIONS

A. It is requirement of the Owner that the proposed system be a true client server environment where as (with the appropriate authorizations) the operator can monitor any garage from any workstation on the entire network. It is a requirement that the operator can view activity, access system events, control gates, program cards, provide onsite validation, view POF levels and have complete control from any workstation on the network as if from the Host PC.

B. In the event of multiple facilities under the control of one host PC, Revenue and Access accounts must be reported as separate facilities unto themselves.

C. Real-time central credit card processing must be part of the revenue control system complete with a PCI compliant offline credit card processing account which will batch all credit card transactions until the credit card connection is restored.

D. Pricing for original bid, options and alternates shall be valid for one year.

1.09 SUBMITTALS

A. Provisions: Comply with Section 01 30 00

B. Shop Drawings: Submit shop drawings and wiring diagrams complete for all equipment furnished under this Section, and interconnects to other related equipment. Indicate all dimensions, shapes, sizes, methods of fabrication and assembly, wiring diagrams, conduit sizes, etc., shown and noted and all details for installing items in the work included, including future equipment, if any. Also, indicate protection pipe (pipe bollard) locations.

C. Product Data: Provide brochures and descriptive data of all accessories and manufacturers recommendations for installation and operation of the complete system.

D. Operating and Maintenance Data: Furnish three (3) sets of complete operating and maintenance instructions, manuals and spare parts lists for the equipment and instruct the Owner’s personnel in the operation and maintenance of the parking control equipment and system including software.

E. Manufacturers Qualifications: Parking control equipment and system shall be manufactured by a firm regularly engaged in the manufacture of such equipment for a period of at least five (5) years unless specifically approved by the Project Manager. To be considered as eligible, the manufacturer shall submit a list of at least three major west coast parking structure installations (project name, location, Owners name and telephone number) for which it has furnished parking control systems as specified which have

operated successfully, within two years prior to submission of bids and shall provide 24-hour service on the equipment. Bidder (installer) shall be an authorized distributor engaged in the installation of parking equipment systems for a period of at least two years prior to submittal of bids and shall submit a copy of any distributorships agreement, as well as a list of qualified field service personnel. All Contractors shall furnish a list of customers served within a 25-mile radius of the project. This list of references will be used to determine the service capability.

2.00 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: SKIDATA or approved equal.

B. Distributor or manufacturer direct must have been in continuous operation for a minimum of five years in the local area.

C. Distributor must be the authorized local (within 60 minutes) service provider for proposed product.

D. Vendor must have performed fifteen successful installations, similar in size, complexity and magnitude of this project.

2.02 PCI/PADSS COMPLIANCE

A. Software must be 'Validated' and listed on the PCI website as 'Valid' for new deployments until at least 2016.

B. All PC's, Severs, network components, etc. must be enclosed in a lockable PCI compliant enclosure.

C. System must include a configured PCI compliant firewall.

D. System must be deployed per the manufacturers 'Secure implementation guide.

E. Successful proposer must participate in changing all required encryption keys and passwords prior to accepting the first credit card.

F. System must in no way prevent the location from receiving a PCI site certification.
1. It must stand up to full system analysis from a Qualified Security Assessor.

G. All equipment and software must be PCI compliant and have an unbroken history of compliancy over the past 5 years. i.e. there must have always been a PCI compliant version of software available at any time valid for new deployments for the last 5 years.

2.03 EQUIPMENT

A. The following equipment list consists of basic system components. Provide auxiliary items required for the proper functioning of the system, whether mentioned or not, including but not limited to: heaters, coolers, control wiring, transformers, relays, pedestals, etc. to provide a complete operating system.

B. Locate equipment on plans as recommended by equipment supplier.

C. All lane equipment must be UL approved.

D. Manufacturer's quality assurance program must be in compliance with ISO 9001 standard.

2.04 PERFORMANCE SPECIFICATIONS

A. Primary components of the Parking and Revenue Control System.
   1. Shall be microprocessor based and provide for on-line communications.
   2. All field programmable functions of the system shall be programmable from the central facility computer or workstation on the parking revenue control network.
   3. In the event of a communication failure from a field device and the central facility computer, the field devices shall continue to function in an off-line mode and shall buffer a minimum of 9,000 transactions, which will update to the central facility computer when communications are restored. It is critical that the access control system maintain its anti-passback function while the system is offline.

B. Intercom Communication System
   1. Adequate networkable IP intercom system allowing for phone activated gate vending and phone forwarding capability.
   2. All Intercom Hardware must be capable of interfacing with Commend.

C. Inductive Loops
   1. Provide for vehicle detection to ensure car presence before allowing facility access.
   2. Loop frequency and sensitivity readings must be recorded and submitted to Owner after installation.

D. Entrances and Exits
   1. Model: Power.Gate with Graphic Display and Intercom (Quantity 4).
   2. Entrances to issue machine-readable parking ticket and print the entry information on the ticket. The Ticket dispenser shall operate as a networked on-line unit.
   3. Exits to accept machine-readable parking ticket and print the exit information on the ticket. The Exit device shall operate as a networked on-line unit.
   4. Required Features/Functions.
      a. Printed circuit board with microprocessor control. (All Entrances and Exits).
      b. Ability to print receipt (Exit)
      c. Illuminated front panel for light up of ticket throat.
      d. Sounds for operational/activity indication such as ticket issue, card read successful.
      e. Thermal printer required. (All Entrances and Exits).
         1) Four lines of user defined text (All Entrances and Exits) and the ability to print graphics (logos/photos) on the ticket by the entry device.
      f. Integrated card reader w/color graphic LCD display that is programmable from the central server or any workstation on the network. (All Entrances and Exits). Ability to display general messages to transient parkers and specific messages to an individual contract parker if needed.
      g. Color Graphic display for entry and exits shall be able to display videos for branding, advertising or general information. This must be available without any additional software or hardware costs.
      h. Ability to read barcode tickets and ability to read magstripe tickets with same hardware and the only change required is checking a box in the system to allow for either one. (All Entrances and Exits)
      i. Accepts credit cards upon exit. Motorized transport mechanism is preferred over insertion reader. (Exits)

j. Integrated intercom. (All Entrances and Exits). System must track the number, time, and lane for all intercom calls for reporting.
k. Vandal resistant finish. (All Entrances and Exits)
l. Automatic, semi-automatic or manual ticket issuance. (Entrances)
m. Traffic Jam mode (Entrances) where ticket can be set to issue ticket in 2 seconds or less upon entering. Ticket is preprinted with date and time stamp to speed up entering for transient vehicles. This shall be selectable upon a schedule or manually activated.
n. Backlight LCD with two lines of text **or** color graphics that are programmable from the central server or any workstation on the network. (All Entrances and Exits)
o. Automatic backout and void ticket control. (Entrances)
    1) Back-out
        a) If a patron backs out of the entrance lane taking the issued ticket, the ticket dispenser shall open the parking gate. The ticket dispenser shall then signal the gate to close after a programmed time period once the car has moved off the ticket dispenser‘s arming loop.
        b) Invalid ticket data shall be recorded in the software host computer to prevent illegal use of the ticket.
        c) If the invalid ticket is presented at the exit or POF station the ticket should be either swallowed/retained or rejected and returned to the patron.
    2) Void: If a patron backs out of the entrance lane without taking the issued ticket, the ticket shall be automatically vaulted back into the ticket dispenser and voided both with a printed mark **and** on the magnetic stripe or barcode **and** within the database.
p. Lost ticket functionality; If customer presses the lost ticket button on the exit device a fee will be displayed and they can satisfy the fee with a credit card.
    1) A second option is for the operator to remotely select a fee and “push” the fee to the exit device to allow for customer service flexibility. This fee can be setup to be a fixed price associated with a Lost Ticket, or the fee can be variable based upon the operational requirement.(Exits).
    2) A third option is to trigger up to 3 predetermined rates upon an external output into SKIDATA. Example would be an output from another access control system, intercom system or other where the 3rd party system would send a predetermined output.
q. QR Barcode (2D) reader shall be included and integrated with entry or exit device and not as a bolted/mounted add on reader device.
    1) QR barcode reader is to be used for:
        a) Reservation systems – Specify any 3rd party or PARCS vendor proprietary reservation systems that you are interfaced with such as Parking Panda, Park Whiz, etc.
        b) Eticketing – Owner/Operator shall have the ability to issue an electronic ticket to a contract parker or a group of contract parkers for entering and exiting the facility. This barcode can be a on the end-users mobile device or printed off at home for use with the system.
        c) Barcode Validation at exit
r. Entrance and Exit devices to be able to offer two-way audio and visual feature with color graphic display.
s. Internal Memory Module will store the following: (Exits)
    1) Transaction data: standard buffer capacity of at least 9,000 transactions or error messages.

2) Exit machine must be able to be programmed from the central workstation of any fee computer on the network.

t. Construction: (All Entrances and Exits)
1) Heavy-duty aluminum construction to prevent rust and corrosion.
2) Heavy duty color impregnated resin

u. Ticket box holds a minimum of 6,000 tickets per carton

v. Printed Ticket Data:
1) Machine (lane) number (programmable option)
2) Ticket issue number
3) Year, month, date and time in military format.
4) Invalid mark for encoded ticket.

w. Encoded ticket data:
1) Garage number
2) Machine number
3) Ticket issue number
4) Month, date, hour and minute of issuance.

x. Illuminated side panel shall be available with the ability to change colors through programming of system, RGB.

y. Electrical:
1) Power Source: 100 – 240V AC, 50/60Hz

2) Power consumption: Maximum 1.8 amps
3) Power reserve: The clock, entry number, and program data are protected for 4 years by the lithium battery.

E. Parking Barrier Gate
1. Model: Barrier.Gate Standard Version
2. One-way pay direction traffic with gate opening initiated by removal of a ticket from the ticket dispenser or presentation of proximity card to the proximity display reader. A vehicle detector signaling the departure of a vehicle shall close the gate
3. Required Features/Functions:
a. The gate control circuitry shall be contained on a printed circuit board that shall be housed in a modular control box. The control box shall not allow access to control switches mounted on the printed circuit board. The gate operational modes and features shall be programmable from the central host pc or any workstation on the parking revenue control network.
b. Auto Stop: The gate arm shall immediately stop its downward travel if the gate closing loop detector senses the presence of a vehicle, and will resume its downward travel after the vehicle leaves the closing loop.
c. Manual Gate Opening: Any system device that allows the gate to be opened without a valid ticket or proximity card transaction must be tracked with available reporting. If the gate is opened via a switch or other device inside the gate cabinet, this must be a reportable statistic.
d. Gate cabinet:
1) Heavy-duty aluminum construction.
2) High impact plastic cover (upper mechanism)
e. Service access: Removable cover for access to drive mechanism and electrical connections.
f. Motor Characteristics
1) Instant reversing motor
2) Direct drive motor/gear reducer assembly
3) Internal thermal/overload circuit breaker protection with manual reset.
4) Maintenance free drive assembly.

5) All motor, relay and solenoid power shall be provided with fused protection.
6) The use of belts or pulleys for the drive assembly is not preferred.
7) Electrical: 120 vac @ 20amps
8) Control panel;
   a) On/Off main power logic circuit breakers.
9) Gate Arm:
   a) Sturdy Fiberglass design
   b) Folding gate arms to be provided without exposed hardware to cause the arm to fold on low overhead applications.
   c) Optional LED (RGB) lighted gate arms shall be an option for both straight arms and for folding gate arms.
10) Optional illumination side bar shall be available

F. On-site validation printing or onsite validation program
1. The system shall allow for onsite validation.
   a. Validations must be site specific and cannot be used in any other location.
   b. Validations shall be able to provide a rate switch, percentage off or dollar discount
   c. Must have interface with web/internet based electronic validation program.
      1) Any third-party validation programs/ systems must be in operation for a minimum of 2 years.
   d. All Tickets produced on site must be capable of being validated by follow up ticket or via electronic web-based validation.

G. Pay On Foot Device
1. Model: Full Service Easy.Cash with Note Recycler (Quantity 1)
2. Required Feature/Functions:
   a. Transient parking tickets
      1) Individual rates for normal transactions, special events and lost tickets
      2) Variable and flat rates
   b. Discount “follow up” Tickets:
      1) Used with transient parking tickets
      2) Up to 9,999 validations accounts
      3) Fixed money amount, time adjustment to entry or exit time, % off gross fee and change rate, discounts (type and amount of discount is programmed at bulk validation system)
      4) Expiration date to void outdated discount tickets
   c. Store validated transient tickets
      1) Store number automatically encoded on validation coupons with Bulk Validation System
      2) Pay station reads store number on ticket and automatically applies discount to the parking fee.
      3) Discount types are fee amount, time, %, rate change, surcharge, and flat fee.
   d. Must be able to accept multiple validations in both paper validations and browser based electronic validations.
   e. Encoder mechanism;
      1) Read/write all tickets and cards
      2) Reads ticket entrance data
      3) Re-encodes transaction data: month, date, and time of validation.

4) Reads credit cards
5) Vaults service cards, discount tickets
6) Issues receipts and lost tickets.
7) Ability to “purchase” other parking products such as a two-day pass, 3-day pass, parking debit card, etc.

f. Coin Mechanism
1) Accepts: nickels, dimes, quarters, and dollar coins.
2) Sorts coins to 4 individual hoppers (predefined amounts) for future change
3) Coin Inventory Status report

g. Hoppers
1) 4 Hoppers with 250-coin capacity
2) User defined coin amounts
3) Inventory reports available.

h. Note Acceptor
1) Programmable choice to accept any of the following: $1, $5, $10, $20, $50 and $100 bills
2) Read notes inserted in any direction
3) Notes store in recycler and overflow to the bill stacker.
4) Escrow options available.
5) Change provided in appropriate notes and coins to minimize coin dispensing.

i. Coin Safe:
1) Coin vault: stores overflow coins from coin sorter

j. Two key operation
1) One key to remove vaults from pay station
2) One key to open vault
3) Separate keys to open coin unit or note stacker

k. Partial and Full warning for empty/full for coin safe, hoppers, bill safe and bill dispenser.

l. Receipt Printer:
1) The pay station is equipped with a thermal receipt printer

m. Display panel
1) Display: Color flat panel LCD monitor displays graphical instructions, touch screen
2) Soft key buttons: Buttons on the Pay On Foot Device are linked to situation specific functionality (lost ticket, language selection)

n. Journal Logging: Journal logging is written to a hard disk which can be copied to a disk or usb drive in a text file format

o. Cancellation of a Transaction;
1) A transaction may be cancelled at any time prior to completed payment of the parking fee (credit card authorization process if applicable)
2) Amount tendered is refunded in coins and notes and any applied discounts are entered in escrow on the patron's parking ticket.
3) Once full parking fee payment is completed, transaction cancellation cannot be performed and refunds shall not be available.
4) Validation Coupons accepted for discounts prior to canceling transaction are applied as credits to the short-term parking ticket

p. The Pay On Foot operates stand-alone and on-line with the System Software

q. Data sent from the pay station to the parking system software
1) Individual transaction data
2) Alarm and event messages

r. Data sent from the parking system software to the pay station;
1) Update program data and time synchronization

2) Backout ticket data
3) In/out service

s. Note Dispensers for Change
1) User defined note values
2) Secured behind locked door panel
3) Lockable cassettes

t. Credit Card Payment System
1) Reads all major credit cards (consult financial processor for availability)
2) Batch mode processing
3) Realtime Credit Card Authorization
4) Customer is required to select merchant account with a bank that can provide credit card processing

u. Housing:
1) Baked enamel finish on exterior cabinet

v. Electrical:
1) Power source: 120V AC, 60HZ
2) Power consumption: Average 60W, maximum 1100W

w. Lost Ticket
1) The Pay Station shall be capable of issuing a replacement ticket to a transient patron that has lost their ticket.
2) Lost ticket can be issued on demand by the patron or issued from a remote location by the operator and have a dynamic fee based on operator input.

x. Keycard encoding
1) The Pay Station must be able to read and display the current balance for cash debit cards

H. Card Readers

1. HID Proxcard II – RS2

2. The card access readers are used to allow and deny access to various user types. The readers are proximity technology. In addition to checking card status of various user types, the readers must be interactive with the database to communicate visual messages via graphic LCD display that are personal, global, by time, and card status. Real-time messages include cardholders name, card number, transaction fee, and remaining value for debit card user, custom messages, status messages, time and date. These messages allow management to make real-time decisions regarding user status.

3. Required Features/Functions:
a. Micro-controller driven technology
b. Can share an LCD display with ticket issuing machine
c. Automatic switching to standalone mode if online communications is interrupted
d. Transactions buffering for up to 9,000 transactions
e. Built-in diagnostics to test reader performance
f. Easy to read graphic LCD display
g. Remote control of gates and auxiliary relay from central software
h. Readers support both debit cards and contract cards same reader
i. Hard or soft anti-passback
j. Displays programmable real-time messages from software; cardholder name, card number, transaction fee, remaining value (debit user), custom message, status messages (card expired, etc.), time and date. This is a sample list of messages.
k. Card Reader only lanes can have the option of using an integrated QR code reader for contract parkers, temporary or short-term contract parkers.

l. Readers can be programmed from the host pc or workstation on the network.
m. Card reader shall be capable of reading 13Mhz ISO standard 15693/14443 standards or optionally HID Weigand format.

I. Management System
1. Software: Parking.Logic
2. Required Features/Functions:
a. Lane Equipment Program
1) Additional language for display of messages on the lane equipment in two languages
2) Definable face text to be printed on Short-Term Parking Tickets (e.g., adverts, advisory information, etc.)
3) Ticket processing at exit points (retain, return or offer)
4) Allow/block exit of Entry Tickets, Cash Debit Cards, Credit Cards and Parking Credit Cards with zero rate
5) Use of Debit Cards (allow/disallow payment of debit card[s] at exit points)
6) Validation configuration (accept/reject validations)
b. Fee Computer/Workstation
1) Number of invoices, broken down by means of payment
2) Definition of max. credit card spending amount
3) Definition of min. amount of receipt for issuance
4) Exit point payment: exit barrier will only open until payment has been received or gate vended manually. (manual gate vends must be recorded and tracked as events in the system)
5) Flexible keyboard defini tion for extended keyboard (Control Console or keyboard dialogue)
6) Definition of up to 5 validations per transaction.
7) Ability to be used as a control station to review entire system devices for operational efficiencies.
8) Dynamic Language Selection to allow users of the system to select the language of their choice where upon logging in their selected language is available. This allows for reducing potential operational problems with multilingual teams.
9) Supports Active Directory
c. Password Access Level Programs
1) Assigning of programs and functions to access level categories, based on own access level
2) Minimum of 7 basic access level categories, definition of up to 90 further access level categories
3) Summary of programs and functions available on individual system devices
4) Data filter option
d. Reports Program
1) Report Compilation: Customizable compilation of reports by means of the following add-on features:
a) Cashier/Lane/Device Reports (Total Turnover, Net Turnover, Sales, Means of Payment, Validation Providers)
b) Garage Reports (Total Turnover, Net Turnover, System Totals Parking Duration)
c) Payment Device Reports (Total Turnover, Net Turnover, Sales, Means of Payment, Validation Providers, System Totals)
2) Data Filters: Customizable compilation of
a) Filtered Reports for definable report periods

b) Daily/Monthly Interim Reports

e. Device Equipment/Accessories – Validation Providers
1) Evaluation of validated and surcharged amounts, broken down by validation provider
2) Additional validation calculations:
a) Applicable daily or weekly
b) Applicable on several consecutive days
c) Entrance required within or before specified time window or always possible

f. Rate Management Program
1) Ability to comply with sales and parking tax requirements.
2) Ability to provide tax exclude and tax included rates in one rate schedule.
3) Flat Rate Options
a) Applicable daily or weekly
b) Applicable on several consecutive days
c) Entrance required within or before specified time window or always possible
d) Payment/exit required within or after specified time window or always possible
4) Flat Rate Payment Options
a) Pay Device(s): Fee Computer/Workstation and/or Pay On Foot devices
b) Activation method: automatic or via request button
c) Rate period

g. Data Interface Program
1) This utility provides system specific data (e.g. payment details, entry/exit statistics, etc) in a platform independent format for evaluation by way of third-party systems. It is also used for importing data into the parking system database

h. Exportable Data Program
1) Parking transactions (entry/exit movements)
2) Parking transactions of Contract Parker Cards and Credit Cards
3) Payments, Sales Payment transactions
4) Payment transactions broken down by method pf payment (cash, check, invoice, credit card)
5) Payment transactions broken down by method of payment (value cards, validations, token)
6) Additional turnover (e.g., handling fees, amount rounding differences, etc)
7) Daily and Monthly Reports, Cash Flow
8) System Events and Alarms
9) User details (export of full records or, optionally, of edited items only)
10) Ticket return details
11) Card utilizations
12) Events
13) Card Batches
14) Staff details (export of full records or, optionally, of edited items only)
15) Settings – Facilities (Main Admin. Units), Garage's, System devices, Articles, Validation Providers

i. Vouchers Program :
1) Allows for ability to issue a "voucher" upon entry" with transient ticket, with exit transaction or at the POF. The voucher could be with an agreement with a retailer for a percentage/dollar discount of a service or product. This would allow for closer collaboration

with other businesses, branding or advertising revenue generation by the Owner.

j. Data Interface Platform:
   1) This program supports real-time TCP/IP-based data transfer between the Parking system and a primary host. This host can transmit commands to Parking System as well as request status information. In case of certain pre-specified events, the Parking System automatically transmits relevant information back to the host. Commands shall include:
      a) Remote control commands (, i.e., raising/lowering of barriers, lost ticket, etc)
      b) Requesting status, shift and level information
      c) Requesting counters and counting domains
      d) Set counting category mode and level

k. Ticket Definition Program
   1) Definition of cards, ticket types and/or categories (up to 500 categories)
   2) Adjust card imprinting
      a) Valid for the whole facility
      b) Available on all ticket types except Short-term Parking Ticket, Lost Ticket and Ticket Duplicate
      c) Definable face text (see Short-Term Parking Ticket)
      d) Imprint can be switched on/off for each article (facility, article designation, user name, user number, validity, ticket value, customer name, 'Follow-up ticket' note, insert direction arrow, receipt information, parking lot no., door code)
      e) Depot Ticket
         i. Depot Ticket function for Long-Term Tickets, Charter/Visitor Cards and Renewable Long-Term Tickets
         ii. Allows for post-dating of tickets intended to become valid at a future date (ticket can be configured for auto-activation upon first use)
         iii. Multiple card payment: Allows for use of more than one payment card per transaction
         iv. Extended entry permission: Allows for access to the parking facility even when full.
         v. Re-use Waiting Period; Specifies the time a system-based Discount Ticket will not be accepted (i.e., rejected) after being used
         vi. Utilizations: Specifies how often Discount Tickets can be used
         vii. Renewable Long-Term Ticket
         viii. Staff Permit
         ix. Group Access Control

l. Debit Cards:
   1) Cash Debit Card, Types
   2) Personalized Cash Debit Card
   3) Time Debit Card
   4) Multiple Time Debit Card

J. System Event and Alarm Communication
   1. The revenue control system shall have the capability to allow for messages to be sent via email, pager or cell phone equipped with text messaging to varying locations and individuals during specified time windows. These messages are to allow for prioritizing by message and by the individual to receive the message.

K. Protection Post
1. PP Protection Post
2. PP Offset (Top) Protection Post

L. Equipment Location: The parking structure facility consists of two (2) "IN" lanes, two (2) "OUT" lanes. All lanes shall accommodate both the visitors and monthly parkers.

1. Control Lane No. 1 (E) Visitor/Monthly Entry from south roadway
1A - Loop Detector Assembly (presence loop)
1B - Entry station with combination ticket dispenser, proximity card reader, and intercom
1C - Gate with remote operation
1D - Loop Detector Assembly (closing loop).

2. Control Lane No. 2 (X) Visitor/Monthly Exit to south roadway
2A -Loop Detector Assembly (presence loop)
2B - Exit station with credit card pay, proximity card reader, and intercom
2C - Gate with remote operation
2D - Loop Detector Assembly (closing loop)

3. Control Lane No. 3 (E) Visitor/Monthly Entry from north roadway
3A - Loop Detector Assembly (presence loop)
3B - Entry station with combination ticket dispenser, proximity card reader, and intercom
3C - Gate with remote operation
3D - Loop Detector Assembly (closing loop)

4. Control Lane No. 4 (X) Visitor/Monthly Exit to north roadway
4A - Loop Detector Assembly (presence loop)
4B - Exit station with credit card pay, proximity card reader, and intercom
4C - Gate with remote operation
4D - Loop Detector Assembly (closing loop)

5. Control Location No. 5 (X) Pay on Foot Device at Ground Level
5A - Pay on Foot Device

6. Control Location No. 6 (X) FUTURE Pay on Foot Device at Second Level
6A - FUTURE Pay on Foot Device

7. Control Location No. 7 (X) FUTURE Pay on Foot Device at Third Level
7A - FUTURE Pay on Foot Device

3.00 EXECUTION

3.01 GENERAL

The parking control equipment to be installed requires that certain items be placed in the concrete structure prior to executing the work of this section. A requirement of this Section is for coordination and supervision by the manufacturer of the control equipment installation and system-wiring of all equipment furnished under this Section.

3.02 VERIFICATION OF CONDUITS

Equipment supplier and installer shall verify the adequacy / location of conduit runs shown on the contract drawings for parking equipment control and power. If the layout indicated is not adequate for the proposed operation or is not in compliance with the manufacturers requirements shall be

brought to the Contractor's attention. Costs associated with modifications to the structure, conduit and / or electrical power or operation signal / function supply shall be assumed by the Contractor at no additional contract cost to the Owner.

3.03 INSTALLATION

A. Proposals shall be complete without exclusion. General Contractor will make available all required, DSL and phone lines required.

B. Excluding lane equipment, all POF's, network equipment, PCs servers, firewalls, servers, etc. must be on battery back-up and surge protected.

C. Equipment implementation and operational scripting
   1. All discovery of user groups and customers are the responsibility of the successful proposer
   2. Operational scripting of all users and customers of the parking facility is the responsibility of the successful proposer
   3. Implementation of the PARCS to accommodate all existing operational requirements is the responsibility of the successful proposer
   4. Workarounds or other operational methods that allow transactions to be completed without closing all tickets are unacceptable
      a. All operational scripting must conclude with a closed transaction; no exceptions
   5. All reporting required to audit the system must be included
      a. All reports must be capable of being created on demand or automatically by schedule. All reports must be capable of being emailed.

3.04 WARRANTY/SERVICE

A. Overall system and components shall have a minimum service life of 10 years.

B. Equipment software warranty shall be 100% parts and labor for 1 year from date of acceptance.

C. Provide alternate pricing for 5 years of preventative maintenance.

D. Provide alternate pricing for 5 years of PCI software upgrades.

3.05 SYSTEM TRAINING

A. The Contractor shall provide to Owners personnel in-depth training with applicable documentation for component level maintenance and operation of the Parking Control Equipment. The Contractor shall provide all training and materials for five (5) employees. The training material shall include but not be limited to maintenance manuals, operational manuals and diagrammatic drawings of all system components, software and interface of components.

B. The training shall be for the overall Parking Control System and be provided by the Contractor prior to actual system acceptance to ensure Owner competence in the operation of the overall system. The Contractor shall conduct the following Owner training classes as a minimum.

C. Detailed training and training documentation for Owner personnel concerning the use of the Parking Control System, its operating principles and administrative capabilities. The Contractor shall ensure that Owner personnel become well acquainted with the operating

and software systems to fully utilize system capabilities to aid in cost reduction and system management.

D. Training of Owner personnel in maintenance support and operating functions, software operations and system components in sufficient detail to enable the Owner to keep the Parking Control System in constant operation. It is the Owner's intent to have component level maintenance training and capabilities.

E. The Contractor shall provide the Owner's project manager with a training schedule outlining each type of class, length of the class and any requirements concerning classroom facilities. The times and locations of training shall be mutually agreed upon by the Owner and the Contractor.

F. The Contractor shall provide the Owner with written documentation describing the training procedures to be used by the Contractor and the training schedule for staff as identified by Owner (System Training Plan). Owner shall approve the training schedule prior to the Contractors implementation of the plan.

END OF SECTION

SECTION 12 93 13 – BICYCLE RACKS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division 1 apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Provide surface-mounted bicycle U-racks including accessories as required for complete, finished installation.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
A. Section 05 50 00: Miscellaneous Metal

1.03 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Shop Drawings: Indicate construction, materials, dimension, thickness, fabrication details, tolerances, colors, finishes, methods of support and anchorages.

C. Manufacturer's specifications, catalogues, shop drawings and other data needed to prove compliance with the specified requirements, with regards to size, materials, finishes, anchorage and quantities of items being supplied.

D. Submit color samples to Architect for review and approval.

1.04 REQUIREMENTS

A. The components indicated on the Drawings show dimensions established to accomplish the Architect's intended visual intent. The Contractor shall verify that the components that will be actually provided for the work of this Section will fit the building's structural elements and conform to the visual design criteria and profiles indicated on the drawings without materially altering profiles and alignments.

B. Any additional support, backing or footings required for the components shall be provided and installed as part of the work of this Section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect the site furnishings and related components during shipment by means of crates and/or padding so that they arrive at the project undamaged. Protect fixtures, before, during and after installation until acceptance by Architect and occupancy by Owner.

2.00 PRODUCTS

2.01 BICYCLE RACKS

A. Description: Units are to be manufactured to accommodate a minimum of two-bike capacity racks. Powder coating finish or equal over hot dipped galvanized rack. Refer to drawing plans and Architect for total number of racks required.
- Classic Bike U Rack by CycleSafe, U-Bike rack by Madrax, Cycloops by Columbia Cascade Company, or equal.

3.00 EXECUTION**Error! Bookmark not defined.**

3.01 FIELD CONDITIONS

A. Verify drawing dimension with actual field conditions. Inspect related work and adjacent surfaces, affecting installation. Examine substrate surfaces to receive work of this section and associated work and conditions under which work will be installed. Where embeds are indicated as being placed in the concrete slab for mounting / welding of surface mounted flanges, verify sizes required and placement locations required.

B. Report to Architect any conditions which prevent proper execution of this work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the installer. Assume full responsibility of fitting the components to the building. Starting of work will be construed as applicators acceptance of conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's latest published requirements/ instructions, specifications, details and approved shop drawings.

B. Use manufacturer's supplied anchors and adhesives required for installing and attaching the bike racks specified herein, including methods for moving and placement.

C. Place surface mounted flange base plates over the previously placed steel cast-in-place embeds and continuously weld and grind smooth connections for the bike lockers on the elevated level. Wire brush ground weld attachment and repair finish with cold galvanizing repair paint.

D. Erect the components, plumb and level, square, true to lines, neat and finished appearance, and/or elevations shown on the Drawings.

E. Include setting of each item in its correct place, fastening it, connecting it, or incorporating it into other portions of the work, as each item may require. Position supports and anchorage devices and set components in place prior to securing fasteners.

F. Handle and install bicycle lockers in accordance with manufacturer's recommendations and installation instructions.

G. Set lockers level and true to line, in correct relationship to adjacent materials, secure in place to prevent theft of bicycles and to prevent theft of lockers.

3.03 CLEANING

Clean soiled units using methods recommended by unit manufacturer. Use extreme care to prevent damage to unit surfaces and surrounding materials.

3.04 PROTECTION

A. Protect all installed work and equipment / components from damage by subsequent construction operations. Damaged or marred work shall be repaired or replaced to the Architects satisfaction.

B. Patching shall be field mixed and applied, using materials / mixtures to match color and texture of surrounding finish, as factory applied. Replace units which cannot be acceptably patched.

C. Patches noticeable from a distance of 5'-0" are not acceptable.

END OF SECTION

SECTION 14 21 23 – ELECTRIC TRACTION PASSENGER ELEVATORS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including but not limited to these major items:
   1. Install three (2) (MRL) machine-room-less general use, electric gearless traction passenger elevator(s) complete and operable with all appurtenances, specified herein or as required by the Owner.
   2. The work required under this section consists of all labor and materials for the complete installation including operational verification of all mechanical, signal and communications equipment required for the elevator(s) as herein specified.

C. Elevator manufacturers Bidding on the Work of this Project are to provide with their Bid Proposal, the supplemental proprietary reference information requested under paragraph 1.08 –'Proprietary Considerations'. Elevator bids received without the requested reference data submittals shall be considered non-responsive and grounds for rejection by the Owner.

1.02 RELATED SECTIONS OF WORK

A.	Section 01 35 00:	Special Project Procedures
B.	Section 05 50 00:	Miscellaneous Metal (pit ladder(s), divider beam(s) and supports for entrance sill(s) and guide rails)
C.	Section 08 41 13:	Aluminum-Framed Storefronts
D.	Section 09 65 19:	Resilient Flooring
E.	Section 09 90 00:	Painting
F.	Section 23 00 00:	Mechanical (ventilation and temperature control of elevator controller / equipment room)
G.	Section 26 00 00:	Electrical (service to main controller disconnect; power for installation and testing; disconnect device prior to activation of sprinkler system; service to control closet; control closet and pit receptacles with ground fault current protection; lighting in control closet and pit; wiring for telephone service to control closet
H.	Section 28 30 00:	Fire Alarm System (fire and smoke detectors, fire alarm signal lines to contacts in the control closet)

1.03 RELATED WORK PERFORMED BY OTHERS

A. Legal Hoist Way and Pit Enclosure:
   1. Hoist way construction in accordance with the required fire rating including hoist way walls penetrated by elevator fixture boxes. Include adequate fastening for hoist way entrance assemblies with the front entrance walls at all landings not constructed until all elevator materials have been located in the hoist way. Front entrance walls shall not be constructed until doorframes and sills are set in place. Overhead clearance shall be suitably sized for necessary hoisting in accordance with the elevator contractor’s details.
   2. Hoist way plumb dimension variations shall not to exceed 1" at any point.
   3. Hoist way hoisting beam installation to facilitate installation of the elevator system.
   4. Installation of structural supports for guide rails, located per reviewed shop drawing details and as required by governing code. Separator beams shall be

installed where required. Steel beam hoist way construction shall have beam webs located more than 2" clear of the hoist way line with rail bracket support fastenings provided.

5. Pit ladder(s), pit screen(s), car and counterweight buffer and rail load supports.
6. Bevel cants 15 degrees from vertical over any rear or sidewall ledges that project 2" or more into the hoist way (Not required on hoist way divider beams).
7. Provide divider beams between adjacent elevators at each floor and between the car and counterweight rail supports (building supports under 0.50g horizontal seismic elevator car or counterweight acceleration not to deflect in excess of 1/4").
8. Cut walls, floors and make necessary repairs, patching and painting of finished surfaces as needed to provide block outs for the installation of push-button stations, hall lanterns, signal and position indicators. The elevator contractor shall make the final modifications.
9. Prepare each landing for entrance sill installation and perform necessary grouting after sill(s) is/are installed. Plumb vertical surfaces square with the hoistway. A horizontal support shall be 1'-0" above the top landing clear opening to support frame assembly.
10. Protect open hoist ways and entrances during construction per OSHA regulations. Guard and protect the hoist way during the installation of the elevators and to complete all of this work in such time as not to delay work of the elevator contractor.
11. Protect cabs, entrances and special metal finish from damage after installation.
12. Coordinate for the cleaning and painting of elevator shaft interior.
13. Guarding of counterweights in a multiple elevator hoist way.
    a. Where counterweights are located between elevators in a hoist way having more than one elevator, the counterweight shall be guarded for the entire height of the hoist way. The guard shall extend at least 6 inches horizontally beyond each counterweight rail. The guard shall be made from wire mesh material equal to or stronger than .048 inch diameter wire with openings not exceeding 1 inch, securely fastened to keep the guard taut and plumb.
    b. Counterweight protection shall conform to Title 24 Part 7 Section 3013 (c)(1) regulation.

B. Control Room / Closet - (Machine Room Less)
1. Suitable light fixture (minimum 10ftc at floor level) and convenience outlets with ground fault circuit interrupter in control room(s) with light switches located within 18" of lock jamb side of the control closet door.
2. Provide properly ventilated, lighted and sound-isolated controller room of sufficient size for the required equipment. Temperature shall be maintained between 65 degrees F. and 90 degrees F. with relative humidity not to exceed 80 percent (non-condensing).
    a. The lobby side self closing control closet door shall be sized to accept the elevator contractor’s controller and transformer and meet all requirements of ASME A17.1 and carry a UL Class 'B' label for a 1-1/2 hour fire rated label.

3. Provide a fire extinguisher in the controller room.

C. Electrical Services:
1. All electrical power for lights, tools, hoists, welding, etc., during erection and installation.
    a. Provide single-phase power wires to control closets prior to delivery of elevator equipment

b. Provide 3-phase mainline power feeds to each controller unit. Connect 3-phase power supply to the elevator contractor's transformer or controller terminals with properly sized intervening 3-phase externally operable fused motor circuit switch or circuit breaker lockable in the open position, sized to suit elevator power characteristics for each elevator circuit breakers at locations shown on elevator shop drawings.

2. A 120V, 20 amp capacity dedicated branch circuit, single-phase power supply with an SPST-fused disconnect switch circuit breaker with feeder wiring to each controller for car lights and exhaust blower.
3. Disconnect switches to be conveniently located in control closets including protected lockable "off" disconnect switch (copper conductors to terminals).
4 Three-phase 30-amp power feeder from each elevator to group elevator control panel in each machine room as designated by the Elevator Contractor.
5. Single-phase, 20-amp power feeder to elevator intercom amplifier located in the elevator machine room.
6. Communication equipment / means within the car for communicating or signaling to an accessible location outside the hoist way or central exchange system or to an approved emergency service, unless stated elsewhere in this specification. System shall be designed according to ADAAG.
7. A 120V, 15 amp capacity dedicated branch circuit, single-phase power supply for elevator intercoms with a fused SPST disconnect switch or circuit breaker separate power supply located as required for inter-communicating power supply. Circuit shall be arranged for feeding from the building emergency power supply, if available. Conduit and wiring shall be provided for remotely located inter-communicating stations.
8. Install products-of-combustion sensors (NFPA No.72) in all elevator lobbies, to initiate firemen's return feature. Run sensing wires to each group elevator controller. Verify primary and secondary car parking floors location with fire department.
9. Elevator lobby heat detectors located as required with wiring from the sensing devices to a terminal block located in the controller room as designated by the elevator contractor. For each group of elevators, Provide a normally closed contact from the smoke detector at the designated return landing as well as a normally closed contact at all other smoke detectors at lobbies, control closets, and hoist way smoke detectors. If a smoke detector is located in the hoist way at or below the lower of the two designated return landings, it shall be wired to activate the same normally closed contact as the smoke detector located in the lobby at the lower of the two designated return landings.
10. If sprinklers are installed in the hoist way, control closet, a means to automatically disconnect the main line power supply of the affected elevator prior to the application of water. Smoke detectors shall not be used to activate sprinklers in hoist ways, control closets or to disconnect the main line power supply.
11. Temporary power and illumination as required by Elevator Contractor to install, test and adjust elevator equipment.
12. Remote conduit and wiring runs for the emergency/fire status panel (if required) and/or between hoist way bank(s) to tie elevator(s) in an emergency power (if required).

D. Emergency Power Provisions:
1. Deliver emergency power of the same voltage characteristics via the normal feeders to run one elevator at full-rated car speed.
2. A pair of conductors from the emergency power transfer switch to a single elevator control panel as designated by the Elevator Contractor to signal the presence to emergency power.
3. Emergency single-phase power for each car lighting, exhaust blower, emergency call bell and intercom amplifier.

4. Means for absorbing regenerated power during an overhauling load; such as full load down, in accordance with ANSI A17.1, Rule 210.10.
   Note: Elevator drive may employ SCR converters.

1.04 REFERENCE STANDARDS

A. Compliance with Regulatory Agencies: Comply with the most-stringent applicable provisions of following Codes and/or Authorities, including revisions and changes in effect on date of these specifications.
   1. CCR Title 8, Subchapter 6, Elevator Safety Orders (Register 79, No. 1, 1-6-79 with all update amendments), CCR, Title 24, Part 7.
   2. Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks, AMSE/ANSI A17.1 and CAN/ CSA B44
   3. Inspectors' Manual, AMSE/ANSI A17.2-1 and CAN/ CSA B44.
   4. California Electrical Code, No. ANSI/NFPA and Title 24, CCR.
   5. The California Elevator Safety Construction Code, Title 24, CCR, Part 7.
   6. Accessible Code, Title 24, CCR, Part 2 and American with Disabilities Act (ADA).
   7. 2010 ADASAD – Americans with Disabilities Act Standards for Accessible Design.
   8. ANSI/NFPA 70, National Electric Code / ANSI/NFPA 80, Fire Doors and Windows
   9. Life Safety Code, NFPA No. 101
   10. ANSI/UL 10B, Fire Tests of Door Assemblies
   11. Requirements of and any other Codes, Ordinances and Laws applicable within the governing jurisdiction.

1.05 SUBMITTALS - Comply with Article 1.08 - 'Proprietary Considerations' for submittal requirements to be furnished by the Contractor with the 'Bid Proposal' for the elevator Schedule of Values.

A. Provisions: Comply with Section 01340.

B. Shop Drawings and Product Data: Within 60 days after award of Contract and before beginning equipment fabrication submit shop drawings and required product data materials for review.
   1. Scaled and Fully Dimensioned Layouts: Plan of pit, hoist way and controller closet layout indicating equipment arrangement, elevations and sections of hoist way, pit and over-ride, details of car enclosures, entrances, etc.
      a. Indicate locations of ladders, shaft wall / controller closets / shaft access doors, hatch locations, separator beams and counterweight screens as well as any other requirements required, even if these items are furnished under separate sections. All information pertaining to installation of the elevators, equipment and other related work shall be furnished.
      b. Dimension guide rails, buffers and other components within the hoist way, required rail bracket spacing including clear inside hoist way and pit dimensions and required clearances and travel for car. Location and sizes of hoist way access doors and controller closet / lobby doors and frames.
   2. Design Information: Indicate equipment lists, reactions and design information on layouts, seismic equipment designs, required clearances between equipment furnished and other building parts. Maximum loads imposed on guide rails requiring load transfer to building structure, including loads on hoisting beams or bearing walls, net vertical load from the elevator system, including total car weight and rated load and any structural supports
   3. Power Confirmation Requirements: Include motor horse power, starting current, full load running current and demand factor for applicable motors.

4. Finish Materials: Submit samples, 3" x 6" of actual finishes specified.
5. Signal Fixtures: Submit shop drawings and product data sheets for all units, components and equipment, including mounting provisions and details.

C. Operation and Maintenance Manuals. Provide manufacturer's operation and maintenance manuals, upgraded as applicable to conform to Division 1 - Contract Closeout requirements, prior to final acceptance and final payment. Provide two (2) final corrected sets after job acceptance for the Owner's file.
1. Single-line wiring diagram of as-installed elevator circuits with index of location and function of all components. Mount installation diagrams on masonite panels and leave on the job, within the controller closet.
2. Lubricating instructions including recommended grade of lubricants.
3. Parts catalogs for all replaceable parts including ordering forms and instructions.

1.06 QUALITY ASSURANCE

A. Manufacturer: Provide elevators of a national manufacturer that have a minimum of ten (10) years experience in fabrication of electric gearless traction elevators, and presently has a (MRL) machine room less system as part of their standard product line.
1. The proposed system shall have features and performance characteristics equivalent to the standards specified.
2. Proposed system shall demonstrate a track record with minimum of two permitted, installed, completed and functional installations similar to that required for this project. Installations shall be at different facilities and within the State of California.
3. Approved Manufacturers/Installers
   a. As stated hereinbefore, the elevator system indicated in the contract documents is based on the “Otis-Gen-2” system.
   b. MRL / Gearless Traction Elevators shall be manufactured / installed by Otis Elevator Co., or equal.
   c. Car Enclosures: Otis, Brice-Southern, Fujitec, Globe Van Doorn, Hauenstein & Burmeister, Mitsubishi, Thyssen Krupp, Schindler, Tyler, Union Mfg.
   d. Hoist Way Entrances: Otis, Brice-Southern, Hauenstein & Burmeister, Mitsubishi, Thyssen Krupp, Schindler, Tyler or equal.

B. Installation: Elevators of this section are to be installed by the approved manufacturer providing the system. Since the work of this contract provides the Owner with new system technology, it shall be considered unacceptable to sub-subcontract the installation.

C. Regulatory Requirements: Design and installation of the elevator system shall comply with the latest version of the specified referenced standards and governing codes of jurisdiction of the work of this contract.

D. Permits and Inspections: Provide licenses and permits and perform required inspections and tests as required by the governing codes of jurisdiction.

1.07 SYSTEM DESIGN

A. The elevator manufacturer shall be responsible for the following:
1. Furnish and install the (MRL) gearless electric traction passenger elevator system as indicated, complete and functional.
2. Furnish and install elevator cab interiors complete as specified.
3. Furnish and install all system controllers with electrical controls, signal fixtures and wiring complete.

4. Furnish and install conduit and wiring to lighting and ventilating fixtures.
5. Furnish and install conduit and wiring inclusive of traveling cables for telephone/intercom/alarm communications within the shaft way and inter connection to the elevator control closet to the electrical room. Furnish and install units that integrate with Owners communication system. Coordinate with the Owner for inter connection to existing systems.
6. Provide four additional pair of shielded traveling cables and make provisions for CCTV with voice capabilities and two spare lines. Equipment, if so decided shall be furnished and installed by others.
7. Furnish and install headers, tracks and threshold; hangers and gibs on car doors and hand doors.
8. Furnish and install car operating panels, signal fixture, call buttons and position indicator controls, lanterns, indicators and faceplates.
9. As required for glass back elevators, furnish and install metal non-vision wings on both sides of the cab glazing to shield shaft way structure and provide sheet metal shroud around the top of the cab unit to shield visible equipment on top of the cab that would be visible through the curtain wall glazing.
10. Basic construction of the cab structure shall be of steel construction minimum 14 gauge.
11. Provide at the controller and on top of the car with the necessary devices to run the elevator during inspection operation, if so permitted by code requirements.
12. Provide at the controller and on top of the car with the necessary emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
13. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
14. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
15. Provide the means from the controller to reset elevator earthquake operation.

1.08 PROPRIETARY CONSIDERATIONS - Carefully review and comply with the following requirements and submit the following documents with the Bid Proposal.

A. Document Verification: Compliance by the Contractor and the manufacturer with all provisions, whether indicated, detailed or specified in the contract documents is required. Owner will not pay for changes to structural, mechanical, electrical or other systems required to accommodate bidder's equipment, if different from the manufacturers system the design was based upon.
   1. The Contractor shall be responsible for a complete operable installation, meeting the specified or otherwise agreed performance characteristics.
   2. Certify the adequacy of the proposed electrical power supplies indicated on the contract documents.
   3. Warranty Coverage: Provide the manufacturers written warranty fully explaining terms and Conditions of coverage, length of coverage and any exclusions that are a factor in the operation of the system.
   4. Maintenance: Provide documentation of the Terms and Conditions of the maintenance period that is covered under the original contract sum and contract for installation.
   5. Manufacturers product data sheets with full explanation of the system, to use as evaluation of the functional and performance differences in system design between the different manufacturers and their respective systems.

1.09 PERMITS, TESTS AND INSPECTIONS

A. Obtain and pay for permits, licenses and inspection fees necessary to complete the elevator installation.

B. Perform tests required by Consultant, Governing Authority and/or the ASME/ANSI A17.1 Safety Code for Elevators and Escalators with procedures described in ASME/ANSI A17.2 Inspector's Manual for Elevators and Escalators in the presence of authorized representatives.

C. Supply personnel and equipment for tests and final reviews indicated in Part 3 at no added cost to Owner.

1.10 MINIMUM DESIGN CODE REQUIREMENTS – Per the requirements of Title 24 Part 2 CCR - Refer to Paragraph 2.01, Equipment Summary for specific project requirements.

A. The elevator car size and configuration must be adequate to accommodate a stretcher 24 inches by 84 inches with not less than 5” radius corners or gurney.

B. The minimum elevator platform size, with center opening doors shall be 80" wide by 54” deep (door to wall).

C. The elevator doors shall have a 36" minimum clear opening.

D. Install a handrail at 32" (if handrail does interfere with controls, otherwise meet 34"-38" requirement) above the elevator car platform with a 1 1/2" minimum clear space between the handrail and the rear wall preferred.

E. The centerline of the alarm button and emergency stop switch shall be at a nominal 35" and the highest floor button cannot be higher than 54" above the car floor. Elevator floor buttons shall be located within 4'-6" above the finish floor for side approach or 48" when there is only a frontal approach.

F. Except for photo electric tube bypass switches, the emergency controls, including the emergency stop and alarm, shall be grouped in or adjacent to the bottom of the panel and shall be no lower than 35" from the floor. Only one set of controls per elevator car need comply.

G. An audible signal shall sound to tell a passenger that the car is stopping or passing a floor served by the elevator.

H. Provide 54" maximum high emergency hands-free telephone.

I. The telephone shall have audio and visual communication abilities.

J. Elevator floor selection buttons shall have square shoulders, 3/4" min. high, a detectable operating motion, illuminated and raised 1/8". Install a white on black 5/8" minimum high Arabic numeral on the left side of the floor number, an alphabet character and California Braille symbol below the numeral with a 3/8" minimum space or other means of separating rows of control buttons.

K. Identify elevator controls and emergency equipment with raised symbols, including but not limited to emergency stop, door open, door close, alarm and telephone. The main entry floor call button shall be designated by a raised star on the left side of the floor designation plaque.

L. Provide an automatic door-opening device that stops and reopens the car door when the door is obstructed while closing. Elevator door opening sensors, not requiring contact to activate, shall be located between 5" and 29" AFF. The door-reopening device shall remain effective for 20 seconds minimum and the doors may close in accordance with ANSI 17.1-88 or ASME 17.1-1990.

M. Automatic elevators shall stop within 1/2" of the floor under normal loading and unloading conditions with a 1 1/4" maximum clearance between the car platform and the hoist way landing edge.

N. Exterior elevator call buttons shall be located 42" AFF maximum, shall be 3/4" minimum in size and raised 1/8". Hall call buttons shall be internally illuminated with a white light over the entire surface of the button.

O. A visual elevator hall lantern and audible signal shall be provided at each hoist way entrance indicating to the prospective passenger the car answering the call and its direction of travel as follows:
1. The visual signal for each direction shall be a minimum of 2 1/2" high by 2 1/2" wide, and visible from the proximity of the hall call button.
2. An audible signal shall sound once for the up direction and twice for the down direction or configured that distinguishes between the up and down travel.
3. The centerline of the fixture shall be located a minimum of 6'-0" (72") in height from the lobby floor.
4. The use of in-car lanterns, or on the doorjambs, visible from the proximity of the hall call buttons and conforming to the above requirements will be acceptable.
5. The use of arrow shapes are preferred for visible signals.

P. The minimum acceptable time from notification that a car is answering a call (lantern and audible signal) until the doors of the car start to close shall be calculated by the following equation: T = D/(1.5 ft/sec). T is the total time in seconds and D is the distance in feet from a point in the lobby or landing area that is 60" directly in front of the farthest call button controlling that car to the centerline of its hoist way door.

Q. Door re-opening devices are to remain effective for a period of not less than 20 seconds.

R. The minimum acceptable time for the doors to remain fully open shall be not less than 5 seconds.

S. Passenger elevator landing jambs on all elevator floors shall have the number of the floor on which the jamb is located, designated by raised Arabic numeral which are a minimum of 2" in height and raised Braille symbols located approximately 5' above the floor on the jamb panels on both sides of the door so that they are visible from within the elevator. Raised Braille symbols shall be placed directly to the left of the corresponding raised Arabic numerals. The raised characters shall be on a contrasting background.

T. Maintain a clear 48" by 30" space under the elevator call button permitting a person using a wheelchair to approach and use the call button.

1.11 WARRANTY

A. Materials and workmanship of the elevator installation shall comply in every respect with contract documents. The elevator contractor guarantees the materials and workmanship of the apparatus furnished under these specifications and further agrees to make good any defects which may develop within one (1) year from the date of acceptance of each elevator not due to ordinary wear and tear, vandalism, improper or insufficient maintenance by others, abuse, misuse, neglect or any other cause beyond the control of the elevator contractor, to the satisfaction of the Owner at no additional cost.

B. Make modifications, adjustments, improvements, etc., to meet performance requirements in Parts 2 and 3 of these specifications.

C. Provide a copy of the manufacturer’s warranty, providing coverage for a period of not less than one (1) year with additional consideration given for extended length of coverage.

1.12 MAINTENANCE

A. Interim:
1. When one or more elevators are near completion and declared ready for service, the Owner or Contractor may accept elevators for interim use and place them in service before entire installation of all elevators have been completed and accepted.
2. During this period Owner or Contractor may pay Elevator Contractor a mutually agreed amount per elevator for preventive maintenance. Indicate amount per unit per month with bid.

B. Include with New Equipment Contract (Warranty Period):
1. The Elevator Contractor shall furnish preventive maintenance on all equipment described herein for a period of 12 months commencing on date of final acceptance of the elevator system, including 24-hour emergency callbacks. The maintenance shall include systematic examinations, cleaning, adjustments and lubrication of all equipment. Repair or replace electrical and mechanical parts whenever required and shall use only genuine, standard parts produced by the manufacturer of the equipment installed. Maintain elevator equipment closets, hoist ways, and pits in clean conditions.
2. Maintenance work is to be performed by personnel under direct employ and supervision of the Elevator Contractor. This service shall not be subcontracted but shall be performed by the elevator contractor. Work is to be performed by competent employees during regular working hours of regular working days.
3. This service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

C. Contract:
1. Bidders shall also quote the monthly cost for a 5-year maintenance agreement to commence on completion of the 12-month maintenance period in "B" above. Submit quote based upon terms and conditions of the elevator manufacturer's standard preventive maintenance agreement. Under this agreement, the equipment performance requirements, as specified, shall be provided at all times.
2. If this Contract is accepted, the contract price may be adjusted at the expiration of the new installation service period and thereafter as provided in the Contract.

D. Maintenance Availability: The final elevator installation shall be able to be maintained by any licensed elevator maintenance company without the need of conferring, cooperation, purchase or leasing of equipment, special tools, or maintenance/repair of any component from the installing elevator company or manufacturer. Installed equipment not meeting this requirement shall be removed and replaced with conforming equipment at no cost to Owner.

1.13 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment on the agreed upon date, Contractor shall be responsible for providing a proper and suitable storage area on or off the premises as required to properly maintain the system components, without additional cost to the Owner.

B. Should the storage area be off site and the equipment not yet delivered, the elevator contractor upon notification from the Contractor, shall divert the elevator equipment to the storage area. If the elevator equipment has already been delivered to the site, Contractor shall be responsible for transporting the elevator equipment to the storage area. The elevator equipment shall be stored and removed from storage to the job site in a timely manner to avoid delay.

C. Deliver materials in manufacturer's original, unopened protective packaging.

D. Store materials in original protective packaging. Prevent soiling, physical damage or wetting.

E. Protect equipment and exposed finishes during transportation, erection and construction period against damage and stains.

2.00 PRODUCTS

2.01 MANUFACTURERS

Provide elevator system(s) manufactured by one of the following: Otis Elevator Company Gen2; or equal. Selection shall be subject to the review and approval by the Owner based on the review of the submittal and proprietary consideration documents required.

2.02 SYSTEM CRITERIA

A. Design Specifications: Provide the selected manufacturers control system, car design and machine room-less electronic gearless traction mid-rise passenger elevator system. System shall have the following performance attributes:
   1. Quantity: Two (2), Elevators 1 & 2
   2. Type: Glass-back Passenger Elevators
   3. Capacity: -- 3500 lbs. Passenger
   4. Speed: Elevators shall ascend and descend at 150 feet/minute
   5. Travel: 22’-8”.
   6. Stops: Three
   7. Floors Served: 1-3
   8. Operation: Two car group (Duplex)
   9. Platform Size: 6’-9 1/2” x 5’-5 9/16”.
   10. Hoist Way Entrances: 3'-6" wide by 7'-0" high
   11. Door Type: Single Slide Side Opening
   12. Door Operation: Safe edges and double light rays with variable timing & nudging features. (Safety Ray / Infrared light beams) The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.
   13. Power Supply: 480 Volts + or - 5% of normal, three-phase, with a separate equipment grounding conductor.
   14. Motor Control: D.C. variable voltage with automatic leveling
   15. Car Lighting Power Supply: 120 Volts, single-phase, 15-amp, 60 Hz.
   16. Signal Fixtures: Vandal Resistant push buttons, key switches and message indicators for elevator operation
       a. Registration Lobby
       b. Car Vandal resistant stainless steel and single riser corridor push buttons, illuminated Registration: LED
       b. Lobby Hall lanterns with audible signals at all floors except Lanterns: ground / entrance level.
       c. Entrance Combination hall position indicator and hall lantern with Lantern: Position indicator with audible handicapped signals at ground floor to be digital LED lights.
       d. Cab Lights: Vandal resistant stainless steel push buttons, illuminated LED, Car push buttons to designate floor level desired.
   15. Roof Hatch:

a. Emergency electrical contact switch shall be provided on the car top roof exit hatch to manually switch the controller off to preclude reactivation with restored power.
b. Escape hatch locks shall be keyed to the access switch key.

18. Entrances: Prime finish at all floors, U/L B 1-1/2 hr label.
19. Communication Intercom wiring for installation and ADA compliant emergency / service.
20. System compliant telephone shall be furnished and installed as part of this work. Provide all wiring between elevator hoist way and control panels.
21. Control Room / Controller Closet Location:
Controller(s) shall be located adjacent to the hoist way at the top landing next to hoistway entrance at the top landing.
23. Maintenance Period: 3 months / 12 months warranty coverage.

B. Additional Features:

1. Maintenance platform top of elevator cage / car top inspection station.
2. Shroud at top and bottom of cab enclosure
3. Emergency power unit shall be furnished in each car for lighting and for emergency alarm bell and fan in the event of a power failure in the building.
4. Entrance Jamb Marking Plates / Accessible Handicapped Accommodations: Provide 4" x 4" plates having raised numeral floor markings with Braille located underneath the floor marking. Marking plates mechanically attached on both sides of the entrance jamb. (no stick-on plates) with Braille and raised Arabic numerals in hall and cab
5. Sight Guards: Black sight guards will be furnished with any metal finish door. Powder-coated matching sight guards will be furnished with powder-coated doors.
6. Single car operating swing panel
7. Full width facias
8. Hoist way access switches
9. Independent service feature
10. Platform isolation
11. Extruded aluminum car sills
12. Load Weighing: Provide means for weighing passenger load. Design control system to provide dispatching in advance of normal intervals and to provide landing call by-pass when the car is filled to approximately 70% of full-capacity load. Settings shall be individually adjustable from 50-80% of full load.
13. Design control system to provide dispatching in advance of normal intervals and to provide landing call by-pass when the car is filled to approximately 70% of full-capacity load. Settings shall be individually adjustable from 50-80% of full load.
14. Door Operation: Doors shall open automatically when a car arrives at a terminal to permit egress of passengers, whether or not the terminal floor call has been registered in the car. When another car is at the terminal and is loading for departure or upon expiration of a timed interval, the doors shall re-open upon registration of a call on the car button or by pressing the door open button. If no other car is at the terminal, an arriving car shall have its doors open until the car is dispatched or expiration of a timed interval with no demand.
Doors on the car and at the hoistway entrances shall be power operated by means of quality operator mounted on top of the car. The motor shall have positive control over door movement for smooth operation. The car door shall have a safety shoe to cause instant reopening should contact be made with any obstruction during the closing cycle.
Car Door Safety Device: Multi-beam infrared door reversal device shall be furnished with the following operation:
    1. The doors shall be prevented from closing from their full open position if a person comes within the zone of detection. The detection zone shall extend from the sill level to a height of 72", across the entire width of the door opening. If a person or object enters the zone as the doors are

closing, the doors shall reverse and reopen. The doors shall reclose after a minimal time interval. A passenger entering or leaving the car shall cause the doors to stop and reverse.

2. After a stop is made, the doors shall remain open for a time interval to permit passenger transfer, after which the doors shall close automatically. This interval shall be less for a car call stop than for a hall call stop or a coincident car/hall call stop.
3. If the doors are prevented from closing for a fixed time period, the door protective device shall be rendered inoperative, a buzzer shall sound on the car and the doors shall close at approximately half speed. Normal operation shall resume at the next landing reached by the car.
4. The device shall be capable of detecting any color, any shaped opaque object within the zone of detection.

15. Automatic Leveling: An automatic two-way leveling device shall be provided, designed to govern the leveling of the car to within 3/8" above or below the landing sill. The leveling operation shall be effective to avoid over travel, as well as under travel of the car and maintain the leveling accuracy regardless of the load in the car, direction of travel, rope slippage or stretch.
16. Rail backing (as required)
17. Motor / controller reduced voltage starting.
18. Products of combustion sensor controls (NFPA No. 72D) at all enclosed levels of elevator lobbies.
19. As built wiring diagrams, operating instructions and parts ordering information

2.03 MATERIALS

A. Steel
1. Sheet Steel for Exposed Work: Stretcher-leveled, cold-rolled, commercial-quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel for Unexposed Work: Hot-rolled, commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
3. Structural Steel Shapes and Plates: ASTM A36 and AISI 1018.

B. Stainless Steel: Type 300 Series complying with ASTM A167 with standard tempers and hardness required for fabrication, strength and durability. Type 302 or 304 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability. Sheets shall be 20 gauges, minimum for door facings and 18 gauge, minimum for entrance frames, front returns and transom.
1. Supply with mechanical finish on fabricated work in the location shown or specified with texture and reflectivity required (Federal and NAAMM nomenclature). Protect with adhesive plastic film or paper covering.
a. No. 4, bright directional polish (satin finish), graining directions running in longest dimension.
b. Rigidized stainless steel: RigidTex 5WL 20-gage.
2. All finishes specified as "satin" to be manufacturer's standard directional polish that complies with commercial No. 4 requirements.
3. All finishes specified as "mirror" to be manufacturer's standard mirror polish that complies with commercial No. 8 requirements.

C. Bronze: Cold finished muntz metal type UNS C28000-H02 complying with ASTM B35/B36M.
1. Supply with mechanical finish on fabricated work in the location shown or specified with texture and reflectivity required (Federal and NAAMM nomenclature). Protect with adhesive plastic film or paper covering.
2. All finishes specified as "satin" to be manufacturer's standard directional polish that complies with commercial No. 4 requirements.
3. All finishes specified as "mirror" to be manufacturer's standard mirror polish that complies with commercial No. 8 requirements.

D. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

E. Plastic Laminate: ASTM E84 Class A and NEMA LD3, 0.050-inch up to 1/16- inch nominal thickness. Plastic laminate surfaces to be used in concealed areas only, with manufacturer's standard color and finish.

F. Fire-Retardant Treated Particleboard Panels: Minimum 3/4" thick backup for rigidized S/S panels and plastic laminate veneered panels, edged and faced as shown, provided with suitable anti-warp backing; meet ASTM E84 Class "1" rating with flame-spread rating of 25 or less, registered with local authorities for elevator finish materials.

G. Paint:
1. Unexposed Steel and/or Iron: Clean metal of oil, grease, scale and other foreign matter and paint one shop coat of manufacturer’s standard rust-resistant primer. Galvanized metal need not be painted.
2. Exposed Steel: Clean exposed metal of oil, grease, scale and other foreign matter. Eliminate any dents, scratches, or other defects that would affect the final finish. For material delivered with primer coat only, apply manufacturer’s standard enamel primer. For material delivered with a finish coat apply two coats of manufacturer’s standard enamel of a color selected by the architect from the manufacturer’s standard color selection.
3. Field Painting: Apply one coat for following equipment as required for a complete inter-phase installation.
   a. All equipment and metal work installed as a part of this work that does not have special architectural finish that is exposed in the hoist way.
   b. Machine, motor generator, controller and selector.
   c. Primed Entrances (Doors and Frames): Provide detailed information relative to recommended methods of preparation, cleaning and application of primer to be compatible with specified finish steel coating / painting per Sections 09 97 13 and 09 90 00.
   d. Prime Finish: Clean all surfaces receiving a baked enamel finish of oil, grease, scale, etc. Apply one coat of rust-resistant mineral paint.

H. Baked Enamel: Prime as noted above. Apply and bake 3 additional coats of enamel in the selected solid color.

2.04 PERFORMANCE

A. The power control system shall provide smooth, accurate speed regulation and efficient operation. The power control system shall interface with the microcomputer elevator logic providing closed loop position control.
1. The power control system shall be designed to vary the alternating current power supply to the AC hoist motor providing smooth acceleration and deceleration regardless of elevator load, and shall deliver power to the motor in a quiet mode, minimizing the need for external power filters for quiet operation.
2. Solid state load/torque balancing circuitry shall be incorporated to automatically monitor carload prior to start and adjust the hoist motor torque to assure smooth car start-up.
3. The power control shall be fully factory pre-set, minimizing the need for field adjustment. Computer inputs shall tailor the power control to the specific elevator design parameters. Provision shall be made for minor field adjustment. Such adjustments shall generally be non-interacting. Adjustment of one characteristic shall not necessarily affect the adjustment of another.

B. Performance
1. Car Speed: ± 3 % of contract speed under any loading condition or direction of travel.

2. Car Capacity: Safely lower, stop and hold up to 125% of rated load (code-required).

C. Ride Quality
1. Vertical Vibration (maximum): 12-17 milli-g
2. Horizontal Vibration (maximum): 10-15 milli-g
3. Vertical Jerk (maximum): 4.6 □ 1.0 ft./sec2
4. Acceleration/Deceleration (maximum): 2.6 □ .33 ft./sec3
5. In Car Noise: 50-55 dB(A)
6. Stopping Accuracy: □ 0.2 in.
7. Re-leveling Distance: □ 0.4 in.

D. Speed: 5% under any loading condition.

E. Capacity: Safely lower, stop and hold up to 125% of rated load.

F. Leveling: 3/8" under any loading condition.

G. Door Opening Time: 1.6 seconds from start of opening to fully open.

H. Floor-to-Floor Performance Time: 7.6 seconds from start of doors closing until doors are 3/4 open and car level and stopped at next successive floor under any loading condition or travel for typical 10'-0" floor-to-floor.

2.06 DUPLEX / SELECTIVE COLLECTIVE OPERATION

A. Using a digital / microprocessor-based solid-state controller with high efficiency processors and have closed loop velocity and positioning. Individual car controllers will incorporate processors in a distributed scheme to provide maximum flexibility and computing power. A pre-selected controller shall be assigned as the system control manager in addition to controlling its individual car. System redundancy in the group system shall be accomplished through identical capabilities housed in one or more of the other individual car controllers. Hall pushbutton risers shall be attached to both the main group controller as well as the back up controller. In the event that the main group controller can't perform its duties, the system shall automatically switch to the backup car controller. Communication between individual car controllers shall be accomplished through a serial link as well as concurrent communication through a secondary serial link.

B. The operation shall be automatic by means of the car and hall buttons. In the absence of system activity, one car can be made to park at the pre-selected main landing. The other (free) car shall remain at the last landing served. Only one car shall respond to a hall call. If a car is removed from service, the other cars shall immediately answer all hall calls, as well as its own car calls.

C. For each individual car controller, provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware. Variable field parameters and adjustments shall be contained in a non-volatile memory module. Serial ports shall be provided for connection to monitoring devices / diagnostic tools.

D. Each elevator machine shall be provided with a tachometer in order to provide accurate feedback to the controller as to car position.

E. All individual elevator control adjustment parameters shall be stored in non-volatile memory within the computer control system.

F. At each landing, a vane shall be installed to provide the code required floor zone detection. The vane shall also serve as a method for referencing absolute building points for the controller.

G. Elevators shall operate without attendants from buttons in each car and at each floor. With two (2) cars in service and no calls registered, one (1) car shall normally park at the entry floor ("home" car). The other car shall park where last used ("free" car). Registration of a hall call above the entry floor, or a car call in the free car, shall cause that car to start and begin operation. When a car has been started, it shall respond to calls registered for the direction of its travel in the order in which the floors are reached.
   1. Once the direction of travel has been established, the car will not reverse direction until all car calls have been answered or until all hall calls, ahead of the car and corresponding to the direction of car travel, have been answered.
   2. Cars shall slow down and stop automatically at floors corresponding to registered calls, in the order in which they are approached in each direction of travel. As slow down is initiated for a hall call, that call shall be automatically canceled and the hall button for that direction of travel remain ineffective until the elevator leaves the floor. Car calls shall be similarly canceled. The car shall remain at the arrival floor for an adjustable time interval to allow passenger transfer.
   3. The car shall only answer calls corresponding to the direction in which the car is traveling except that it may answer a call in the opposite direction if that call is the highest call registered.
   4. When the free car is clearing calls, the home car shall respond to:
      a. A call registered on the home car buttons.
      b. An up hall call registered below free car while the free car is traveling up.
      c. An up or a down call registered above the free car while the free car is traveling down.
      d. A hall call registered and the free car is delayed in its normal operation for a predetermined period.

H. When both cars are clearing calls, only one car shall stop in response to any registered hall call. The first car to clear its calls shall return to the main floor and become the home car. Should the last service required bring both cars to the main floor, the car that arrived first shall become the free car.

I. Registration of a call shall cause the appropriate button to illuminate. When the call is answered, the light shall go out.The car shall start down to answer calls below the car and shall not stop where only up calls are registered. When traveling up, the car shall reverse at the highest call and proceed to answer calls below it. When traveling down, the car shall reverse at the lowest call and answer calls above it.

2.08 AUTOMATIC STANDBY POWER OPERATION WITH MANUAL OVERRIDE

A. This operation shall return each car automatically to a designated landing when there is an interruption in normal power. One or more cars are returned at a time. Preference is given to loaded cars over empty cars in order to reduce passenger wait times. A car must respond by beginning to move toward the designated landing (emergency power recall floor) within a pre-determined time and park with its doors either open or closed until all cars have returned to that floor. If a car does not respond, it is automatically placed in a "Not Available" mode while other cars are moved. If a car was not returned to the designated landing on the first try, a second attempt is made. If the second attempt is not successful, the car will remain in a "Not Available" mode and can only be moved by manual means. Once each car has returned to the designated landing, the doors will remain open for a predetermined amount of time.

B. Independent Service: Provide controls for operation of each elevator from car buttons only. Under this operation door closing time shall be by constant pressure on desired destination floor button.

C. Motor Control: The motor control system on all elevators shall be DC variable voltage type; suitable for the operation specified and capable of providing smooth, comfortable

acceleration, retardation and dynamic braking, limiting the difference in speed between full load and no load to not more than 5% of the contract speed.

D. Successive Starting: In the event of power interruption rotating power units shall not start up simultaneously when power is restored.

E. Emergency Operation / Features:

Cab Interior

Emergency Lighting and Emergency Alarm Unit: Car mounted battery unit including solid-state charger and testing means enclosed in common metal container. Back-up battery power to be by a sealed, rechargeable, lead, acid or nickel cadmium type with a ten (10) year minimum life expectancy. The emergency lighting unit shall illuminate two of the normal standard car lights. Acrylic lens emergency fixture mounted to the top of the control panel is not acceptable.

Power Transfer

1. In the event of cessation of normal building power, the elevators shall brake to an emergency stop. After a predetermined time interval, the elevator shall start and return non-stop to the emergency power recall floor where it will stop and automatically open its doors. If there is more than one elevator in the bank, each elevator, one at a time, shall also return to the emergency power recall floor and park with its doors either open or closed until all cars have returned to that floor.
2. Emergency Operation: Equip the elevators with control system to operate and recall the cars in fire or other emergency condition. Provide terminals on controller for connection of signal from sensors provided in other sections of the work. Operation shall be similar on all elevators and visual/audible signal shall operate until return is complete or automatic operation restored.
3. Fireman Key Switch:
   a. Provide a Firemen's key operated switch at Ground Level. Key shall be removable in the "On" or "Off" positions. When the switch is in the "On" positions, the elevator controlled by this switch and which is on automatic service shall return non-stop to the ground level landing and the doors shall open and remain open. Provide a third position to override a heat or smoke sensing device, if such a device is provided or required.
   b. The key switch at the ground level shall have two (2) positions "On" and "Off".
4. Elevator Recall Interface Module:
   a. Activation of the smoke/heat detector in an elevator controller closet, or in an elevator lobby on all but the designated primary floor (Ground Level) for that elevator, shall cause closure of a set of relay contacts within the Fire Alarm Control Panel (FACP) for the express purpose of effecting recall of that elevator (and only that elevator) to the primary floor. Activation of an elevator lobby smoke / heat detector on the designated primary floor for that elevator shall cause closure of a set of relay contacts within the FACP for the express purpose of effecting recall of that elevator (and only that elevator) to the designated alternate floor.
   b. Actuation of an elevator controller closet heat detector at 180 deg. F shall shut down the main line power to the elevators via the shunt trip coil on the circuit breaker.
   c. Coordinate with Electrical Section - Fire Alarm Control Panel, for the specific requirements of the recall operation. .

Restoration of Power

1. The elevator shall automatically resume normal operation upon restoration of normal power.
2. Coordinate with ASME Section 102, Rule 102.2, C, 3, 4, 5, for fire protection and power supply inter-phase.

2.09 EQUIPMENT

A. Power and Operational Controls:
1. Power Control: The elevator power control system shall be a digital, solid-state based control system. The power control system shall provide smooth, accurate speed regulation and efficient operation. The power control system shall interface with the microcomputer elevator logic providing closed loop position control.
2. The power control system shall be designed to vary the alternating current power supply to the AC hoist motor providing smooth acceleration and deceleration regardless of elevator load, and deliver power to the motor in a quiet mode, minimizing the need for external power filters for quiet operation.
3. Solid-state load/torque balancing circuitry shall be incorporated to automatically monitor carload prior to start and adjust the hoist motor torque to assure smooth car start-up.
4. The power control shall be fully factory pre-set, minimizing the need for field adjustment. Computer inputs shall tailor the power control to the specific elevator design parameters. Provision shall be made for minor field adjustment. Such adjustments shall generally be non-interacting. That is, adjustment of one characteristic shall not necessarily affect the adjustment of another.

B. Mechanical Equipment - The elevator shall incorporate all necessary standard components required for such application all in accordance with applicable code(s).
1. Mounting of the hoisting machine shall incorporate isolation to minimize the transmission of noise and/or vibration to the building structure.
2. The hoisting machine shall include an AC gearless drive motor, with a synchronous permanent-magnet motor, mounted to the back of the car guide rail at the top landing., dual solenoid service and emergency disc brakes, mounted at the top of the hoist way.
   a. The Hoisting Machine shall be equipped with an electric drive motor especially designed for elevator service, developing high starting torque with low starting current.
   b. Motor horsepower shall be in accordance with the duty specified.
3. The machine brake shall be electrically released and spring applied. The drive sheave shall be accurately turned and grooved for the quantity and size of (hoist ropes/belts/cables), as applicable to this service.
4. Traction steel hoist ropes as applicable, of size and number appropriate to insure proper wearing qualities, shall be provided. As a minimum, the number and size of ropes shall comply with the factor of safety requirements of the ASME/ANSI A17.1 Safety Code for Elevators.
5. The Elevator System shall include a car frame, car safety, over speed governor and pit buffers for both car and counterweight; all integrated into this system in accordance with application criteria.
6. Counterweight: Each elevator shall be suitably counterbalanced with adequate weights contained in a structural steel frame. This counterweight shall be equal to the weight of the complete elevator car plus a percentage of the capacity load.
7. Counterweight Guard: A counterweight guard of the appropriate design and size shall be provided in place at the bottom of the hoist way.
8. Otis Elevator Company Gen2 Hoisting Machine:
   a. The hoisting machine shall be located within the hoist way and mounted on the car guide rail furnished by the elevator contractor.
   b. Mounting of the Hoisting Machine shall incorporate isolation to minimize the transmission of noise and/or vibration to the building structure.
9. Machine: AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoist way.
10. Governor: The over speed governor shall be a tension type governor.
11. Pit Buffers for both, Car and Counterweight:
    150 fpm - Compression spring type buffers shall be used.

12. Hoist way Operating Devices:
    a. Emergency stop switch in the pit
    b. Terminal stopping switches.
13. Positioning System: Consists of an encoder, reader box, and door zone vanes.
14. Counterweight Safeties: Counterweight safeties shall be applied to the counterweight frame and shall be flexible guide clamp type.
15. Up-Fall Protection: Provide a system that monitors for unintended upward movement of the elevator system. In the event unintended upward movement occurs the system shall engage a braking system to stop a car with up to 125% of rated capacity. The main car brake, rope/belt brakes and sheave wedges are not acceptable alternatives.
16. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails and one of the car guide rails to building fastening. Provide either of the following:
    a. Guide Shoes: Guide shoes shall be provided and mounted to the top and bottom of both the car and counterweight frame. Each guide shoe assembly shall be arranged to maintain constant contact on the rail surfaces.
    b. Guide Rails: Elevator car and counterweight guide rails shall be provided, erected plumb, and securely fastened to the hoist way framing. Design and provision of hoist way framing shall be of adequate strength and properly positioned to withstand loads applied in conjunction with data provided by the elevator contractor.
    c. Roller Guides: Roller guides shall be provided and mounted to the top and bottom of both the car and counterweight frame. Each roller guides assembly shall be arranged to maintain constant contact on the rail surfaces.
18. Coated Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords.
19. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.
    Fascia: Galvanized sheet steel shall be provided at the front of the hoist way.
20. Seismic Protection - Provide per CCR, Title 8 with the following clarifications:
    Counterweight Retainer Plate: Bolt plates to the counterweight frame. Welded plates are not acceptable.

2.10 SIGNAL FIXTURES - CAB

A. A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation.
    1. The car operating panel shall have a #4 brushed satin stainless steel finish.
    2. Hinged or surface applied car operating panel mounted to the cold rolled steel hinged panel laminated with a textured stainless steel 20 gage veneer shall be furnished.
    3. The panel shall contain a bank of round mechanical illuminated buttons.
    4. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan.
    5. The emergency call button shall be connected to a bell that serves as an emergency signal.
    6. All buttons to have raised numerals and Braille markings.
    7. Provide colored LED halo illumination (coordinated with the Architect to correspond to the floor graphic colors) with minimum flat flush or 1/8" projecting targets.
    8. Target finish shall be satin stainless steel finish
    9. All applied cover plates shall have beveled edges.

B. The car operating panel shall be equipped with the following standard features:
   1. Raised markings and Braille shall be provided to the left hand side of each push-button.
   2. A digital car position indicator consisting of a dot matrix display shall be provided in the car at the top of and applied surface or integral to the swing hinged panel. The position of the car shall be indicated by single or dual numeral and/or letter floor designations. The position indicator shall be located near the top of the car operating station.
   3. Illuminating pushbuttons shall be provided on the control panel which when pressed, shall signal the waiting passenger that the call has been registered. The button shall remain illuminated until the call has been answered.
   4. Car Direction Signs: Car direction sign(s) shall be supplied which shall include directional indications and an audible signal. The appropriate arrow shall illuminate to correspond with the direction in which the car is set to travel. The audible signal shall alert passengers in the car and at the landing, sounding once for UP and twice for DOWN. The car position indicator shall be provided with an audible signal that shall sound when the car passes each floor or stops at a floor.
   3. Car Position Indicator at the top of and integral to the car operating panel.

C. Door open and door close buttons.
   1. Light key-switch.
   2. Fan key-switch.
   3. Inspection key-switch.
   4. Elevator Data Plate marked with elevator capacity and car number.
   5. Illuminated alarm button with raised markings. Emergency pulsating siren shall be mounted on top of the car that is activated when the Alarm button in the car-operating panel is engaged. Siren shall have a rated sound pressure level of 80 dB (A) at a distance of 10'-0" from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.

D. In car stop switch (toggle or key unless local code prohibits use)

E. Firefighter's hat with firefighter's key-switch. Fireman’s Service, keyed to be Adams WD01 key or as directed by campus engineering.

F. Call cancel button

G. Combination Service Cabinet/Telephone Cabinet:
   1. Provide an integral to the main car operating station below the car-operating panel, with a flush door, concealed hinge and door lock shall be provided.
   2. Within this cabinet, specialized controls shall be installed for restricted elevator functions.
   3. Necessary wires for the telephone shall be included in the compartment and connected to the car traveling cable.
   4. The telephone instrument shall be furnished by others.

H. Communication System:
   1. An ADA-approved hands-free, self-dialing, vandal resistant two-way communication system with recall tracking and voiceless communication emergency notification/phone shall be furnished and installed in this cabinet.
   2. 999 minutes auto disconnect. Called party must disconnect.
   3. A separate phone line to the elevator controller shall be provided and located in the elevator machine room under another section of the specifications.

I. Firefighter's Phase I and II emergency in-car operating instructions, worded according to A17.1 2004.

J. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either

stopping at or passing a floor served by the elevator.

2.11 SIGNAL FIXTURES - LOBBY

A. Lobby Car Position Indicator: A 16-segment, digital, car position indicator shall be integral to the car operating panel.

B Car Position Indicator: A digital LED car position indicator shall be integral to the car operating panel and shall be 2 inches minimum.

C. All applied cover plates shall have beveled edges.

D. Hall Fixtures:
1. Call Buttons: Vandal resistant hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a round mechanical button marked to correspond to the desired direction of travel landings, in a raised fixture housings. Buttons shall be flat flush or 1/8" projecting in vertically mounted fixture. One hall pushbutton station shall be provided at each landing served by the elevator system proposed. Buttons which when pressed shall signal the car passenger that the call has been registered. The button shall remain illuminated until the call has been answered. Hall stations at each landing shall have a permanently install fire signs as required by CBC Chapter 30. Signs shall be etched or engraved into hall station and read in ½" height lettering: "In Case Of Fire Use Stairway For Exit. Do Not Use Elevator". Furnish faceplate pictograph according to ASME A17.1, Appendix H.
2. Combination Hall lanterns and position indicators shall be illuminated by means of LED. Fixture shall be satin stainless steel finish and centered above the entrance at Ground Level Lobby. Hall lanterns including audible signals shall be provided. As soon as the car has reached a predetermined distance from a landing and is set to stop at that landing the hall lantern corresponding to the direction the car shall travel shall be illuminated and the audible signal shall sound once for up and twice for down. The lantern shall remain illuminated until the doors have closed. Single lanterns shall be furnished at terminal landings and Up / Down lanterns shall be furnished at intermediate landings.
3. Vandal Resistant Hall Fixtures shall feature round mechanical buttons in flush mount face frame with vandal resistant buttons. Buttons shall be flat flush or 1/8" projecting in vertically mounted fixture. Hall lanterns and position indicators shall be illuminated by means of LED. Fixture shall be satin stainless steel finish.
4. Options:
   a. Key-switch operation in lieu of hall buttons. (all levels)
   b. Access key-switch at top floor in entrance jamb.
   c. Access key-switch at lowest floor in entrance jamb.
   d. Coaxial cable (RG6) in traveling cable.
   e. Emergency (Standby) power key-switch: Manual selection of each elevator in normal operation after automatic return in standby power operation has been initiated.

2.12 CAR ENCLOSURES

A. Cab Shell: Sides and rear wall, 14 gauge cold rolled furniture quality steel, stretcher leveled, substantially reinforced for rigidity, lightproof joints, baked enamel finish, cutouts reinforced, flush panel construction sound deadened with all panels fastened to the platform in an approved manner.
1. Provide framing and opening for glass vision panel and 18 gauge exterior skin and trim at rear of cab with baked enamel finish, color selected by Architect.

B. Platform: The car platform shall be constructed of 2 layers of plywood and 2 layers of .032" thick aluminum laminate for a total thickness of 1-1/2". Load weighing device shall be mounted under the platform.

C. Cab Shrouds: Reinforced 14 gage furniture steel with baked enamel finish in color selected by Architect. Shrouds to be low profile angled back to car sling on top and bottom of cab. Provide 5'-0" wide hinged access panel in back of car for access to cab emergency exit and to provide a safe place for hoist way and car glass maintenance to be performed. Provide retractable guardrails at counterweight side and rear car top.

D. Canopy, 12 gauge (.090") cold rolled furniture quality steel, stretcher leveled, suitable reinforced to withstand the distributed weight of two men and fastened to the side walls in a suitable manner for rigidity, hinged top exit included per code.

E. Door Operator:
1. A closed loop permanent magnet high performance door operator shall be provided to open and close the car and hoist way doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoist way entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
2. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by the local code.
3. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
4. The car door shall be provided with a protective device extending the full height. This device shall be designed to sense an obstruction in its path while the doors are closing and automatically cause the car and hoist way door to return to the open position. The doors shall remain open until the expiration of a time interval; the doors will then close automatically.
5. Door hangers and tracks shall be provided for each car and hoist way door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

F. Counterweight Safeties: Counterweight safeties shall be applied to the counterweight frame, and shall be either a type “D” or “E”, flexible guide clamp type.

2.13 CAB INTERIOR

A. Side Walls: Provide removable or applied flush panel construction with all panels fastened to the platform in an approved manner. Panels to be fabricated of 3/4" compressed wood core, panel face and wrapped edges shall be laminated with 20 gage 5WL rigidized #4 satin finish stainless steel finish. Provide 3/4" recess between panels, painted black.

B. Rear Walls: Provide a glazed wall of 9/16" laminated glass panel 3’-6" from finish floor to ceiling, 4'-0" wide. Glazing shall be per code. Sides of rear wall shall match the sidewalls and as indicated above.

C. Front Returns: Posts and Transom: Provide manufacturers standard 14 gage cold rolled steel laminated with 20 gage 5WL rigidized #4 satin finish (brushed) stainless steel, with

an integral construction vertical hinged swing return control panel.

D. Doors: Center opening doors to be constructed of 16 gage cold rolled steel laminated with 20 gage 5WL rigidized satin finish stainless steel, flush design sides.

E. Handrail: Provided on the rear wall only of the car enclosure. Handrails shall be round 1-9/16" diameter extruded aluminum handrail with a #4 brushed stainless steel finish, mounted at 3'-6" & 2'-10" above finished floor. Verify with governing code for handrail requirements. Handrail ends are capped with hemisphere shaped end-caps having the same finish and material as the handrail.

F. Ceiling: Suspended 18 gage stainless steel panelized (6 panels) ceiling with a #7 mirrored finish with indirect lighting and concealed access (Exit / Service) panel. LED light fixtures shall be provided continuously end-to-end around the perimeter within the recessed cove. Fixtures shall be provided in sufficient number to meet minimum code requirements. The clear height under the suspended ceiling shall be 7’-9” minimum.

G. Sill: Extruded aluminum.

H. Flooring: Provide 12" x 12" x 3/16" thick vinyl/marble chip terrazzo tile, Marble Mosaic Classic Series 600 by Fritz Chemical Co. or equal with contrasting color border at cab perimeter. Color of field tile #CL697, Dapple Gray and a 4" x 12" accent border tile #CL621, Raven Black at cab perimeter. Provide the blac/k tile as 4" base material. Refer to Section 09 65 19. Do not block cab base ventilation slots if present.

I. Ventilation: Variable speed exhaust blower mounted above top ceiling with grille and flow through concealed vents at panel base. Car exhaust fan is to be sized to provide two air changes per hour.

J. Emergency Lighting: Provide emergency power to two of the standard perimeter LED recessed cove fixtures. Control panel mounted acrylic fixtures are not permitted.

K. Telephone Cabinet: Provide hands-free ADA compliant self-dialing vandal resistant two-way communication system with recall, tracking and voiceless communication emergency notification/phone unit mounted in front return panel complete.

2.14 HOLLOW METAL ELEVATOR ENTRANCES

A. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoist way and shall be of 14-gauge sheet steel.

B. Sills: Extruded aluminum.

C. Doors: Entrance doors shall be of 16 gage cold rolled steel hollow metal construction with vertical internal channel reinforcements. Finish is to be a baked on prime coat with powder coated finish on hallway side of doors. Provide interior core for sound deadening.

D. Door Hangers and Tracks: For each hoist way sliding doors, furnish and install sheave type two point suspension hangers and tracks complete. Sheaves shall have polyurethane tires with ball bearings properly sealed to retain grease. Hangers shall be provided with an adjustable slide to take up-thrust of the doors. Tracks are to be drawn steel shapes, smooth surface shaped to conform to the hanger sheaves.

E. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.

F. Entrance Finish: Floors 1-3 powder coated finish, color as selected by architect.

G. Entrance Jamb Marking Plates / Accessible Accommodations: Provide 4" x 4" plates

having raised numeral floor markings with California Contracted Grade 2 Braille located underneath the floor marking. Marking plates mechanically attached on both sides of the entrance jamb (no stick-on plates) with California Contracted Grade 2 Braille and raised Arabic numerals in hall and cab.

H. Sight Guards: Black sight guards will be furnished with any metal finish door. Powder-coated matching sight guards will be furnished with powder-coated doors.

I. Corridor Transom: Manufacturers standard 18 gage cold rolled steel, laminated with 20 gage Rigidized stainless steel Rigidtex 5WL with #4 satin finish stainless steel running full width of cab with cutouts for position indicator.

3.00 EXECUTION

3.01 PREPARATION

Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 DEMONSTRATION

The elevator contractor shall make a final check of each elevator operation with the Owner or Owner’s representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices

3.04 SITE CONDITION INSPECTION

A. Prior to beginning the installation of equipment, examine the hoist way and machine room areas and verify that no irregularities exist that would affect quality of execution of work as specified. Particularly, note:
   1. Hoist way size and plumb, well way lengths.
   2. Sill supports and pockets, if any.
   3. Support areas for brackets, beams, etc.
   4. Divider beams.

B. Do not proceed with installation until work in place conforms to project requirements.

3.05 INSTALLATION

A. Install each equipment item in accordance with accepted manufacturer's direction, referenced codes and specifications.
   - Install elevator and equipment in accordance with accepted manufacturer's shop drawings, applicable codes and industry standards. Additionally requirements specified herein and/or required by the Owner or the Owners consultant shall be incorporated as general performance conditions that the installation shall comply for a complete and operable system.

B. Install machine room equipment with clearances complying with referenced codes and specifications.

C. Install items able to be removed by portable hoists or other means for maintenance and/or repair.

D. Install items so that access for maintenance is safe and readily available.

E. Guide Rails: Elevator car and counterweight guide rails shall be provided, erected plumb, and securely fastened to the hoist way framing. Design and provision of hoist way framing shall be of adequate strength and properly positioned to withstand loads applied in conjunction with data provided by the elevator contractor.

F. Install equipment to afford maximum safety and continuity of operation in the event of seismic activity.

3.06 FIELD QUALITY CONTROL

A. Work at the job site will be checked during the course of installation. Full cooperation with inspectors is mandatory. Accomplish corrective work prior to performing further installation.

B. Have code authority acceptance inspection performed. Verify that such tests have been completed, all corrective work accomplished and installation approved for issuance of a permit to operate shall be required before acceptance of any unit.

3.07 ADJUSTMENTS

A. Align guide rails vertically within a tolerance of 1/16" in 100'. Secure joints without gaps and file any irregularities to a smooth surface.

B. Balance cars to equalize pressure of roller guide shoes on rails.

C. Lubricate all equipment in accordance with manufacturer's instructions.

D. Adjust motors, pumps, valves, generators, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.

E. Fabricate and assemble the various parts in the shop insofar as practical to minimize field assembly. Parts that cannot be shop assembled which require close field fit shall be trial assembled in the shop and marked for field erection.

3.08 CLEAN UP

A. Keep work areas orderly and free from debris during progress of project.

B. Remove all loose materials and filings resulting from this work.

C. Clean machine room equipment and floor of dirt, oil and grease.

D. Clean hoist way, car, car enclosures, entrances, operating and signal fixtures, handrails and trim of dirt, oil, grease and finger marks.

3.09 ACCEPTANCE INSPECTION AND TESTS

A. General: Final acceptance of the installation shall be made only after all field quality control inspections and tests are complete, all submittals and certificates have been received and the Owner's representative is satisfied that the following have been satisfactorily completed:
   1. Workmanship and equipment comply with specification.
   2. Contract speed, capacity and floor-to-floor performance shall comply with specification.
      a. Starting, accelerating, running.

b. Decelerating, leveling, stopping accuracy.
c. Door operation and closing pressure.
d. Equipment noise levels.
e. Signal fixture utility.
f. Overall ride quality.

3. Test Results:
   a. In all test conditions the speed and performance times specified shall be met. Leveling accuracy shall be maintained without re-leveling and general riding quality being compromised.
   b. Temperature rise in windings shall not exceed 50 degrees Celsius above ambient. Conduct a full-capacity one-hour running test stopping at each floor for 10 seconds in up and down directions.

B. Performance Guarantee: Should these tests develop any defects or poor workmanship, any variance or noncompliance with the requirements of the specified codes and/or ordinances or any variance or non-compliance with the requirements of these specifications, the following work and/or repairs shall be completed at no additional expense to the Owner.
   1. Replace all equipment that does not meet Code or specification requirements.
   2. Perform all work and furnish all materials and equipment necessary to complete the specified operation and/or performance.
   3. Perform and assume cost for all retesting required by the governing Code Authority and Owner to verify the specified operation and/or performance.

3.10 WARRANTY INSPECTIONS

A. At least 30 days prior to warranty expiration, schedule final inspection and retest with Owner's representative. Requirement shall include close examination of all equipment.

B. Replace, repair or adjust any equipment found defective and covered by warranty prior to expiration of warranty period.

END OF SECTION

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

2.2 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

END OF SECTION 210517

SECTION 210523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Check valves.
2. Bronze OS&Y gate valves.
3. Trim and drain valves.

1.3 DEFINITIONS

A. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

B. NRS: Nonrising stem.

C. OS&Y: Outside screw and yoke.

D. SBR: Styrene-butadiene rubber.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:

1. Main Level: HAMV - Fire Main Equipment.

    a. Level 1: HCBZ - Indicator Posts, Gate Valve.
    b. Level 1: HLOT - Valves.

        1) Level 3: HLUG - Ball Valves, System Control.
        2) Level 3: HLXS - Butterfly Valves.
        3) Level 3: HMER - Check Valves.
        4) Level 3: HMRZ - Gate Valves.

2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.

    a. Level 1: VQGU - Valves, Trim and Drain.

B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:

1. Automated Sprinkler Systems:

    a. Indicator posts.
    b. Valves.

        1) Gate valves.
        2) Check valves.

            a) Single check valves.

        3) Miscellaneous valves.

C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.

D. NFPA Compliance: Comply with NFPA 24 for valves.

E. Valve Pressure Ratings: Not less than the minimum pressure rating indicated or higher as required by system pressures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Handlever: For quarter-turn trim and drain valves NPS 2 and smaller.

2.2 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Anvil International, Inc.
2. Mueller Co.; Water Products Division.
3. NIBCO INC.
4. Viking Corporation.

B. Description:

1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
2. Minimum Pressure Rating: 175 psig.
3. Type: Single swing check.
4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: Bronze, ductile iron, or stainless steel[with elastomeric seal].
6. Clapper Seat: Brass, bronze, or stainless steel.
7. Hinge Shaft: Bronze or stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.3 BRONZE OS&Y GATE VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Milwaukee Valve Company.
2. NIBCO INC.
3. United Brass Works, Inc.

B. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 175 psig.
3. Body and Bonnet Material: Bronze or brass.
4. Wedge: One-piece bronze or brass.
5. Wedge Seat: Bronze.
6. Stem: Bronze or brass.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Threaded.

2.4 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Fire Protection Products, Inc.
b. NIBCO INC.
c. Tyco Fire & Building Products LP.
d. Victaulic Company.

2. Description:

a. Pressure Rating: 175 psig.
b. Body Design: Two piece.
c. Body Material: Forged brass or bronze.
d. Port size: Full or standard.
e. Seats: PTFE.
f. Stem: Bronze or stainless steel.
g. Ball: Chrome-plated brass.
h. Actuator: Handlever.
i. End Connections for Valves NPS 1 through NPS 2-1/2: Threaded ends.
j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2: Grooved ends.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Fire Protection Products, Inc.
b. NIBCO INC.
c. United Brass Works, Inc.

2. Description:

a. Pressure Rating: 175 psig.
b. Body Material: Brass or bronze.
c. Ends: Threaded.
d. Stem: Bronze.
e. Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

A. Comply with requirements in the following Sections for specific valve installation requirements and applications:

1. Section 211200 "Fire-Suppression Standpipes" for application of valves in fire-suppression standpipes.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.

E. Install valves in horizontal piping with stem at or above the pipe center.

F. Install valves in position to allow full stem movement.

G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.

H. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.

I. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

END OF SECTION 210523

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SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seismic-restraint accessories.
2. Mechanical anchor bolts.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, due to seismic forces required to select vibration isolators, and due to seismic restraints.
3. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.
4. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
    d. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for fire-suppression piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the ACSE/SEI: C.
2. Assigned Seismic Use Group or Building Category as Defined in the ACSE/SEI: I.

    a. Component Importance Factor: 1.5.

3. Seismic Design category as defined in teh ACSE/SEI 7-05: D.
4.
5. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

2.2 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper B-Line, Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. TOLCO.

B. Hanger-Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections Reinforcing steel angle clamped to hanger rod.

C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.3 MECHANICAL ANCHOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

1. Cooper B-Line, Inc.
2. Hilti, Inc.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.

C. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 211200 "Fire-Suppression Standpipes," for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

END OF SECTION 210548

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Warning signs and labels.
2. Pipe labels.
3. Valve tags.
4. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark.
6. emedco.
7. LEM Products Inc.
8. Marking Services Inc.
9. National Marker Company.
10. Seton Identification Products.

11. Stranco, Inc.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Red.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

H. Fasteners: Stainless-steel .

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information, plus emergency notification instructions.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ActionCraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark.
7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services Inc.
11. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.

C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

E. Pipe-Label Colors:

1. Background Color: Safety Red.
2. Letter Color: White.

2.3 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. ActionCraft Products, Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark.
7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services Inc.
11. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping-system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032 inch thick, with predrilled holes for attachment hardware.
2. Fasteners: Brass wire-link chain.
3. Valve-Tag Color: Safety Red.
4. Letter Color: White.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.4 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.

5. Craftmark.
6. emedco.
7. Kolbi Pipe Marker Co.
8. LEM Products Inc.
9. Marking Services Inc.
10. Seton Identification Products.

B. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 PIPE LABEL INSTALLATION

A. Piping: Painting of piping is specified in Section 099600 "High-Performance Coatings."

B. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit a view of concealed piping.
5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:

1. Valve-Tag Size and Shape:

a. Fire-Suppression Standpipe: 2 inches, round.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

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SECTION 211200 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection specialty valves.
3. Hose connections.
4. Alarm devices.
5. Pressure gages.

1.3 DEFINITIONS

A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For fire-suppression standpipes.

1. Include plans, elevations, sections, and attachment details.
2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and professional engineer.

B. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Fire-hydrant flow test report.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

F. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire-suppression standpipe service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of fire-suppression standpipe service.
2. Do not proceed with interruption of fire-suppression standpipe service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

2.2 PERFORMANCE REQUIREMENTS

A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Fire-hydrant flow test records shall be provided by owner. Contractor to conduct basis of design hydrant testing and submit with shop drawing approvals.

C. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is as follows:

a. NPS 1-1/2 Hose Connections: 65 psig.
b. NPS 2-1/2 Hose Connections: 100 psig.

D. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

2.3 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

A. Schedule 40: ASTM A 53/A 53M, Type E, Grade B; with factory- or field-formed ends to accommodate joining method.

B. Schedule 40: ASTM A 135/A 135M, Grade A; with factory- or field-formed ends to accommodate joining method.

C. Schedule 40: ASTM A 795/A 795M, Type E, Grade A; with factory- or field-formed ends to accommodate joining method.

D. Malleable- or Ductile-Iron Unions: UL 860.

E. Cast-Iron Flanges: ASME B16.1, Class 125.

F. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

G. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

H. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Anvil International, Inc.
    b. Corcoran Piping System Co.
    c. National Fittings, Inc.
    d. Shurjoint Piping Products.
    e. Tyco Fire & Building Products LP.
    f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

D. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or FM Global's "Approval Guide."
2. Pressure Rating:

    a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
    b. High-Pressure Piping Specialty Valves: 250 psig minimum.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Globe Fire Sprinkler Corporation.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Venus Fire Protection Ltd.
    e. Victaulic Company.
    f. Viking Corporation.

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages,[retarding chamber,] and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

2.6 HOSE CONNECTIONS

A. Nonadjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Brooks Equipment Co., Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. Fire-End & Croker Corporation.
    d. Fire Protection Products, Inc.
    e. GMR International Equipment Corporation.
    f. Guardian Fire Equipment, Inc.
    g. Kennedy Valve; a division of McWane, Inc.
    h. Mueller Co.; Water Products Division.
    i. NIBCO INC.
    j. Potter Roemer.
    k. Tyco Fire & Building Products LP.
    l. Viking Corporation.
    m. Wilson & Cousins Inc.

2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
8. Pattern: Angle or gate.
9. Finish: Rough brass or bronze.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Globe Fire Sprinkler Corporation.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.

2. Standard: UL 753.
3. Type: Mechanically operated, with pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10-inch diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4.
8. Outlet: NPS 1 drain connection.

C. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Notifier; a Honeywell company.
   c. Potter Electric Signal Company.

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 8-inch minimum diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

E. Indicator-Post Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Potter Electric Signal Company.
   b. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.8 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: Zero to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.

J. Drain dry-type standpipe system piping.

K. Pressurize and check dry-type standpipe system piping and .

L. Fill wet-type standpipe system piping with water.

M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Install bypass check valve and retarding chamber drain-line connection.

3. Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.6 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.

D. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device.

3.7 HOSE-STATION INSTALLATION

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.11 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Standard-pressure, wet-type fire-suppression standpipe piping, shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Schedule 40, black-steel pipe with grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Schedule 40, black-steel pipe with plain ends; steel welding fittings; and welded joints.
4. Schedule 40, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 211200

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220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping materials and installation instructions common to most piping systems.

B. Equipment drains and overflow piping.

C. Transition fittings.

D. Dielectric fittings.

E. Escutcheons.

F. Grout.

G. Equipment installation requirements common to equipment sections.

H. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 EQUIPMENT DRAINS AND OVERFLOW

A. Piping material shall be suitable for type and temperature of drainage and location of equipment.

B. Cooling coil condensate drainage shall be type M drawn-temper copper tubing with soldered joints. Indoor pipes shall be insulated.

C. Route drains and overflows to nearest floor drain unless shown otherwise. Slope piping to drain at 1/8 inch per foot.

2.5 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:

a. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities, Inc.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Hart Industries, International, Inc.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
e. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

M. Verify final equipment locations for roughing-in.

N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32 and AB-1953.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.7 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 220500

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SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.035 (20 gauge)9-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Jay R. Smith. Mfg. 1720 Series or comparable product by one of the following:

1. Smith, Jay R. Mfg. Co.

2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

C. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Calpico, Inc.
2. Metraflex Company (The).
3. Pipeline Seal and Insulator, Inc.
4. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

C. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

D. Pressure Plates: Carbon steel.

E. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, (for above grade) and Stainless steel (for below grade level) of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6 : Galvanized-steel-sheet sleeves.
   b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6 Galvanized-steel-pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade and above Grade:

a. Piping Smaller Than NPS 6 : Sleeve-seal fittings.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Interior Partitions:

a. Piping Smaller Than NPS 6 : Galvanized-steel-sheet sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

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SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fastener systems.
4. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 fire-suppression piping Sections for pipe hangers for fire-suppression piping.
3. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
4. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 with California Building Code amendments.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.7 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel .

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural galvanized carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

K. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use 1/4-inch thick felt padded hangers and clamps for all piping to eliminate vibration.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
3. Provide clamps with rubber surface for elimination of vibration and sound to the building structure.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation. Install in addition to shield inserts.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, apply to all pipe sizes.

L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Restraining braces and cables.

1.3 DEFINITIONS

A. ASCE/SEI: American Society of Civil Engineers/Structural Engineering Institue.

B. CBC: California Building Code.

C. IBC: International Building Code.

D. ICC-ES: ICC-Evaluation Service.

E. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the ASCE/SEI 7-05: C .
2. Building Occupancy Category as Defined in the ASCE/SEI 7-05: I.
3. Component Importance Factor: 1.5.
4. Seismic Design Category as Defined in the ASCE/SEI 7-05: D.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ASCE/SEI, OSHPD or an agency acceptable to authorities having jurisdiction.
b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, seismic restraints, and for designing vibration isolation bases.
2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Preapproval and Evaluation Documentation: By an evaluation service member of ASCE/SEI, OSHPD or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.

B. Qualification Data: For professional engineer and testing agency.

C. Welding certificates.

D. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the CBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproved by ASCE/SEI, or preapproved by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. Cooper B-Line, Inc.; a division of Cooper Industries.
3. Hilti, Inc.
4. Isat. Inc.
5. Mason Industries.
6. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ASCE/SEI, OSHPD or an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Restraint Cables: ASTM A 603 galvanized -steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

D. Hanger Rod Stiffener: Steel slotted-support-system sleeve with internally bolted connections to hanger rod.

E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

F. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

G. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

H. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

I. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ASCE/SEI, OSHPD or an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Piping Restraints:

1. Comply with requirements in MSS SP-127.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install seismic-restraint devices using methods approved by an evaluation service member of ASCE/SEI, OSHPD, OR an agency acceptable to authorities having jurisdiction providing required submittals for component.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 22 Section "Domestic Water Piping" for piping flexible connections.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust active height of sprint isolators.

C. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 220548

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SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets .
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Black.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.
2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

2.4 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches or 4 by 7 inches based on application.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major piece of equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Yellow.
b. Letter Color: Black.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.6 PIPING IDENTIFICATION

A. Do not use pipe markers and tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

B. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.

C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

A. Clean faces of mechanical identification devices.

END OF SECTION 220553

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SECTION 221314 - FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" with CBC amendments.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Piping and fittings shall be from the same manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle manholes according to manufacturer's written rigging instructions.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Project Manager and Owner no fewer than seven days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Project Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: CISPI Standard 301 and ASTM A-888 and marked with the Cast Iron Soil Pipe Institutes collective trademarks.

B. Pipe, Couplings and Fittings shall bear the collective trademarks of CISPI and NSF International.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, stainless steel fasteners, and neoprene sleeve with integral, center pipe stop.

1. Manufacturers:

a. ANACO-HUSKY
b. Fernco, Inc.
c. Tyler Pipe; Soil Pipe Div.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 1784, Schedule 40.

B. PVC DWV Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

C. Solvent Cement and Adhesive Primer:

1. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564.
2. Use solvent cement that has a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 33 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard**,** shielded, stainless-steel couplings, and hubless-coupling joints.

C. Aboveground storm drainage piping NPS 8 and larger shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard**,** shielded, stainless-steel couplings, and hubless-coupling joints..

D. Underground storm drainage piping NPS 8 and smaller shall be the following:

1. Solid wall schedule 40 PVC and PVC DWV fittings.

3.3 PIPING INSTALLATION

A. Storm sewer and drainage piping outside the building are specified in Division 33 Section "Storm Drainage."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping."

D. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Division 22 Section "Plumbing Equipment Specialties."

E. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

G. Install wall-penetration fitting system at each service pipe penetration through foundation wall. Make installation watertight.

H. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Buried PVC pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668.

L. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: Minimum 2 percent downward in direction of flow for piping NPS 3and smaller; Minimum 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

M. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls" and "Seismic Restraints for Plumbing Systems."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42 clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:

    a. 100 Feetand Less: MSS Type 1, adjustable, steel clevis hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 15 Section "Hangers and Supports."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 : 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5 : 60 inches with 5/8-inch rod.
4. NPS 6 : 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221314

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" with CBC amendments.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

B. Piping and fittings shall be from the same manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Handle manholes according to manufacturer's written rigging instructions.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Construction Project Manager and Owner no fewer than seven days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Project Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: CISPI Standard 301 and ASTM A-888 and marked with the Cast Iron Soil Pipe Institutes collective trademarks.

B. Pipe, Couplings and Fittings shall bear the collective trademarks of CISPI and NSF International.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and neoprene sleeve with integral, center pipe stop.

1. Manufacturers:

a. ANACO-HUSKY
b. Fernco, Inc.
c. Tyler Pipe; Soil Pipe Div.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 1784, Schedule 40.

B. PVC DWV Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.

C. Solvent Cement and Adhesive Primer:

1. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564.
2. Use solvent cement that has a VOC content of 325 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 6 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings standard shielded, stainless-steel couplings; and hubless-coupling joints.

C. Aboveground, vent piping NPS 6 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

D. Underground, soil, waste, and vent piping NPS 6 and smaller shall be the following:

1. Solid wall schedule 40 PVC and PVC DWV fittings.

3.2 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 23 Section "Basic Mechanical Materials and Methods."

B. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 23 Section "Basic Mechanical Materials and Methods."

F. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.

G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

H. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 4 and smaller.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

M. Install underground ABS and PVC soil and waste drainage piping according to ASTM D 2321 and ASTM F 1668

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 and 23 Section "Basic Mechanical Materials and Methods."

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping."

B. Pipe hangers and supports are specified in Division 22 Section " Hangers and Supports for Plumbing Piping." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.

G. Install supports for vertical cast-iron soil piping every 15 feet.

3.5 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.6 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Through-penetration firestop assemblies.
4. Miscellaneous sanitary drainage piping specialties.
5. Flashing materials.

B. Related Requirements:

Section 221423 "Storm Drainage Piping Specialties" for storm drainage piping inside the building, drainage piping specialties, and drains.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Floor Drains.
2. Trench Drains.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. 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.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.7 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

1. ASME A112.36.2M, Cast-Iron Cleanouts:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Josam Company.
2) MIFAB, Inc.
3) Smith, Jay R. Mfg. Co.
4) Tyler Pipe.
5) Watts Drainage Products.
6) Zurn Plumbing Products Group.

2. Closure: Countersunk or raised-head, cast-iron plug.
3. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains : See Plumbing Schedules.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies :

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. ProSet Systems Inc.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps :

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

a. NPS 2: 4-inch- minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

B. Air-Gap Fittings :

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device :

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings :

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

E. Vent Caps :

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..
2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3.6 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof drains.
2. Cleanouts.
3. Through-penetration firestop assemblies.
4. Flashing materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains : See Plumbing Schedules.

2.2 CLEANOUTS

A. Test Tees :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.

c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe.
e. Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
4. Size: Same as connected drainage piping.
5. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
6. Closure Plug: Countersunk or raised head, .
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.3 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M,12 oz./sq. ft..

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.

2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install test tees in vertical conductors and near floor.

F. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

G. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.

H. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

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SECTION 230548 - VIBRATION/SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: Consult Structural.
2. Building Classification Category: Consult Structural.
3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

1.2 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

C. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

3.3 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Identification Systems.
f. emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services Inc.
j. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

3. Letter Color: White.
4. Background Color: Black.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Actioncraft Products, Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Identification Systems.
7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Services Inc.
11. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Refrigerant Piping: Black letters on a safety-orange background.

END OF SECTION 230553

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealant and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ductmate Industries, Inc.
    b. Lindab Inc.
    c. McGill AirFlow LLC.
    d. MKT Metal Manufacturing.
    e. SEMCO LLC.
    f. Sheet Metal Connectors, Inc.
    g. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 .

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches .

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg , positive and negative.
7. Service: Indoor or outdoor.
8. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 , "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Ductmate Industries, Inc.
3. Hilti, Inc.
4. Kinetics Noise Control, Inc.
5. Loos & Co., Inc.
6. Mason Industries, Inc.
7. TOLCO.
8. Unistrut; Part of Atkore International.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service the Office of Statewide Health Planning and Development for the State of California an agency acceptable to authorities having jurisdiction.

C. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections Reinforcing steel angle clamped to hanger rod.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch , plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches .

K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.

3. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg : Seal Class B.
4. Conditioned Space, Return-Air Ducts: Seal Class C.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 , "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with ASCE/SEI 7.

1. Space lateral supports a maximum of o.c., and longitudinal supports a maximum of o.c.
2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service the Office of Statewide Health Planning and Development for the State of California an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Supply Ducts with a Pressure Class of 3-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.

b. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections, selected by Architect from sections installed, totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give days' advance notice for testing.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

D. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.
6. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :

   a. Pressure Class: Positive 2-inch wg .
   b. Minimum SMACNA Seal Class: C.
   c. SMACNA Leakage Class for Rectangular: 24.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Equipment Not Listed Above:

   a. Pressure Class: Positive 2-inch wg .
   b. Minimum SMACNA Seal Class: B.
   c. SMACNA Leakage Class for Rectangular: 24.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

   a. Pressure Class: Positive or negative 1-inch wg .
   b. Minimum SMACNA Seal Class: B.
   c. SMACNA Leakage Class for Rectangular: 24.
   d. SMACNA Leakage Class for Round and Flat Oval: 12.

C. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: .

D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm:

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

        1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
        2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
        3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
        4) Radius-to Diameter Ratio: 1.5.

    b. Round Elbows, and Smaller in Diameter: Stamped or pleated.
    c. Round Elbows, and Larger in Diameter: Standing seam.

E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Turning vanes.
3. Flexible connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 .

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Aire Technologies.
    b. American Warming and Ventilating; a Mestek Architectural Group company.
    c. Flexmaster U.S.A., Inc.
    d. Flex-Tek Group.
    e. McGill AirFlow LLC.
    f. Nailor Industries Inc.
    g. Pottorff.
    h. Ruskin Company.
    i. Trox USA Inc.
    j. Vent Products Co., Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized -steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

E. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. CL WARD & Family Inc.
2. Ductmate Industries, Inc.
3. Duro Dyne Inc.
4. Elgen Manufacturing.
5. Hardcast, Inc.
6. JP Lamborn Co.
7. Ventfabrics, Inc.
8. Ward Industries; a brand of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Compliance with ASHRAE/IESNA 90.1-2004 includes Section 6.4.3.3.3 - "Shutoff Damper Controls," restricts the use of backdraft dampers, and requires control dampers for certain applications. Install dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches .
2. Two-Hand Access: 12 by 6 inches .
3. Head and Hand Access: 18 by 10 inches .
4. Head and Shoulders Access: 21 by 14 inches .
5. Body Access: 25 by 14 inches .
6. Body plus Ladder Access: 25 by 17 inches .

I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

L. Connect flexible ducts to metal ducts with draw bands.

M. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

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SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) for each air-handling unit.
2. Gaskets: One set(s) for each access door.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: Five year(s) from date of Substantial Completion.
c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
3. Mitsubishi Electric Sales Canada Inc.
4. Mitsubishi Heavy Industries America, Inc.
5. SANYO North America Corporation; SANYO Fisher Company.
6. Trane; a business of American Standard companies.

7. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Concealed Evaporator-Fan Components:

B. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Retain one of first two subparagraphs below if heating coil is required.
5. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
6. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

7. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
8. Filters: Permanent, cleanable.
9. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face.
        2) Depth: A minimum of 2 inches (50 mm) deep.

    b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on [one end] [both ends] of pan.

        1) Minimum Connection Size: NPS 1 (DN 25).

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.

C. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Factory standard with removable panels on front and ends and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.

3. Fan: Direct drive, centrifugal.
4. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Enclosure Type: Totally enclosed, fan cooled.
    d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    f. Mount unit-mounted disconnect switches on exterior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

    a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 1 inch deep.

    b. Double-wall, galvanized -steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 1 .

    d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
    e. Condensate lift pump: Provide manufacturer selected condensate lift pump for discharge to elevated gravity drain.

7. Air Filtration Section:

    a. General Requirements for Air Filtration Section:

        1) Comply with NFPA 90A.
        2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
        3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

    b. Disposable Panel Filters:

        1) Factory-fabricated, viscous-coated, flat-panel type.
        2) Thickness: 1 inch.

3) Dust-Holding Capacity: .
4) Initial Resistance: .
5) Recommended Final Resistance: Insert inches wg (Pa).
6) Arrestance according to ASHRAE 52.1: 80.
7) Merv according to ASHRAE 52.2: 5.
8) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.

Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

2.3 ACCESSORIES

A. Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence and Operations for HVAC Controls."

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose and pump: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install structural hanging support and seismic restraints.

D. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 26 05 05

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Architect before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Extend existing installations using materials and methods as specified.

3.04 CLEANING AND REPAIR

A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Heat shrink tubing.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 26 05 05 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

E. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

M. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

N. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

I. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

J. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.
   d. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
   a. Cerro Wire LLC: www.cerrowire.com.
   b. Encore Wire Corporation: www.encorewire.com.
   c. Southwire Company: www.southwire.com.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
   a. Size 10 AWG and Smaller: Solid.
   b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
   a. Size 4 AWG and Larger: Type XHHW-2.
   b. Installed Underground: Type XHHW-2.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
   1. Manufacturers:
      a. 3M: www.3m.com.
      b. Ideal Industries, Inc: www.idealindustries.com.
      c. NSI Industries LLC: www.nsiindustries.com.

H. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com.
      b. Ilsco: www.ilsco.com.
      c. Thomas & Betts Corporation: www.tnb.com.

2.05 WIRING ACCESSORIES

A. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com.
   2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
a. 3M: www.3m.com.
b. American Polywater Corporation: www.polywater.com.
c. Ideal Industries, Inc: www.idealindustries.com.

E. Cable Ties: Material and tensile strength rating suitable for application.
1. Manufacturers:
a. Burndy LLC; _____: www.burndy.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
b. Size raceways, boxes, etc. to accommodate conductors.

7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Install conductors with a minimum of 12 inches of slack at each outlet.

H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
   b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Identify conductors and cables in accordance with Section 26 05 53.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Field quality control test reports.

D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
      b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
      c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
2. Provide grounding electrode conductor to connect derived system grounded conductor to concrete encased electrode. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
   b. Metal gas piping.
8. Provide bonding for metal building frame.

I. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
   b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
   c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Oxide Inhibiting Compound: Comply with Section 26 05 19.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.06 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 4. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.
   2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
   3. Channel Material:

a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
6. Manufacturers:
   a. Cooper B-Line, a division of Eaton Corporation; _____: www.cooperindustries.com.
   b. Unistrut, a brand of Atkore International Inc; _____: www.unistrut.com.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
   c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
   d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
   e. Outlet Boxes: 1/4 inch diameter.
   f. Luminaires: 1/4 inch diameter.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
5. Sheet Metal: Use sheet metal screws.
6. Plastic and lead anchors are not permitted.
7. Powder-actuated fasteners are not permitted.
8. Hammer-driven anchors and fasteners are not permitted.
9. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
10. Manufacturers - Mechanical Anchors:
    a. Hilti, Inc; _____: www.us.hilti.com.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.

J. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.

K. Secure fasteners according to manufacturer's recommended torque settings.

L. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. PVC-coated galvanized steel rigid metal conduit (RMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

H. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 33.16 - Boxes for Electrical Systems.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

F. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005 (R2013).

G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
   2. Exterior, Direct-Buried: Use rigid PVC conduit.
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit.

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit.

L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

M. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

2.02 CONDUIT REQUIREMENTS

A. Electrical Service Conduits: Also comply with Section 26 21 00.

B. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Underground, Interior: 3/4 inch (21 mm) trade size.
   4. Underground, Exterior: 3/4 inch (21 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

C. PVC-Coated Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

D. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   4. Arrange conduit to maintain adequate headroom, clearances, and access.
   5. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   6. Arrange conduit to provide no more than 150 feet between pull points.
   7. Route conduits above water and drain piping where possible.
   8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.
   11. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   4. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
   7. Use of spring steel conduit clips for support of conduits is not permitted.
   8. Use of wire for support of conduits is not permitted.
   9. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

H. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

J. Underground Installation:
1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.

K. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

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SECTION 26 05 33.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Underground boxes/enclosures.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 27 26 - Wiring Devices:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2013.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
   1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, and underground boxes/enclosures.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.
   4. Use suitable concrete type boxes where flush-mounted in concrete.
   5. Use suitable masonry type boxes where flush-mounted in masonry walls.
   6. Use raised covers suitable for the type of wall construction and device configuration where required.
   7. Use shallow boxes where required by the type of wall construction.
   8. Do not use "through-wall" boxes designed for access from both sides of wall.

9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
13. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
14. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Provide logo on cover to indicate type of service.
5. Applications:
    a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 8 load rating.
    b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
    c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
    a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Unless dimensioned, box locations indicated are approximate.
   2. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
   3. Locate boxes so that wall plates do not span different building finishes.
   4. Locate boxes so that wall plates do not cross masonry joints.
   5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   7. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   8. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Floor-Mounted Cabinets: Mount on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

M. Install boxes as required to preserve insulation integrity.

N. Underground Boxes/Enclosures:
   1. Install enclosure on gravel base, minimum 6 inches deep.
   2. Flush-mount enclosures located in concrete or paved areas.
   3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
   4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 05 26.

S. Identify boxes in accordance with Section 26 05 53.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:

1) Identify ampere rating.
2) Identify voltage and phase.
3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Use identification nameplate to identify main overcurrent protective device.
5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

b. Panelboards:
1) Identify ampere rating.
2) Identify voltage and phase.
3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
5) Use typewritten circuit directory to identify load(s) served for panelboards with a door.

c. Transformers:
1) Identify kVA rating.
2) Identify voltage and phase for primary and secondary.
3) Identify power source and circuit number. Include location when not within sight of equipment.

d. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify power source and circuit number. Include location when not within sight of equipment.

2. Service Equipment:
a. Use identification nameplate to identify each service disconnecting means.

3. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

4. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
a. Service equipment.

5. Arc Flash Hazard Warning Labels: Comply with Section 26 05 73.

6. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
a. At each source and load connection.
b. Within boxes when more than one circuit is present.
c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Boxes:
   1. Use voltage markers or color coded boxes to identify systems other than normal power system.
   2. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
      a. For exposed boxes in public areas, use only identification labels.

D. Identification for Devices:
   1. Identification for Communications Devices: Comply with Section 27 10 05.
   2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
   3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
      a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic or stainless steel nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
      a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. Equipment designation or other approved description.
      b. Other information as indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. Equipment Designation: 1/2 inch.
      b. Other Information: 1/4 inch.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Emergency Power System: White text on red background.

D. Format for Caution and Warning Messages:
   1. Minimum Size: 2 inches by 4 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/2 inch.
   5. Color: Black text on yellow background unless otherwise indicated.

E. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
   a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:
   1. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
   2. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C. Legend:
   1. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
   1. Tape for Buried Power Lines: Black text on red background.

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
   1. Materials:
      a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
      b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
   2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
   3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
      a. Do not use labels designed to be completed using handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Boxes: Outside face of cover.
8. Conductors and Cables: Legible from the point of access.
9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

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SECTION 26 05 73
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.
   1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 26 21 00 - Low-Voltage Electrical Service Entrance.
   1. Includes Utility Company contact information.

C. Section 26 24 13 - Switchboards.

D. Section 26 24 16 - Panelboards.

E. Section 26 28 16.13 - Enclosed Circuit Breakers.

F. Section 26 29 13 - Enclosed Controllers.

1.03 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

B. IEEE 141 - IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants; 1993 (Reaff 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata, 2003.

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc Flash Hazard Calculations; 2002, including 1584a (2004) and 1584b (2011) amendments.

G. NEMA MG 1 - Motors and Generators; 2016.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
   2. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

1.06 POWER SYSTEM STUDIES

A. Scope of Studies:
   1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
   2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
      a. Known Operating Modes:
         1) Utility as source.

B. General Study Requirements:
   1. Comply with NFPA 70.
   2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
   1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
      a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
         1) Obtain up-to-date information from Utility Company.
         2) Utility Company: As indicated on drawings.
      b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
      c. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
      d. Protective Devices:
         1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
         2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
      e. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
   1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
   2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
      a. Maximum utility fault currents.
      b. Maximum motor contribution.
      c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:
   1. Comply with applicable portions of IEEE 242 and IEEE 399.
   2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
   3. Analyze protective devices and associated settings for suitable margins between time-current curves to achieve full selective coordination while providing adequate protection for equipment and conductors.

F. Arc Flash and Shock Risk Assessment:
   1. Comply with NFPA 70E.
   2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
   3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
      a. Maximum and minimum utility fault currents.
      b. Maximum and minimum motor contribution.
      c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
   1. General Requirements:
      a. Identify date of study and study preparer.
      b. Identify study methodology and software product(s) used.
      c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
      d. Identify base used for per unit values.
      e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
      f. Include conclusions and recommendations.
   2. Short-Circuit Study:
      a. For each scenario, identify at each bus location:
         1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
         2) Fault point X/R ratio.
         3) Associated equipment short circuit current ratings.
      b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
   3. Protective Device Coordination Study:
      a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
      b. For each graph include (where applicable):
         1) Partial single-line diagram identifying the portion of the system illustrated.
         2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
         3) Conductors: Damage curves.
         4) Transformers: Inrush points and damage curves.
         5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
         6) Motors: Full load current, starting curves, and damage curves.
         7) Capacitors: Full load current and damage curves.

c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
   1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
   2) Include ground fault pickup and delay.
   3) Include fuse ratings.
   4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:
   a. For each scenario, identify at each bus location:
      1) Calculated incident energy and associated working distance.
      2) Calculated arc flash boundary.
      3) Bolted fault current.
      4) Arcing fault current.
      5) Clearing time.
      6) Arc gap distance.
   b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
   c. Identify locations where the calculated maximum incident energy exceeds 40 calories per sq cm.
   d. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.07 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 26 05 53.
   2. Minimum Size: 4 by 6 inches.
   3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
      b. Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.
      c. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
      d. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Site-specific PPE (personnel protective equipment) requirements.
         4) Nominal system voltage.
         5) Date calculations were performed.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.02 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

END OF SECTION

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SECTION 26 05 83
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 05 33.13 - Conduit for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 27 26 - Wiring Devices.

E. Section 26 28 16.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 28 16.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 27 26.

D. Flexible Conduit: As specified in Section 26 05 33.13.

E. Wire and Cable: As specified in Section 26 05 19.

F. Boxes: As specified in Section 26 05 33.16.

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 21 00

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 - Hangers and Supports for Electrical Systems.

E. Section 26 05 33.13 - Conduit for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 24 13 - Switchboards: Service entrance equipment.
   1. Includes utility metering transformer compartment.

1.03 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.04 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Owner.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
   1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
   2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Utility Company letter of availability for providing electrical service to project.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
   1. Obtain Utility company approval of shop drawings prior to submittal.

E. Drawings prepared by Utility Company.

F. Project Record Documents: Record actual locations of equipment and installed service routing.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility:
   1. Pad-Mounted Utility Transformers:
      a. Transformers: Furnished and installed by Utility Company.
      b. Primary:
         1) Trenching and Backfilling: Provided by Utility Company.
         2) Conduits: Furnished by Utility Company and installed by Contractor.
         3) Conductors: Furnished and installed by Utility Company.
      c. Secondary:
         1) Trenching and Backfilling: Provided by Contractor.

2) Conduits: Furnished and installed by Contractor.
3) Conductors: Furnished and installed by Utility Company (Service Point at service entrance equipment).

2. Terminations at Service Point: Provided by Utility Company.
3. Metering Provisions:
   a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
   b. Metering Compartments in Service Entrance Equipment: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components in accordance with Section 26 05 29.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.

F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.04 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION

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SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Flexible conduit connections.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 24 16 - Panelboards.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.

C. IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers; 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.

F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

D. Maintenance Data: Include recommended maintenance procedures and intervals.

E. Project Record Documents: Record actual locations of transformers.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Siemens Industry, Inc; _____: www.usa.siemens.com.

D. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
   1. Altitude: Less than 3,300 feet.
   2. Ambient Temperature:
      a. Greater than 10 kVA: Not exceeding 104 degrees F.
      b. Less than 10 kVA: Not exceeding 77 degrees F.

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Primary Voltage: 480 volts delta, 3 phase.

C. Secondary Voltage: 208Y/120 volts, 3 phase.

D. Insulation System and Allowable Average Winding Temperature Rise:

1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

E. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

F. Winding Taps:
1. Less than 3 kVA: None.
2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

H. Sound Levels: Standard sound levels complying with NEMA ST 20.

I. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor mounting.

J. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor clean, dry locations: Type 2.
b. Outdoor locations: Type 3R.
2. Construction: Steel.
a. Less than 15 kVA: Totally enclosed, non-ventilated.
b. 15 kVA and Larger: Ventilated.
3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
4. Provide lifting eyes or brackets.

2.04 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 26 05 33.13, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Mount floor-mounted transformers on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

I. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

3.04 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 13
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 26 21 00 - Low-Voltage Electrical Service Entrance.
   1. Includes Utility Company contact information.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Revision E with Supplement 1, 2013.

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

L. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

M. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
3. Obtain Utility Company approval of switchboard prior to fabrication.
4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
5. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation demonstrating selective coordination upon request.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switchboards:
   1. Eaton Corporation; _____: www.eaton.com.
   2. Schneider Electric; Square D Products: www.schneider-electric.us.
   3. Siemens Industry, Inc: www.usa.siemens.com.

B. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:
   1. Main Device(s): Individually-mounted.
   2. Feeder Devices: Panel/group-mounted.
   3. Arrangement: Front accessible only (not rear accessible), rear aligned.
   4. Gutter Access: Bolted covers.

E. Service Entrance Switchboards:
   1. Listed and labeled as suitable for use as service equipment according to UL 869A.
   2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
   3. Comply with Utility Company requirements for electrical service.
   4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.
   5. See Section 26 21 00 for additional requirements.

F. Service Conditions:
   1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
      a. Altitude: Less than 6,600 feet.
      b. Ambient Temperature:
         1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.
   2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

G. Short Circuit Current Rating:
   1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
   2. Minimum Rating: 65,000 rms symmetrical amperes.

H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J. Bussing: Sized in accordance with UL 891 temperature rise requirements.
   1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
   2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Phase and Neutral Bus Material: Copper.
   5. Ground Bus Material: Copper.

K. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Line Conductor Terminations:
      a. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
      b. Main and Neutral Lug Type: Mechanical.
   2. Load Conductor Terminations:
      a. Lug Material: Copper, suitable for terminating copper conductors only.
      b. Lug Type:
         1) Provide mechanical lugs unless otherwise indicated.

L. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
      b. Outdoor Locations: Type 3R.
   2. Finish: Manufacturer's standard unless otherwise indicated.

M. Future Provisions:
   1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
   2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

N. Instrument Transformers:
   1. Comply with IEEE C57.13.
   2. Select suitable ratio, burden, and accuracy as required for connected devices.
   3. Current Transformers: Connect secondaries to shorting terminal blocks.
   4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
   1. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   2. Molded Case Circuit Breakers:
      a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
         1) Provide thermal magnetic circuit breakers unless otherwise indicated.
         2) Provide electronic trip circuit breakers for circuit breaker frame sizes 225 amperes and above.
      b. Minimum Interrupting Capacity:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.

c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

d. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   1) Provide the following field-adjustable trip response settings:
      (a) Long time delay.
      (b) Short time pickup and delay.
      (c) Instantaneous pickup.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer cases test.
   4. Electrical operation and control wiring tests, including polarity and sequence tests.
   5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment components in accordance with Section 26 05 29.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

L. Provide filler plates to cover unused spaces in switchboards.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

C. Inspect and test in accordance with NETA ATS, except Section 4.

D. Perform inspections and tests listed in NETA ATS, Section 7.1.

E. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

F. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10.

G. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

C. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NEMA PB 1 - Panelboards; 2011.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

C. Siemens Industry, Inc; _____: www.usa.siemens.com.

D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
   2. Listed series ratings are not acceptable.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures as indicated.
   2. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Copper, suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Do not use tandem circuit breakers.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required supports in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed branch devices, components, and accessories.

J. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

K. Provide filler plates to cover unused spaces in panelboards.

L. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.
   3. Communications equipment circuits.
   4. Intrusion detection and access control system circuits.
   5. Video surveillance system circuits.

M. Identify panelboards in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.02 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.

F. Section 26 29 13 - Enclosed Controllers: Manual motor starters and horsepower rated motor-starting switches without overload protection.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Revision H, 2014.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Revision G, 2014.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Project Record Documents: Record actual installed locations of wiring devices.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Ivory with stainless steel wall plate.

C. Wiring Devices Installed in Finished Spaces: Ivory with stainless steel wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Ivory with galvanized steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: Ivory with specified weatherproof cover.

2.03 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

D. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
   1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

2.05 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches above finished floor.
      b. Receptacles: 18 inches above finished floor or 6 inches above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

N. Identify wiring devices in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 28 16.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Revision E with Supplement 1, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Project Record Documents: Record actual installed locations of enclosed circuit breakers.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

C. Siemens Industry, Inc; _____: www.usa.siemens.com.

D. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
   2. Listed series ratings are not acceptable.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide thermal magnetic circuit breakers unless otherwise indicated.

G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
   3. Provide surface-mounted enclosures unless otherwise indicated.

I. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. 14,000 rms symmetrical amperes at 480 VAC.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Lug Material: Copper, suitable for terminating copper conductors only.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

F. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Identify enclosed circuit breakers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.

D. Test shunt trips to verify proper operation.

E. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 28 16.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E. Section 26 29 13 - Enclosed Controllers: Manual motor controllers.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual locations of enclosed switches.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

C. Siemens Industry, Inc; _____: www.usa.siemens.com.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:

1. Comply with NEMA KS 1.
2. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Identify enclosed switches in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Magnetic motor starters.
   2. General purpose contactors.
   3. Manual motor starters.

B. Overcurrent protective devices for motor controllers, including overload relays.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 26 28 13 - Fuses: Fuses for fusible switches.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

D. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices; 2000 (R2010).

E. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).

F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

L. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
   3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.

4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
6. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual installed locations of controllers and final equipment settings.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

C. Siemens Industry, Inc; _____: www.usa.siemens.com.

D. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.02 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.

D. Short Circuit Current Rating:

1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 05 73.
2. Listed series ratings are not acceptable.

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Enclosures:
1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1 or Type 12.
   b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

G. Magnetic Motor Starters: Combination type unless otherwise indicated.
1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Minimum Starter Size: NEMA Size 0.
4. Disconnects: Circuit breaker type.
   a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
   b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
   c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
5. Overload Relays: Bimetallic thermal type unless otherwise indicated.
6. Pilot Devices Required:
   a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
   b. Single-Speed, Non-Reversing Starters:
      1) Pushbuttons: START-STOP.
      2) Selector Switches: HAND/OFF/AUTO.
      3) Indicating Lights: Red ON, Green OFF.

H. General Purpose Contactors: Combination type unless otherwise indicated.
1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Disconnects: Circuit breaker type.
   a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
   b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
   c. Provide auxiliary interlock for disconnection of external control power sources where applicable.

I. Manual Motor Starters:
1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
2. Configuration: Non-reversing unless otherwise indicated.
3. Fractional-Horsepower Manual Motor Starters:
   a. Furnish with toggle operator.
   b. Overload Relays: Bimetallic or melting alloy thermal type.
   c. Furnish Red ON indicating light.

4. Integral-Horsepower Manual Motor Starters:
    a. Furnish with toggle operator.
    b. Overload Relays: Bimetallic or melting alloy thermal type.
    c. Furnish Red ON indicating light.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
    a. Interchangeable current elements/heaters.
    b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    c. Trip test function.
7. Solid-State Overload Relays:
    a. Adjustable full load current.
    b. Phase loss protection.
    c. Phase imbalance protection.
    d. Ambient temperature insensitive.
    e. Thermal memory.
    f. Trip test function.
    g. Provide isolated alarm contact.

B. Fusible Disconnect Switches:
1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
2. Fuse Clips: As required to accept indicated fuses.
3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

C. Circuit Breakers:
1. Interrupting Capacity (not applicable to motor circuit protectors):
    a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
    b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
2. Motor Circuit Protectors:
    a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
    b. Provide field-adjustable magnetic instantaneous trip setting.

2.04 CONTROL ACCESSORIES

A. Auxiliary Contacts:

1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
1. Comply with NEMA ICS 5; heavy-duty type.
2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
4. Indicating Lights: Push-to-test type unless otherwise indicated.
5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
1. Comply with NEMA ICS 5.
2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus 50 VA spare capacity.
2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install controllers in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment components in accordance with Section 26 05 29.

E. Install enclosed controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Install all field-installed devices, components, and accessories.

H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 26 05 73.

L. Identify enclosed controllers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION

SECTION 26 33 23
CENTRAL BATTERY EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Emergency power supply.

B. Remote trouble alarm indicator.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B.

C. NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems; 2016.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog and data sheets showing electrical characteristics and connection requirements. Include unit ratings, dimensions, and finishes. Include performance data for batteries.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include battery maintenance and unit testing procedures.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Myers Power Product- Illuminator E Seriess.

B. Substitutions: Not Permitted.

2.02 EMERGENCY POWER SUPPLY SYSTEM DESCRIPTION

A. Nominal Input/Output Voltage: The input/output voltage of the Centeral Inverter shall be pre-configured to match the specified input and load requirements.

B. Output Load Capacity: Teh output load capacity of the Central Inverter shall be rated in kVA at unity power factor. The inverter shall be capable of supplying the rated kW from .5 lagging to .5 leading.

C. Battery System: The inverter shall be provided with sealed, value regulated, front access, lead acid batteries. Battery system shall be sized to provide the necessary reserve time to feed the inverter in case of a main power failure. the battery charger shall recharge the fully discharged batteries within 24 hour period. Charger shall be an integrated 3-step, microprocessor controlled and temperature compensating.

D. Mode of Operation: The inverter shall be designed to operate with less than a 2- millisecond transfer time:

1. Normal Operation: The Inverter is a line interactive standby syastem and the commercial AC power continuously supplies the critical load. A boost tap transformer protection circuit will maintain the desired output voltage during low voltage "brownout conditions, without continously switching to battery, thereby perserving battery capacity. The input converter (bi-directional transformer) derives power from the commercial AC power source and supplies the inverter while simultaneously providing floating charge to the batteries.
2. Emergency Operation: Upon failure of the commercial AC power the inverter instantaneously with a maximum of a 2 millisecond break, switches its power supply formt he input converter to the battery system. There shall be no loss of power to the critical load upon the failure or restoration of the utility source.
3. Recharge: Upon restoration of commercial AC power after a power outage, the input converter shall automatically restart and start charging the batteries. The critical loads are powered by the commercial AC power again.

2.03 RATINGS

A. AC Input
   1. Voltage: 277 volts (+10%, -20%), 60 Hz (+/- 3Hz)
   2. Power Factor:.5 leading/lagging
   3. Inrush current: 1.25 times nominal input current.
   4. Current limit 125% of nominal input current.
   5. Current distortion: 10% THD maximun from 50% load to full load.
   6. Surge protection:Sustains input surges without damage per standards set in ANSI C62.41 and ANSI C62.42.45.

B. Inverter Output
   1. Voltage: 277 volts, 60Hz
   2. Static Voltage Stability: Load current changes +/-2%, battery discharge +/-12.5%
   3. Dynamic Voltage Stability: +/-2% (25% step load), +/-3% (50% step load)
   4. Harmonic Distortion: Less than 3% (with linear load)
   5. Load Power Factor Range: 0.5 lagging to 0.5 leading.
   6. Overload Capability: 100% Continuous, 115% 10 min., 150% 16 line cycles.
   7. Output Circuit Breakers: 20 amp, 1 pole non-supervised, 22kAIC rated.
   8. Efficiency: 97 - 98%.

2.04 FABRICATION

A. All materials of the Inverter shall be new, of current manufacturer, high grade, free from all defects ans shall not have been in prior service except as required during factory testing. Components shall be housed in a single freestanding NEMA type 1 enclosure. Front access only shall be required for installation. All components shall have a modular design and quick disconnect means to facilitate field service.

2.05 COMPONENTS

A. UPS Module: The UPS Module shall contain the inverter, an AC distribution module with an input circuit breaker, back-feed relay, a boost tap transformer, control, and monitoring subsystems.

B. Battery Module: The battery module shall contain the battery plant requird to produce the reserve energy to supply the inverter suring abnormal AC mains condidtion. The 90 minute battery module shall be contained in the same cabinet as electronics regardless of the system VA.

2.06 BATTERY CHARGER

A. General: In the standard configuration the charger converts AC voltage to dc voltage. With commercial power present, the inverter power transformer is powered and the IGBT modules are mircoprocessor controlled to recharge the batteries. The temperature compensated battery charger circuit supplies constant voltage and constant current to the batteries. Once the batteries have received a full recharge, a constant trickle charge maintains batteries at a maximum level. Recharge time is 24 hours maximum at nominal ac input voltage. The ac ripple

current of the dc output meets the battery manufacturers specifivaitons, thus ensuring the maximum battery lifetime.

B. AC Input Current:The charger unit is provided with an ac input current limiting circuit whereby the maximum input current shall not exceed 125% of the output full current rating.

C. Automatic Restart: Upon restoration of utility AC power, after a AC power outage and after a full Inverter automatic end of discharge shutdown, the inverter will automaticlly restart, perfomeing the normal inverter start up.

D. DC Filter: The charger shall have an output filter to minimize AC ripple voltage into the battery. Under no conditions shall ripple voltage into the battery exceed 2% RMS.

E. Battery Recharge: The charger shall be capable of producing battery-charging current suffcient enough to recharge the fully discharged battery bank within a 24 hour period. After the battery is recharched, teh charger shall maintain full battery charge until the next emergency operation.

F. Overvoltage Protection: The charger shall be equipped with a DC over-voltage protection circuit so that if the DC voltage rises above the pre-set limit, the charger shuts down automaticlly and initiates and alarm condition.

2.07 INVERTER

A. General: teh inverter convertss dc voltage supplied by the battery to ac voltage of a precisely stabilized amplitude and frequency that is suitable for power most sohphisticated electrical equipment. teh inverter output voltage is generated by sinusoidal pulse width modulation (PWM). teh user of the high carrier frequency for PWM and a dedicated ac filter circuit consisting of a transformer and capactors to, ensure a very low distorionof the output voltage.

B. Overload Capability: The inverter during emergency modes shall be capable of supplying a current and voltage for overloads exceeding 100% and upto 150% of full load current for 16 line cycles, 115% for 10 minutes.

C. Output Power Transformer: A dry type power transfomer shall provide the inverter AC output. The transformer shall be built with copper wiring exclusively. The hottest winding temperature of the transformer shall not exceed the termperature limit of th transformer insulation class of material at ambient temperature.

2.08 DISPLY AND CONTROLS

A. Monitoring and Control: The Inverter system shall be provided with operation monitoring and control, audible alarms and diagnostics. Dispaly/control panel shall be front mounted and includes a 4 line by 20 character vacuum fluorescent display and keypad for user interface. Display shall be menu driven. The system shall have a continuous scrollijng display for the following:
   1. Date and Time
   2. System Status (AC Status, Battery Status, Charger Status)
   3. System faults

B. Metering: Following fucntions shall be metered and capable of display on the control panel:
   1. Utility input voltage
   2. System output voltage
   3. Battery voltage
   4. Battery current
   5. System output current
   6. System output VA
   7. Inverter wattage
   8. System temperature
   9. Date and Time
   10. System Dayts

C. Audible Alarm: Audilble alarm will activate with any of the following conditions and automatically store the 75 most recent events:
   1. High battery charger voltage

2. Charger fault
3. High AC input voltage
4. Low AC input voltage
5. Near Low battery voltage
6. Low battery voltage
7. Laod reduction fault
8. High ambient temperature
9. Inverter fault
10. Output fault
11. Output overload
12. Output overload shutdown

2.09 RS-232 INTERFACE

A. The system shall be equipped with an RS-232 serial port (DB9) for remote communications.

2.10 MANUAL AND PROGAMMABLE TESTING

A. The system shall incorporate a manual test fucntion and two automatic test modes. The system will perform a programmable, self diagnostic monthly test for 5 miniute, which is preset, for the 15th of every month and the user can program the evend day and time. Teh yearly self diagnostic test is for 90 miniutes and the user can program the day and time the event is to take place. the microprocessor automatically records the last 75 test events in its own seperate test result log.

2.11 BATTERY ASSEMBLY

A. The batteries shall be front accessible, sealed, lead-acid value regulated battery cells with a one year full and nine year prorated warranty. Batteries shall be interconnected via buss bars. Disconnections means shall be included for isolation of bartery assembly from teh UPS module.

2.12 SYSTEM OPTIONS

A. Provide the following system options:
   1. Output Circuit Breakers: 18, 20 amp 1 pole un-supervised, 120 volt 22 kAIC.
   2. Output Circuit Breaker Trip Alarm: Audible and visual alarm activates when an output distribution circuit breaker is open or has tripped.
   3. Email/Fax Modem: Configurable option to send a system status report vai any combination of eamil, fax or voice message upon the completion of a preprogrammed monthly or yearly test and upon any selected alarm condition.
   4. Summary Form "C" contacts. Form "C" contacts rated at 5 amps maximum 250 VAC/30 VDC.
   5. Maintenance Bypass Switch: Internally mounted, make before break switch.
   6. Long Life Sealed Lead Calcium, VRLA Battery: Maintenance free, One year battery full warranty and nineteen year prorated.

2.13 SYSTEM ACCESSORIES

A. Provide the following system accessories:
   1. Remote Summary Alarm Panel: 4" high x 4" wide by 2-1/4" deep box containing a red alarm light and buzzer with a silence switch that will activate on any alarm condition.

2.14 WARRANTY

A. Inverter/UPS Module: manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after the intital start-up or 18 months after ship date, whichever occurs first. The standard warranty will be increased to 2 years with factory start-up.

B. Battery: Long Life Sealed Lead Calcium, VRLA Battery: Maintenance free. One year battery full warranty and nineteen years prorated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units plumb and level.

3.02 UNIT START-UP AND SITE TESTING

A. Site start up and testing shall be provide by the manufacturer's field service represntative during normal working hours. Site testing shall consist of a complete test of the inverter and accessories by the manufacturer in accordance with the manufacturer's statndards. Manufacturer's approved service representative must perform teh commissioning for the 2 year warranty to apply.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Verify operation of each unit by simulating outage.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstrate normal operation of unit.

END OF SECTION

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SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

C. Ballasts and drivers.

D. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 05 33.16 - Boxes for Electrical Systems.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

D. Section 26 56 00 - Exterior Lighting.

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

B. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 101 - Life Safety Code; 2015.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

2.04 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.05 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Exit Signs:

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Lamps.

D. Poles and accessories.

E. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

D. Section 26 27 26 - Wiring Devices: Receptacles for installation in poles.

E. Section 26 51 00 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; American Association of State Highway and Transportation Officials; 6th Edition, with 2015 Interim Revisions.

B. ANSI O5.1 - American National Standard for Wood Poles -- Specifications and Dimensions; 2015.

C. IEEE C2 - National Electrical Safety Code; 2012.

D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015.

F. IES RP-8 - Roadway Lighting; 2014.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2015.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1598 - Luminaires; Current Edition, Including All Revisions.

L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution.
   3. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Lamps: Include rated life and initial and mean lumen output.
   3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

2.04 LAMPS

A. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.05 POLES

A. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Structural Design Criteria:
      a. Comply with AASHTO LTS.
      b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      c. Include structural calculations demonstrating compliance with submittals.
   3. Material: Steel, unless otherwise indicated.
   4. Shape: Square straight, unless otherwise indicated.
   5. Finish: Match luminaire finish, unless otherwise indicated.
   6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   7. Unless otherwise indicated, provide with the following features/accessories:
      a. Anchor bolts with leveling nuts or leveling shims.
      b. Anchor base cover.

2.06 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires in accordance with NECA/IESNA 501.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Pole-Mounted Luminaires:
   1. Maintain the following minimum clearances:
      a. Comply with IEEE C2.
      b. Comply with utility company requirements.
   2. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
      e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
      f. Install anchor base covers or anchor bolt covers as indicated.
   3. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

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SECTION 27 10 05

STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Includes intersystem bonding termination.
   2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

B. Section 26 05 33.13 - Conduit for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; 2012.

B. NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.

C. TIA-492AAAC-B - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Telecommunications Industry Association; 2009.

D. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; Rev C, 2015.

E. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2016.

F. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; Rev C, 2009 (with Addenda; 2016).

G. TIA-568-C.3 - Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011).

H. TIA-569-D - Telecommunications Pathways and Spaces; Rev D, 2015.

I. TIA-598-D - Optical Fiber Cable Color Coding; Rev D, 2014.

J. TIA-606-B - Administration Standard for Telecommunications Infrastructure; Rev B, 2012 (with Addenda; 2015).

K. TIA-607-C - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Rev C, 2015.

L. UL 444 - Communications Cables; Current Edition, Including All Revisions.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

N. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

O. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports.

G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A company having at least 5 experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 5 period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cabling and Equipment:
   1. 3M Communications Technologies; _____: solutions.3m.com.
   2. METZ CONNECT USA Inc; P|Cabling Products; _____: www.metz-connect.com.
   3. Siemon Company; _____: www.siemon.com.
   4. TE Connectivity; _____: www.te.com.

2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569-D (pathways), latest editions (commercial standards).
   2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607-C and are UL listed or third party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
   1. Backbones - Between Buildings: Copper, 25-pair.
   2. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.
   3. Provide additional outlets where indicated on drawings.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. For the entire campus there is one main distribution frame and for each building there is a building distribution frame (BDF) that functions as the main distribution frame (MDF) for that building.
   2. Locate main distribution frame as indicated on the drawings.
   3. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.03 PATHWAYS

A. Conduit: As specified in Section 26 05 33.13; provide pull cords in all conduit.

B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.04 COPPER CABLE AND TERMINATIONS

A. Copper Backbone Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568-C.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
   2. Cable Type: TIA-568-C.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
   3. Cable Capacity: Quantity of pairs as indicated on drawings.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.

B. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568-C.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568-C.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
5. Cable Jacket Color - Voice and Data Cable: Blue.

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

E. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
a. Quantity: One for each pair of patch panel ports.
b. Length: 8 feet.

2.05 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Fiber Optic Backbone Cable:
1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568-C.3, TIA-598-D, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC-B.
3. Cable Capacity: Quantity of fibers as indicated on drawings.
4. Cable Applications:
a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
5. Cable Jacket Color:
a. Laser-Optimized Multimode Fiber (OM3/OM4): Aqua.

B. Fiber Optic Interconnecting Devices:
1. Connector Type: Type SC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

2.06 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.

a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606-B.
d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606-B.
c. Provide incoming cable strain relief and routing guides on back of panel.
d. Provide rear cable management tray at least 8 inches deep with removable cover.
e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
1. Do not paint over UL label.

D. Equipment Racks and Cabinets: EIA/ECA-310 standard 19 inch wide component racks.
1. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

2.07 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 05 33.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
a. Data or Combination Voice/Data Outlets: _____ ports.

2.08 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607-C.

2.09 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B.

2.10 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569-D (pathways), TIA-607-C (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Grounding and Bonding: Perform in accordance with TIA-607-C and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches from power conduits and cables and panelboards.
   3. 5 inches from fluorescent and high frequency lighting fixtures.
   4. 6 inches from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 26 05 33.13:
   1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
   2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
   3. Arrange conduit to provide no more than 100 feet between pull points.
   4. Do not use conduit bodies.
   5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         1) Telephone and Data Outlets: 18 inches above finished floor.
         2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches above finished floor to top of telephone.
         3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
      b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      c. Locate outlet boxes so that wall plate does not span different building finishes.
      d. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches.
   2. At Outlets - Copper: 12 inches.
   3. At Outlets - Optical Fiber: 39 inches.

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
   3. Use T568B wiring configuration.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

F. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.
   4. Inspect patch cords for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test backbone cables after termination but before cross-connection.
   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
   3. Test operation of shorting bars in connection blocks.
   4. Category 3 Backbone: Perform attenuation test.
   5. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
   6. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
   7. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:
   1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
   2. Multimode Backbone: Perform tests in accordance with TIA-526-14.
   3. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 27 32 26 - EMERGENCY PHONES

PART 1 GENERAL

1.1 DESCRIPTION

A. This section includes the requirements for provision and installation of the intercom system. Provide a complete and functioning two-way communication system for the Tri-City Medical Center Parking Structure.

B. Contractor shall furnish and install hardware devices, stanchions, and other components of the system as shown and specified.

C. Furnish and install outlets, junction boxes, conduit, connectors, wiring, and other accessories necessary to complete the system installation. Requirements shall be in accordance with Division 26, Electrical.

1.2 PRECEDENCE

A. Obtain, read and comply with General Conditions and applicable sub-sections of the contract specifications. Where a discrepancy may exist between any applicable sub-section and directions as contained herein, this section shall govern.

1.3 GENERAL CONDITIONS

A. In accordance with Section 28 05 00, Security System General Requirements

1.4 RELATED WORK

A. In accordance with Section 28 05 00, Security System General Requirements
B. In accordance with Section 28 07 00, Security System Integration
C. In accordance with Section 28 08 00, Security System Testing and Commissioning
D. In accordance with Section 28 23 00 Video Surveillance System
E. In accordance with Section 28 13 00 Electronic Access Control System

1.5 APPLICABLE PUBLICATIONS

A. In accordance with Section 28 05 00, Security System General Requirements

1.6 SHOP DRAWINGS & EQUIPMENT SUBMITTAL

A. In accordance with Section 28 05 00, Security System General Requirements

1.7 OPERATING AND MAINTENANCE MANUALS

A. In accordance with Section 28 05 00, Security System General Requirements.

1.8 SERVICE AND MAINTENANCE

A. In accordance with Section 28 05 00, Security System General Requirements

1.9 TRAINING

A. In accordance with Section 28 05 00, Security System General Requirements

1.10 WARRANTY

A. In accordance with Section 28 05 00, Security System General Requirements

1.11 TECHNICAL REQUIREMENTS, EMERGENCY PHONE SYSTEM

A. General

1. The following information is provided to establish required system performance for a complete operating Emergency Phone System for the site. Some functions and

performance requirements noted herein are supported and supplied by existing systems in concert with new equipment which shall be provided by the Contractor under this scope of work. Contractor shall provide equipment, wiring and programming at all sites as necessary to provide a complete system as described herein and as shown on the drawings.

2. Components provided under this scope of work shall be compatible with the Owner communications phone system. Coordinate with the Owner on the necessary provisions.

B. Purpose: The system is designed to allow communications from the device to the programmed responding location allowing the responder to assist the caller.

1. Attributes
    a. General
        1) Exterior Emergency phones with visual locating devices are located in public areas outside the buildings as shown on plans.
    b. Exterior Emergency Phones
        1) Emergency phones utilize the campus phone system dialing automatically to call a monitoring location.
        2) Each device shall be equipped with a blue light identifying the location of activation.
        3) Each device shall be equipped with a single pushbutton which will activate the calling function and the blue location light.
        4) Emergency phone shall be provided in a wall mounted or free standing configuration, as indicated on the plans.
        5) Emergency Phones shall be integrated within the existing EACS and VSS System

PART 2 PRODUCTS

2.1 GENERAL

A. Product Acceptability: The Products section contains lists of acceptable products. If product substitutions are proposed, they must be made based upon a comparison of equivalence to the product specified and compatible with the existing system. Considerations may include but shall not be limited to functional, physical, aesthetic and/or interface aspects. The Owner shall be the sole judge of whether or not a submitted substitution is deemed to be equivalent" to that specified. Contractor may not use contractor proprietary interface modules for connections between field devices and controller

B. Equipment shall have a UL Listed mark on the product.

C. Assemblies shall be approved by a recognized agency acceptable to the City of Los Angeles.

2.2 EMERGENCY PHONE

A. Provide Emergency Phones in the following configurations. Phones shall incorporate communication compatible with the Owner’s communications system.

1. Tower Phone
    a. Provide “Talk-A–Phone” model ETP-WM Phone Tower, with the following characteristics.
        1) Vandal-resistant, exterior enclosure
        2) Blue Strobe Light housed in protective acrylic housing that is activated when the call button is pressed
        3) Constant light Faceplate
        4) Power: 120VAC

5) Provide color as required by Owner
6) Shall meet ADA requirements for access
7) UL listed

b. Provide ETP-400 series single button faceplate with Red Emergency activation button
1) Lettering “EMERGENCY”
2) LED indicator for hearing impaired
3) Built in auto-dialer
4) Auto-Answer
5) Second number dial on first number no answer
6) Unit shall be handsfree after activation
7) Stainless Steel faceplate
8) Shall include speaker for audible communication
9) Shall include activation button.

2. Exterior Wall Phone
a. Provide “Talk-A–Phone” model ETP-WM Phone
1) Vandal-resistant
2) Blue Light housed in protective acrylic housing
3) Activated Strobe light when call button is pressed
4) Constant light Faceplate
5) Low voltage version shall be 24VDC.
6) Provide color as required by Owner
7) UL listed

b. Provide “Talk-A–Phone” model ETP-400 series single button faceplate with Red Emergency activation button
1) Lettering “EMERGENCY”
2) LED indicator for hearing impaired
3) Built in auto-dialer
4) Auto-Answer
5) Second number dial on first number no answer
6) Unit shall be handsfree after activation
7) Stainless Steel faceplate
8) Shall include speaker for audible communication
9) Shall include activation button

2.3 WIRE AND CABLE

A. General: Cables which are not installed in conduit shall be a version of the specified cable rated for use in plenums.

B. System cable: Provide cable as shown below, or as recommended by the Manufacturer.
1. Emergency Phone: Belden 5302GE, 1 Pair Twisted Shielded 18AWG, with 2 conductor 18AWG, or equal.
2. Alarm Monitoring: Belden 5500FE, 1Pair Shielded 22AWG, or equal, for conection to EACS.
3. Network Cable: As required by Owner Infrastructure. Refer to the drawings

C. Cable installed below grade shall be rated for immersion in water.

PART 3 EXECUTION

3.1 GENERAL

A. In accordance with Section 28 05 00, Security System General Requirements.

3.2 EMERGENCY PHONE INTEGRATION

A. Provide access control system integration equipment, software programming, in accordance with Section 28 07 00, Security System Integration. In addition provide specific integration schemes noted.

3.3 GROUNDING PROCEDURES

A. Provide grounding of all systems and equipment in accordance with Section 28 05 00, Security System General Requirements.

3.4 WIRE AND CABLE INSTALLATION PRACTICES

A. Provide wire and cable installation in accordance with Section 28 05 00, Security System General Requirements.

3.5 START-UP RESPONSIBILITY

A. Provide start-up services for all systems and equipment in accordance with Security System General Requirements, Section 28 05 00.

3.6 PRELIMINARY INSPECTION AND TESTING

A. Provide preliminary inspection and testing services for systems and equipment in accordance with Testing and Commissioning, Section 28 08 00.

3.7 SYSTEM PERFORMANCE TESTING AND ADJUSTING PROCEDURES

A. Provide performance testing and adjusting of systems and equipment in accordance with Testing and Commissioning, Section 28 08 00.

B. Emergency Phone

1. Verify phone indicator is on
2. Verify phone indicator flashes when activated.
3. Verify voice communication with called station
4. Verify visual indicator is on during normal operation
5. Verify visual indicator strobe function is activated during use.

3.8 BURN-IN PERFORMANCE PERIOD

A. Provide a burn-in performance period to demonstrate the stability of the system, in accordance with Testing and Commissioning, Section 28 08 00.

3.9 COMMISSIONING AND VALIDATION

A. Provide commissioning and validation services to prove and improve the effectiveness of the system, in accordance with Testing and Commissioning, Section 28 08 00.

3.10 TRAINING

A. Provide training requirements of Security System General Requirements Section 28 05 00

3.11 FINAL PROCEDURES

A. Perform final procedures in accordance with section 28 05 00, Security System General Requirements.

END OF SECTION

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements and conditions which pertain to the furnishing and installation of a functional security system.

B. The Contractor will be engaged to perform the work detailed in a highly confidential and proprietary environment. All technical specifications, submittals and other documentation related to this project are considered confidential information and must remain secure at all times.

C. Contractor shall provide a proposed project schedule with their proposal. Schedule shall identify the number of teams working, building sections being worked on, type of work being conducted (submittals, staging, programming, pathways, cabling, etc.), and identify key milestone dates. Schedule shall include a bi-weekly construction meeting, at a minimum. Project may require a weekly meeting at the initiation of construction until the team is acquainted with all processes. Project shall identify, to the best of the contractor's abilities, any major lead time items.

D. System provided shall be a unified security platform as defined in spec 281300 part 2.2 and spec 282300 part 2.2. System shall be able to communicate with a centralized Identity system owned by TRI-CITY MEDICAL CENTER, meaning that an update to a user in the centralized identity system shall automatically roll down to permission changes to the unified security platform without need of manual input or changes.

E. Additive Alternates:

1. Not used

F. Unit Price

1. Contractor to provide unit pricing for the addition of a single camera, per each type.

G. All project coordination shall be through the Owner's Consultant/Representative, Guidepost Solutions. Contact information: Contact, e-mail, phone:

Michael Niola
Email: mniola@guidepostsolutions.com
Office #: 213-598-1205

1.2 RELATED SECTIONS

A. Section 280800 Security System Commissioning

B. Section 281300 Access Control & Alarm Monitoring System (ACAMS)

C. Section 282300 Video Surveillance

D. Coordinate door hardware with the Division 8 Hardware contractor

E. All electrical power and conduit required shall be included in the Contractor's scope of work. All security systems shall be on a dedicated security designated branch circuits.

F. General and Supplementary Conditions: Drawings and general provisions of Contract apply to all Division 28 sections

1.3 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

B. Codes: Perform work in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:
   1. ADA – Title 3 of the Americans with Disabilities Act
   2. Uniform Building Code (UBC).
   3. Uniform Fire Code (UFC).
   4. National Electric Code (NEC), NFPA 70.
   5. Uniform Mechanical Code (UMC).
   6. National, State, Local and any other binding building and fire codes.
   7. FCC Regulations:
   8. Part 15 – Radio Frequency Devices & Radiation Limits
   9. Underwriter's Laboratories (UL): Applicable listing and ratings.
   10. UL 294: Access Control System Units
   11. UL 1076: Proprietary Burglar Alarm Units and Systems
   12. EIA testing standards

C. Electronic devices radiating "RF" energy shall comply with Federal Communication Commission regulations, particularly Part Fifteen, and shall meet minimum Class "B" requirements.

1.4 DEFINITIONS

A. The Definitions of Division 1 shall apply to all Division 28 sections.

B. In addition to those Definitions of Division 1, the following list of terms as used in this specification shall be defined as follows:
   1. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories.
   2. "Install": To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, all parts, items, or equipment supplied by contractor. Installation shall be complete and ready for regular operation.
   3. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation.
   4. "Connect": To install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
   5. "As directed": As directed or instructed by the Owner, or their authorized representative.
   6. "Cabling": A combination of all cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].
   7. "ACAMS": Access Control & Alarm Monitoring System
   8. "ACP": Access Control Panel
   9. "VMS": Video Management System

1.5 OUTLINE OF WORK

A. Overview
   1. The work includes, but is not limited to providing all materials, transportation, equipment, and performing all operations required to complete the security systems as indicated on the drawings and specified herein. Provide equipment, whether specified or not for a complete and working system.
   2. Work called for on the drawings and not mentioned in the specifications or vice-versa, shall be performed as though fully set forth in both. In the case of differences between the drawings and specifications, the decision of the Owner shall govern. Work not particularly detailed, marked, or specified, shall be the same as similar parts that are detailed, marked or specified.
   3. The Contractor has overall responsibility to oversee, coordinate, and cooperate with other contractors in the conduct of the work outlined. Contractor will participate in weekly status calls and/or be onsite as needed for coordination meetings.
   4. The Contractor will be responsible for supplying all security devices as detailed in this specification including the cameras, card readers, door contacts, security panels, power supplies, final device connections (including electrified locking hardware), and all devices indicated on security drawings.

5. The Contractor will be responsible for verifying all installed copper cabling connectivity and verifying suitable cable has been installed to provide full system functionality.
6. The Contractor will provide all final terminations to include security components and door locking hardware.
7. The objective of the project is update the existing card readers and system architecture, as well as adding new card readers and access control panels.
8. The objective of the project is to update the existing video cable infrastructure to upgrade existing system to a network based video management platform.
9. The video management system and access control platform shall be a unified, single executable file, Enterprise solution. Each new field panel/ controller(s) shall be its own LAN chain.
10. Additional objectives will include installing additional security components as outlined in the Security Equipment (SE) Drawings.
11. If a fire alarm cross connection is required the Contractor shall be responsible for all coordination, equipment, installation and testing between the building owner's life safety system service provider and the owner's new Access Control system. The Contractor is responsible to provide all required cabling between all life safety systems and Access Control devices.
12. The Contractor shall ensure that all new access control field panels are installed as indicated on the SE Drawings. All electrical connections will be completed internal to the equipment cabinet.
13. New camera power supplies shall be installed as shown on the SE drawings.
14. The Contractor shall provide new contact/tamper switches in all field panels.
15. The Contractor will provide and install resistors at the following devices for 4- state supervision - supports secure, alarm, short circuit and open circuit states:
    a. Position switches
    b. Request to exit devices
    c. Motion detectors
    d. Exit alarms
    e. Door management alarms
    f. Glass break devices

B. Work in Contractor's Scope

1. The Contractor, unless otherwise noted on the SE design drawings, will be responsible for supplying all copper cabling (to include network, and security device specific), all conduits, all cable trays / baskets, and all (electrified / non-electrified) door hardware including micro Request to Exit Switches for the project.
2. Electrical outlets shown on the "SE" drawings are in the Contractors scope of work.
3. The Contractor shall supply all computing hardware for the video storage and any required media converters. The owner will provide the computers for the workstations and application server.
4. The Contractor shall provide power outlets and power supplies where electrified hardware requires local power.

C. Required submittal with bid package

1. The Contractor shall submit separate pricing packages as outlined on the "Bid Compliance Form". Quantify total pricing into the categories of system materials, cable, installation labor, project management, engineering and drafting. Use the provided pricing matrix worksheet forms and supply a complete list of materials including quantity, manufacturer, model number and description. Pricing matrix must be returned in Microsoft Excel format.
2. Include the material list with UNIT PRICING FOR EACH MAJOR PIECE OF EQUIPMENT. Unit pricing must include material per unit and the labor charge per unit inclusive of installation, engineering and project management.
3. Provide the resume of the Project Manager with three (3) references to similar completed projects.
4. Provide Certificates of Certification for each associate performing installation, programming and commission work in the bid response.
5. List subcontractors by:

a. Name
b. Primary Role
c. Physical address and distance from job site
d. Three (3) references to similar completed projects

6. The Contractor must submit a Proposed Project Schedule utilizing current project management software (MS Project preferred) detailing their project approach and milestones to complete all specified systems within 5 months of project award. This schedule should detail not only the tasks to be completed, but the resources the Contractor will commit to achieve the Owner's scheduling requirement. The schedule should identify each device outlined on the SE drawings; indicate incremental measurements relating to the status of each device. The incremental measurements will be:
   a. "Pre-Wiring" due date and % complete
   b. "Hardware Installed Date" due date and complete
   c. "Operational Date" due date and % complete

1.6 SUBMITTALS

A. General: Submit required submittal(s) in accordance with the following requirements and all additional requirements in related Division 28 specification sections.

B. Procedures
   1. Provide submittals to TRI-CITY MEDICAL CENTER's Consultant in digital format.
   2. Provide hardcopies in binder only if requested by Owner.

C. Cover Letter: Include a cover letter stating that the submittal is in full compliance with the requirements of the Contract Documents. List in full the items and data submitted, signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.

D. Submittal Description: Product Data
   1. General: Product data submittals must be submitted within 4 days of Notice to Proceed.
   2. Quantity:
      a. 1 digital set to Consultant
      b. 2 hardcopies to Owner if requested
   3. Format: PDF or other computer media.
      a. Clearly label the cover of each submittal package with the following information:
         1) Client Name (e.g., "Tri City Medical Center").
         2) Project Number and Contract Number.
         3) Project Name and Address (e.g., "Project Name").
         4) Contractor's Submittal Number.
         5) Submittal Title (e.g., "Product Data Submittal For Electronic Access Control System").
         6) Specification Section Number (e.g., "Section 28 13 00")
         7) Date of Submittal. Format: <month> <day>, <year> (e.g., "January 1, 2008").
         8) Contractor Name.
      b. Include a Table of Contents at the beginning of the submittal that lists materials by article and paragraph number found in the section and in the order outlined in the specification (e.g., "2.03-b Card Reader").
      c. Delivery dates for all equipment.
   4. Content:
      a. Product Information:
         1) Include product data consisting of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). This data shall clearly describe the product's characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements.

2) Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded.
3) Include delivery dates for equipment.

E. Submittal Description: Shop Drawings
1. General: Engineered shop drawings must be submitted within 10 days of Notice to Proceed.
2. The Owner / Owner's Representative will provide electronic files via e-mail or via CD- ROM containing the contract documents drawing files for use in preparing shop drawings.
3. Quantity & Media: Furnish PDF submittals to Consultant as well as, if requested, one hardcopy to Owner.
4. Format: Use AutoCAD Version 2010 or later.
   a. Use the same sheet size and project title block as the Drawings.
   b. Use identical symbols as those in the Design Drawings.
   c. Screen background information
   d. System components (devices, cable routes, etc.) and text shall be plotted at a sufficient line weight to stand out against background information.
   e. Each sheet in the shop drawings set shall be labeled with the Specification Section Number (e.g., "282300").
5. Content:
   a. Floor Plans:
      1) Floor and site plans showing the locations of all devices and door furniture associated with each door locations (ex: contacts, REX, locks, card readers) and cable routing paths with cable type and quantity called out. Prepare cable schedule if required to simplify sheet plan notation
      2) Provide termination information for each device on the plans or in a schedule that identifies the physical connections to the equipment panels. Include the panel address, and the termination point ID that is consistent and reflective of the programming fields.
   b. Point-to-Point Diagrams: Include all wiring, points of connection and interconnecting devices.
      1) Include all miscellaneous control relays.
      2) Include all devices connected to the system.
      3) Identify all conductors on the point-to-point diagrams with the same tag as the installed conductor.
   c. Block Diagram/Riser Diagram: Show the system components and all conduit and wire types and sizes between them including all cabling inter-ties between termination hardware.
   d. Installation Details: Include installation details for all devices.

F. Submittal Description: Cable Distance and Continuity Test Reports
1. General: Test reports must be submitted upon 100% completion of cable installation.
2. All horizontal cable pulls shall be tested to verify distance limitation requirements are met.
3. Test all cables and provide reports in PDF format to the Consultant.
4. Hardcopies of test results may be requested by the Owner.

G. Submittal Description: Labeling Sample
1. General: Digital samples of labels for all wiring, panels, and devices shall be provided within 10 days of NTP.
2. Submit two sets of physical product samples for review and comment by Owner prior to the installation of equipment:
3. Content:
   a. Provide panel label
   b. Provide cable label on a cut length of cable.

H. Submittal Description: Record Drawings
1. Quantity & Media:

a. Submit a complete set of red-line prints for use in compiling record drawings for review by the Owner upon completion of the project.
b. Fully represent actual installed conditions and incorporate all revisions made during construction.
c. Include drawings submitted as part of the Shop Drawing package, plus any additional information required to accurately document installed conditions.
d. Device addresses & IP address information.

2. Floor plans shall show:
    1) Locations and identifiers of all devices.
    2) Size, quantity, location, and routes of all pathways (such as cable trays, conduits, J-hangers, and other cable support devices).
    3) Floor plans showing exact placement of all equipment ACP's, card readers, alarms, cabinets/frames, rack bays, and other equipment.
    4) Installation details.

1.7 SUBSTITUTIONS

A. Substitution of products, materials, and equipment must be approved by Owner and Consultant and requested prior to RFP response. Substitutions after RFP due dates may be rejected but may be accepted only when there is a significant advantage to the Owner created by an overall upgrading of a component by a manufacturer or an operational advantage created by a modification to the equipment proposed as a substitution. In the event any substitution is requested, the Contractor shall make the Project Consultant aware of the proposed new products, materials, and equipment and shall provide the following information:

1. Complete technical information on the products, materials, and equipment proposed.
2. A copy of the original equipment data sheet along with a brief summary that identifies the advantages of the new equipment's application within the system(s).
3. Project cost impact showing the amount to be deducted or any additional cost of the equipment to be replaced. Pricing shall include the direct cost of the new equipment proposed, the cost of engineering to modify the Contract Documents and the site specific Drawings and Statement of Work for each Project, and the cost of additional labor (if any) to install the new equipment.
4. The Contractor shall include in his quote all incidental and related cost by other contractors or subcontractors to make the proposed changes.

B. Under no circumstances will a change in the originally specified products, materials, or equipment be made unless approved in writing by the Owner.

1.8 QUALITY ASSURANCE

A. Contractor Qualifications

1. Primary business locations from which project management, installation technicians, and service personnel are dispatched, to ensure response time for technical assistance within 4 hours.
2. At least 5 years of experience, and a minimum of five satisfactory completed projects similar in scope and cost.
3. Provide a resume of satisfactory evidence of project manager and lead technician's qualifications and certifications by the manufacturer for the work.
4. A current dealer training certification indicating that contractor has attended training and successfully completed the training course.
5. A current, active, and valid State Contractors License.
6. Authorized reseller/dealer, warranty provider, and a factory certified installer of the ACAMS security system.

B. Permits and Inspections

1. Obtain and pay for permits and inspections required for the work.
2. Furnish materials and workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of any legal authority having jurisdiction.

D. Obtain review from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with all requirements of reference codes indicated herein.

E. Materials
   1. Provide new and unused materials, equipment, and parts of current manufacturer and without defects for the units specified herein.
   2. Furnish only specified products and equipment, or products and equipment that have been approved in writing.

F. Regulatory Requirements
   1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Nothing in these specifications is to be construed to permit work not conforming to the most stringent of the applicable codes.
   2. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.
   3. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this series of Sections, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Drawings and Specifications. The Contract Documents address the minimum requirements for construction.

1.9 PROJECT MANAGEMENT AND COORDINATION SERVICES

A. Overview: Provide a project manager/engineer for the duration of the project to coordinate the security system work with all other trades. Coordination services, procedures and documentation responsibility shall include, but shall not be limited to the items listed in this section.
   1. Obtain copies of all shop drawings and product data for equipment provided by others that require security connections or interface with the security system work.
   2. Prepare and maintain a shop drawing review log indicating the following information:
      a. Shop drawing number and brief description of the system/material.
      b. Date of your review.
      c. Indication if follow-up coordination required.

B. Request for Information (RFI)
   1. Thoroughly review the contract documents prior to the preparation and submission of an RFI. If an RFI is submitted, attach 8 1/2" x 11" copies of all relevant documents to clarify the issue.
   2. Prepare and maintain an RFI log using a Microsoft Excel spreadsheet indicating the following information:
      a. RFI number and brief summary of the issue.
      b. Date of issuance and receipt of response.

C. Scheduling of Work
   1. Prepare work schedules for each floor / building indicating the following information:
      a. Cable installation dates.
      b. ACP build-out dates.
      c. Device installation dates.
      d. Programming dates.
      e. Testing dates.
   2. Note that alternative scheduling shall be provided for work at Salk and Child Care area. Work must be performed while students are not in the building (i.e. Spring Break at Jonas Salk and after 4:30 PM at Child Care area). Coordinate scheduling with Owner prior to deployment.

D. Role of the Security Consultant
   1. During the construction phase of the project, the Consultant will work with the Contractor to provide interpretation and clarification of project contract documents, reply to (and 'process') relevant Requests for Information (RFIs), and act as an interface between the Contractor and the Owner.
   2. The Owner has retained the Consultant's services to observe the Work for general compliance with the Contract Documents and to ensure that the installation meets the design intent of the system.
   3. In summary, the Consultant will perform the following specific services during the construction phase:
      a. Review product submittals and shop drawings for general compliance with the contract drawings and specifications.
      b. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
      c. Interpret field problems for Owner, and translate into understandable language.
      d. Review the testing procedures to confirm compliance with industry-accepted practices.
      e. Oversee security works through interface with the Contractor and OAC meetings.
      f. Final commission testing and acceptance of all security related equipment.

1.10 DELIVERY, STORAGE AND HANDLING

A. Delivery
   1. Do not deliver products to the site until protected storage space is available. Contractor shall provide their own storage containers. Coordinate location and space requirements with the Owner prior to deployment.
   2. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.
   3. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels (name of the manufacturer, product name, type, grade, UL classification, etc.) intact.
   4. Replace materials damaged during shipping at no cost to the Owner.

B. Storage
   1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
   2. Comply with manufacturer's requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.
   3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
   4. Storage outdoors covered by rainproof material is not acceptable.
   5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
   1. Handle in accordance with manufacturer's written instructions.
   2. Damaged equipment shall not be installed.
   3. Replace damaged equipment at no cost to the Owner.
   4. Handle with care to prevent internal component damage, breakage, denting, and scoring

1.11 WARRANTY

A. Contractor shall provide a parts and labor guarantee on all Work. Unless otherwise specified herein, Contractor's guarantee shall be for a period of one (1) year from date of Acceptance, except where any specific guarantees from a supplier or equipment manufacturer extends for a longer time.

B. Contractor warrants that all Work furnished (material and labor) under this Contract will be of good quality, free from faults and defects, and in conformance with the Project Drawings and Specifications.

C. Warranty begins when system commissioning is completed, punch-list items resolved, and Owner provides in writing acceptance of system.

D. The warranty package shall include but not necessarily be limited to the following:
   1. Emergency maintenance service on a regular working hour basis.
   2. Service by factory trained and employed service representatives of system manufacturer.

E. Maintain regular service facilities and upon incident request, provide a qualified technician's response within four (4) hours of receipt of a notice of malfunction including weekends and holidays. Provide material, devices equipment and personnel necessary for repairs. Install approved temporary, alternate equipment if required by the Owner, complete and operational within twenty-four (24) hours after notification of a malfunction, at no additional cost.

F. Conduct warranty repairs and service at the job site unless in violation of manufacturer's warranty; in the latter event, provide substitute systems, equipment and/or devices, acceptable to the Owner, for the duration of such off-site repairs. Transport warranty substitute and/or test systems, equipment, devices, material, parts and personnel to and from the job site at no additional cost.

G. Guarantee shall not cover any damage to material or equipment caused by misuse, unauthorized modification or repair by TRI-CITY MEDICAL CENTER, or acts of god.

1.12 MAINTENANCE PROPOSAL

A. Contractor shall provide a proposal for maintenance services during year 1, year 2, and year 3. Each year shall be proposed as its own line item for consideration by the District.

B. Maintenance proposal constitutes Additive Alternate 3 for pricing.

C. Maintenance shall include:
   1. Monthly system health inspection and report submission to include review of any software system error logs, review of storage drive health, and all monthly manufacturer recommended checks.
   2. Quarterly camera inspection for material obstructions and dome clean up. Review of camera views and re-focus if needed.
   3. Quarterly random access control device triggering and testing to confirm card reader and door contact operability (Min. 10 random card readers per floor, per site).
   4. All manufacturer recommended maintenance items.
   5. Full system commissioning near the completion of the year to test all devices and cameras for operability.

PART 2 - PRODUCTS

2.1 NOT USED – REFER TO ADDITIONAL SECURITY SECTIONS FOR PRODUCT DETAIL

PART 3 - EXECUTION

3.0 EXAMINATION

A. Verify existing conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. Verify that all penetrating elements and supporting devices have been properly installed, and that all temporary lines, and markings, have been removed.

3.1 PREPARATION

A. Staffing
   1. Provide a qualified foreman in charge of the work at all times and be present at the job site during the installation of the work.
   2. Provide a supervised work force capable of performing the installation within the restraints of the construction schedule.
   3. Site work hours for this project are 8:00 a.m. to 5:00 p.m. Monday through Friday, with the exception with Jonas Salk and Child Care area. Coordinate those work hours to be outside of when students are in the building.
   4. Work to be performed outside of these hours must be approved in advance by the Owner.

B. Project Management
   1. Prepare an overall construction schedule based on the results of the planning meetings with the Owner.
   2. Prepare updated schedules whenever there are modifications. Coordinate and attend weekly status meetings to review the overall progress and issues to be resolved throughout the course of construction. The Contractor is responsible for preparing and distributing meeting agenda prior to and meeting notes after all meetings in a format acceptable to the Owner.

C. Safety Program
   1. The Contractor shall furnish to the Owner, the Owner's Representative and the project General Contractor three (3) copies of the Contractor's published safety program
   2. All associates working at the site must comply with all safety requirements including but not limited to site safety training and certification programs conducted by the General Contractor.

3.2 INSTALLATION

A. Perform this work in accordance with acknowledged industry and professional standards and practices and the procedures specified herein.

B. The work shall be performed by skilled installers under the direction of experienced technician, all of whom shall be properly trained and qualified for this work.

C. A complete, operating system shall be provided. Include all devices specified including basic components and accessories, interconnecting wiring and other equipment and installation devices necessary for a complete system as specified.

D. Provide wire, system cabinets, system devices, etc., shall be in accordance with applicable codes for systems as specified. Label all wiring and equipment.

E. The control equipment and wiring shall be installed in a neat and workmanlike manner by trained mechanics or electricians.

F. Auxiliary and incidental equipment necessary for the operation and protection of the systems specified in this section shall be furnished and installed as if specified in full herein.

G. Install the Security System with the full support of the manufacturer of the system components.

H. Coordination
   1. Maintain a competent supervisor and supporting technical personnel, acceptable to the Owner during the entire installation. Change of supervisor during the project shall not be acceptable without prior written approval from the Owner.
   2. Communications between the Contractor and the Owner, the Owner's Consultant and the project General Contractor will be frequent and necessary. Items discussed or agreed that involve interpretations to the plans or specification, methods of installation, or clarification must be confirmed in writing. Verbal agreements not confirmed in writing on documents acceptable to the Owner shall not be binding.
   3. The Contractor shall maintain at the site a complete set of all specifications, drawings and submittals in accordance with the Contract Documents.

I. Boxes, Panels, and Enclosures
   1. Install all boxes, panels, and enclosures square and plumb. Set all "flush mounted" units so that the face of the cover, bezel or escutcheon shall be in the same place as the surrounding finished surface. Mount boxes, panels and trim so that there are no gaps, cracks or obvious lines between the trim and the adjacent finished surface and ready them to receive final finish, as applicable.
   2. Install insulating terminations in signal circuit boxes, panels, wire ways or enclosures of this section.
   3. Provide key locks on all enclosures that are accessible and below the ceiling.
   4. Provide tamper switches on all enclosures that are accessible and below the ceiling.

3.3 REPAIR / RESTORATION

A. Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement.

B. Punch List:
   1. Inspect installed work in conjunction with the General Contractor or Owner and develop a punch list for items needing correction.
   2. Provide punch list to Owner or Owner representative for review prior to performing punch walk with the Owner's Representative.

C. Re-Installation:
   1. Make changes to adjust the system to optimum operation for final use. Make changes to the system such that any defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.
   2. Repair defects prior to system acceptance.

D. Rejected Work:
   1. Promptly correct all Work rejected by the Owner, as defective or failing to conform to the Contract Documents and the site specific Drawings. This shall apply whether observed before or after acceptance and whether or not installed or completed.
   2. The Contractor shall bear all costs of correcting such rejected work. Cost of work corrected after acceptance shall be fully covered under Contractor's warranty.

3.4 TRAINING

A. Contractor shall provide complete operator and administrator training on the Unified Security Platform. Training shall consist of twenty hours of classroom instruction for the people selected by Tri-City Medical Center, Hands-on training shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.

B. Training shall be by engineers or technicians highly skilled in the systems installed and factory trained and certified by the manufacturer as qualified to train in the particular systems.

C. Training focus:
   1. Operator Training: Main focus shall be on day-to-day operations specific to TRI-CITY MEDICAL CENTER. TRI-CITY MEDICAL CENTER anticipates this will be the most used method and users need to be trained to allow proper level of comfort and system familiarity.
   2. Administrator Training: Main focus shall be on the administrator tasks specific to TRI-CITY MEDICAL CENTER, to allow system administrators to be familiar with the tasks they would utilize.

D. Provide twenty (20) hours of scheduled training for the equipment provided under Division 28, including programming, operation, service, and maintenance.

E. Training shall be conducted at dates and times as directed by the Owner.
   1. Provide proposed training schedule and syllabus for review and approval prior to beginning any training.
      a. Coordinate with TRI-CITY MEDICAL CENTER while composing proposed schedule.

2. Training will be provided over multiple sessions at multiple locations as needed to accommodate the dates and times and attendees as directed by the Owner.
3. The initial default distribution of training sessions shall be conducted as ten (10) 2-hour sessions subject to approval by the Owner.

F. Training sessions shall be shall be provided in a “train the trainer” model as well as in sessions for general users.

G. Documentation of completion of training shall be delivered to and verified by the Owner prior to release of retainage.

H. Training shall cover all operating features of the system, including the following:
1. System set-up and cardholder database configuration.
2. Access control features.
3. Alarm monitoring features.
4. Report generation and searches.
5. Card management and Badge Design/Printing
6. Disk backup procedures
7. Routine maintenance and adjustment procedures.
8. Camera call-up
9. Video search, storage, extraction, and backup
10. Adding, removing, updating users

I. Provide hardcopy and softcopy training materials to turnover to all attendees for all training sessions. Training material handouts should include, at a minimum, Operation & Maintenance (O&M) Manual which includes the final Product Data and “As-Built” Record Drawings as described in PART 1 SUBMITTALS.

3.5 FINAL DOCUMENTATION

1. Quantity: Furnish two (2) O & M Manuals and record drawing sets.
2. Format:
   a. Furnish each O & M Manual in a white, 3-ring binder with front cover and spine clear pockets for insertion of the project information as well as digital format.
   b. Clearly label the cover of each O & M Manual with the following information:
      1) Client Name.
      2) Project Name and Contract Numbers.
      3) Project Name and Address.
      4) Manual Name (e.g., “Operation And Maintenance Manual for ACAMS System).
      5) Date of Submittal. Format: <month> <day>, <year> (e.g., “January1,2008”).
      6) Contractor Name.
   c. Include a Table of Contents at the beginning that lists the contents.
   d. Include tabbed separators for improved navigation through the manual.
3. Content:
   a. Functional Design Manual: Includes a detailed explanation of the operation of the system.
   b. Hardware Manual which includes:
      1) Pictorial parts list and part numbers.
      2) Pictorial and schematic electrical drawings of wiring systems, including devices, control panels, instrumentation and annunciators.
      3) Telephone numbers for the authorized parts and service distributors.
      4) Include all service bulletins.
   c. Operator’s Manual which fully explains all procedures and instructions for the operation of the system and includes:
      1) System start-up and shut down procedures.
      2) Use of system.
      3) Equipment recovery and restart procedures.
      4) Reader command functions
   d. Maintenance Manual which includes:

1) Instructions for routine maintenance listed for each component and a multi-page summary of all components' routine maintenance requirements.
2) Detailed instructions for repair of the security system.
3) A summary of the TCP/IP address used and which system component they are associated with. Include the gateway address, subnet mask, DNS server, and host name information.
4) Manufacturer's warranty certificates.

e. e.Record Drawings Manual: 11"x17" prints of Record Drawings, as described above. Provide one Record Drawing set per panel location.

B. Re-submittals: Include a cover letter listing the action taken and revisions made to each product submittal in response to Submittal Review Comments. Re-submittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the re-submittal package.

END OF SECTION

SECTION 280800 - SECURITY SYSTEM COMMISSIONING

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Section Includes

1. General: Furnish engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working Access control and Video Surveillance System installation as described in these specifications and shown in detail on the drawings.

B. Base Bid Work

1. Full testing of completed security system which includes:
   a. Complete pretest of the security system
   b. Final walk test with the Owner
   c. Test Results Record Documentation

1.2 RELATED SECTIONS:

A. Consult all other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to test a complete and operable system.

B. Section 280500 Common Work Results for Electronic Safety and Security

C. Section 281300 Access Control & Alarm Monitoring (ACAMS)

D. Section 282300 Video Surveillance Systems

E. Coordinate door hardware with the Division 8 Hardware contractor.

F. Coordinate all electrical power and conduit requirements with the Owner. All security systems shall be on a dedicated security designated branch circuit, unless otherwise approved by the Owner.

G. General and Supplementary Conditions: Drawings and general provisions of Contract ad Division 1 of the Specifications, apply to 28xxxx series Sections.

1.3 SUMMARY OF SYSTEM COMMISSIONING ACTIVITIES

A. Overview

1. The purpose of system commissioning is to ensure the security system operates properly when it is needed most. Security systems are very complex from both equipment and programming standpoint, and thorough testing is necessary to ensure correct operation.
2. Perform testing activities when the system is “quiet” and the building is generally unoccupied. This will minimize the amount of irrelevant activity in the system activity reports that will be used as a record of the pre and final test results
3. Contractor shall provide follow-up commissioning at 30 and 90 days after installation completion to verify they all components are working as intended and storage is working per the programmed parameters.

B. Pre-Test

1. Perform a 100% pre-test of all system aspects to verify correct operation prior to scheduling the final test. The pre-test will help to make the final test run smoothly when demonstrating the system’s operation to the Owner.
2. Document the results of the pre-test using the approved test forms and submit a copy to the Owner along with the system activity reports.

C. Final Test

1. Perform a final test of the system in the presence of the Owner to demonstrate correct operation of the security system.
2. Recommendation for acceptance by the Owner's or the Owner's Representative will be generated if all of the following conditions have been satisfied:
   a. All items conform to the plans and specifications.
   b. All previous deficiencies or errors have been corrected.
   c. All deficiencies noted during the final test are corrected.
   d. All systems are complete and working according to the intent of the Contract Documents.
3. If deficiencies still exist, recommendations for acceptance will be withheld or qualified until all items have been corrected and re-inspection is completed as outlined above.
4. Final acceptance will not occur, even if all systems are acceptable, until all documentation to include as-built drawings and operation/service manuals have been received, reviewed, and approved by the Owner or the Owner's Representative.
5. The warranty/guarantee period shall commence once final testing of the system has been completed, all manuals and documentation have been reviewed and approved, and the Owner has accepted the system in writing.

1.4 SUBMITTALS

A. Submit in accordance with the requirements of Section 280500: Common Work Results for Electronic Safety and Security, the following items:
   1. Sample Test forms
      a. Provide sample test forms that will be used in the pre and final system tests.
      b. Test forms shall include all items to be tested per part 3 below.
      c. Sample Test forms shall be provided prior to contractor conducting pre test.
   2. Operation and Maintenance Manuals: Submit the following for review and comment at the completion of the project and **before final testing occurs**:
      a. Functional Design Manual
      b. Hardware Manual
      c. Software Manual
      d. Operator’s Manual which fully explains all procedures and instructions for the operation of the system and includes
      e. Maintenance Manual
      f. Test Results Manual, which includes the document results of all tests, required under this Specification, organized by System, Floor, and Door.
      g. Record Drawings Manual
   3. Record Drawings:
      a. Submit for review and comment at the completion of the project:
      b. Final acceptance will not be made until the record drawings approved by the Owner.

1.5 QUALITY ASSURANCE

A. General
   1. All testing work shall be completed in a neat, high quality manner acceptable to the Owner.

B. Project Management and Coordination Services
   1. Provide a project manager to coordinate the security system commissioning work with all other trades.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.0 SCHEDULING

A. Prepare a construction schedule for the testing activities. Prepare updated schedules whenever there are modifications.
   1. Approved Substitutions: Due to the presence of an existing system that will share database information with this project, no substitutions will be considered.

3.1 TESTING REQUIREMENTS

A. Site Tests
   1. Perform a 100% pretest of the system prior to final testing by the Owner. The pretest must occur prior to substantial completion of the system, with the final inspection no later than seven (7) days prior to final acceptance in order to meet the Owner's timetable for systems familiarization.
   2. The Contractor shall include the cost of these tests and adjustments in his bid proposal, and shall furnish all equipment necessary and perform all work required to determine or modify the performance of the System in accordance with the Contract Documents.
   3. At the conclusion of the work on a floor, test the system on that floor to verify proper operation and reporting of devices.
   4. Work with the door hardware supplier to resolve any electric hardware failures and door alignment/closure problems.
   5. At the completion of all work, test the entire system to verify proper operation. These tests shall include:
      a. Card Reader Door Test: Test doors to ensure alarm contact provide alarm activation and relock when closed, rex shunts door and command card reader bypasses alarm inputs for area when applicable.
      b. Card Reader/ADA Test: Test doors according to card reader test above. In addition, test ADA push plate interlocking function to ensure door does not operate when locked. Test that interior ADA actuator always functions.
      c. Door Contact Test: Test doors to ensure local alarm, activation and deactivation of alarm output, door held open alarm, access control panel tamper switch detection, etc..
      d. Emergency Button Test: Test help button devices to ensure activation and alarm reporting.
      e. Security Equipment Room Test: Inspect all system panels, power supplies, and other related security equipment located in these areas. Test AC, Battery, and communications loss.
   6. Recommendation for acceptance will be generated if all of the following conditions have been satisfied:
      a. All items conform to the Contract Documents and the site specific drawings and statement of work.
      b. All previous deficiencies noted during the final inspection are corrected.
      c. All systems are complete and working in accordance with operational criteria.
      d. All documentation and submittals required by the Contract documents and the site specific drawings have been received and approved by the owner.

B. Test Preparation
   1. Provide device identification numbers that differ from or were not included on the original contract drawing set.
   2. Furnish a complete systems point list.
   3. Include both new locations and existing locations that have new readers installed in the testing and commissioning process.

4. During testing, provide a minimum of one technician familiar with the installation to assist with the test.
5. Furnish radios for use by the Owner during testing.

3.2 TEST PROCEDURES

A. CARD READER DOOR
1. Verify that the reader LED is in the RED state with the door closed.
2. Check to see if door is locked.
3. Present an invalid card. Reader should beep and not unlock door. An invalid card alarm will be generated in the access control system
   a. Biometric reader will turn red and not unlock door. No alarms will occur in system
4. Present a valid card / finger. Reader LED should flash green and red during the unlock time. Unlock time should be set to 5 seconds.
   a. Biometric reader will turn amber. Presenting a valid finger the LED turns green.
5. Open door and hold open until a held open alarm is generated.
6. Test for forced open. On a double door always check both leafs for forced.
7. Egress out the door and make sure you don't get a forced. On double doors exit out both leafs separately to ensure that both doors have a REX signal.
8. Verify the door has a door closer.
9. Open the door let it close on its own. Make sure that the door properly locks. If there are adjustments to be made make a note.
10. Note if there are any door stops installed. Note if there are any and recommend that they be removed.
11. Verify that card reader is labeled.
12. Verify that camera trigger is set up in the access control system.
13. Verify card reader mounted properly and with sound construction methods.
14. Verify any exterior card readers are rated for the application and sealed.
15. Verify all mullion mounted card readers are mullion mounted form factor readers.

B. DOOR CONTACTS / CABINET TAMPER SWITCHES
1. Open door. Alarm is generated by access control system.
2. Close door. Alarm remains until acknowledged.
3. Acknowledge the alarm in the access control system.

C. ACCESS CONTROL PANEL TESTS
1. Verify installation is clean, neat, and per design
2. Verify device cables and panels are labeled.
3. Verify that panels are grounded to Earth Ground.
4. Identify Power Source type:
   a. Normal
   b. Emergency
   c. UPS
5. Identify Power Circuit Information:
   a. Power Panel #
   b. Breaker
   c. Location
6. Verify Batteries are connected if wall mounted. If not wall mounted ensure panel is connected to UPS.
   a. Quantity
   b. VDC
   c. AH
7. Validate battery fail alarm.
8. Configuration Communication Functional?
9. Verify that primary communications are functional.
10. Validate panel tamper alarms work upon opening and closing of Equipment racks or wall mounted
11. Verify key locks are installed.

12. Verify 110VAC is hardwired (wall mount applications only)
13. Verify network drop is secured inside locked enclosure.
14. Verify fire relay is installed and test.
15. Verify enable learn mode.
16. Validate the following:
    a. Supports Card Usage Remaining
    b. Support Disabling Door Alarms
    c. Support Extended Triggers
    d. Supports User Initiated Door Times
    e. Anti-Pass Back Set

D. CAMERAS AND VIDEO MANAGEMENT SYSTEM TESTS
1. Verify installation is clean, neat, and per design.
2. Verify cables and patch panels are labeled.
3. Verify all exterior cameras are weatherproofed and sealed.
4. Verify all camera views are as intended and all feeds can be seen at the client workstation and video wall, if applicable.
5. Verify cameras are storing correctly at the NVR.

E. SYSTEM TEST
1. Log on Test
2. Log Off Test
3. Role-based log on Test
4. On/Off Line Test Via Monitor
5. On/Off Line Test Via File Server
6. Comm Fail/Comm Return Test
7. Primary Communications Test
8. General System Control Test
9. (Dates, Passwords, Schedules, Etc)
10. Alarm Test (Including Silence and Acknowledge)
11. Display Screen Graphics on Alarm Test
12. Input Response to Alarm Test
13. Remote Panel Supervision Alarms Test
14. Supervisory Alarms with/without Auto-Offline
15. Operator Access Level Test
16. Command File Test
17. Command File Scheduling Test
18. Linkage Test
19. Class and Card Assignments Test
20. Backup Database Test
21. Backup History Test
22. Generate Database Reports Test
23. Generate History Reports Test
24. Verify Graphic Map Test
25. Verify setup of single sign-on, active directory integration, and other owner required integrations are completes, as applicable. List each item on the Pre Test form.
26. Verify default passwords have been changed and provided to Owner

3.3 DOCUMENTATION

A. Provide an 11x17 drawing containing a detailed wiring diagram (layout of equipment/elevation, complete parts list, and a complete wiring diagram for each ACU & I/O Board) for each ACP. Fold the diagram and place it inside a clear plastic pocket affixed to the inside door of the ACP.

B. Provide a service log on the inside door of each ACP. Service log shall include columns for the following information: date of service, description of work performed, service technician(s), and service company. Place the service log inside a separate clear plastic pocket affixed to the inside door of the ACP.

3.4 DEMONSTRATION

A. On completion of the acceptance test, provide the Owner instruction in the operation and testing of the system, at a time convenient to them as defined in Section 28 05 00.

END OF SECTION

SECTION 281300 - ELECTRONIC ACCESS CONTROL SYSTEM

PART 1 -GENERAL

1.1 SECTION INCLUDES

A. Head-end Hardware and Software

B. Field Panels

C. Cards & Readers

D. Electric Locks

E. Request-to-Exit Devices

F. Wiring

1.2 SUMMARY

A. Labor and Materials: Unless otherwise noted in the Drawings and Specifications, the Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the Work.

B. Specification Language: Specifications and notes are written in imperative and abbreviated form. Imperative language of the technical specifications is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting “shall”, “shall be”, “the Contractor shall”, and similar mandatory phrases by inference. The words “shall be” is supplied by inference where a colon (:) is used within product specifications.

C. Drawings and Specifications:
   1. Contractor shall be provided a digital copy of the Drawing Set and Specifications for his use.
   2. Contractor shall carefully study the Drawings and Specifications, and shall at once report any error, unforeseen circumstances, inconsistency or omission upon discovery.
   3. The Tri-City Medical Center Project Manager shall be the interpreter of the requirements of the Drawings and Specifications, subject to the final approval of TRI-CITY MEDICAL CENTER.

D. Intent and Correlation:
   1. The intent of the Project Drawings and Specifications is to include all items necessary for the proper execution and completion of the Work.
   2. The Project Drawings and Specifications are complementary, and what is required by any one shall be as binding as if required by both.

E. At a minimum, contractor shall program all features typically used by this type of Owner as well as the items below:
   1. Link alarms with video from NVR for incident playback at locations where cameras are specifically viewing a related door (ex. door held open alarm pulls up associated video)
   2. Graphic site maps.
   3. Online archiving of history logs.
   4. Import existing staff database and access levels (credential information).
   5. Any additionally requested features included in this specification
   6. Role based logins described in the specifications
   7. System health reports, automated delivery
   8. Building schedules for access control system as well as room schedules where initially requested
      a. Contractor shall provide with the submittals a form listing all buildings and doors with card readers, requesting the Owner’s input for scheduling (hours system shall open/close doors) as well as doors that should be on “toggle” mode or other specific schedules.

1.3 REFERENCES

A. Submit the project and customer information of customers for at least three other projects of similar size and complexity using similar technologies.
   1. Shall include a minimum of the following:
      a. Customer Name
      b. Customer Point of Contact
      c. Customer Point of Contact Phone Number and email address
      d. Address of project
      e. Title of Project
      f. Type of project completed

B. Submit the technician certifications for the proposed access control system obtained or renewed within one year of RFP due date.
   1. Shall include a minimum of the following:
      a. Two installation technicians employed by the Contractor.
      b. One project manager employed by the Contractor.

1.4 DEFINITIONS

A. Industry standard words and phrases are used throughout the Drawings and Specifications, except:
   1. Words which have well-known technical or trade meanings are used in accordance with such recognized meanings.
   2. Whenever the following listed words and phrases are used, they shall be mutually understood to have the following respective meanings:

B. The words “as indicated.” means: as shown on the Drawings, and in accordance with the Specifications.

C. The words “as required.” means: as required to provide a complete and satisfactory Work in full conformance with the Drawings and Specifications.

D. The word “New” means: new Work to be provided by Contractor.

E. The word “Provide” means: furnish, install, connect, test and make ready for use.

F. The words “Relocate existing” means: remove existing item from present location. Reinstall, re-connect, and test existing item and make ready for use at new location as shown on the Drawings.

G. The words “Remove existing “means: remove existing item and return item to TRI-CITY MEDICAL CENTER**.**

H. The word “Replace” means: remove existing item and return item to TRI-CITY MEDICAL CENTER. Provide new item as indicated.

I. The word “Work”: The Work is the completed construction required by the Drawings and Specifications, and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

J. The word “Furnish” means: supply item as specified. Item to be installed by others.

1.5 CONTRACTOR DESIGN REQUIREMENTS

A. The Project Drawings represent the level of system design to be provided to the Owner. Contractor shall provide all additional system design work required, including:
   1. Conduit layout and sizing, based on best fit constructability and existing conditions.
   2. Wire and cable layout, based on the headend and endpoints shown on the drawings.
   3. Video storage, based on the requirements in the specifications
   4. Other detailed design work required.

B. Contractor's design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with NFPA 70: National Electrical Code, current version, unless local codes establish more stringent requirements.

C. Contractor's design work is subject to review and approval by TRI-CITY MEDICAL CENTER's Project Manager and Consultant.

D. Contractor's design shall also include:
   1. The addition of all wire, cable, conduit, connectors and junction boxes required for system operation.
   2. The installation of conduit between the control components and all equipment at each door, as necessary.
   3. Completed "as-built" documentation of all security systems, including documentation of existing equipment, wiring, conduits, and raceways.
   4. Other Work as defined within the Project Drawings and Specifications.

1.6 SYSTEM USER REQUIREMENTS

A. System Overview:
   1. The contractor shall provide and install a new integrated security management system that shall provide a simple and easy-to-use graphical user interface. The system shall provide local operational control of all access points and alarm sensors.
   2. The system shall carry FIPS-140-2 certification of appropriate parts of its communication encryption infrastructure, and the manufacturer shall provide the NIST certificate number confirming certification. Systems that do not carry FIPS-140-2 certification shall not be acceptable.
   3. The manufacturer of the proposed system shall have been producing access control products for at least 20 years and shall be ISO 9001 certified.
   4. The manufacturer shall be ISO 140001 certified indicating their commitment to conserve energy and reduce waste.
   5. The manufacturer shall supply, immediately upon request, a VPAT statement showing support for Section 508.

B. The manufacturer of the proposed system shall require resellers to pass a formal training program prior to being certified as authorized to sell and install the system. Such certification shall require annual re-qualification. The system integrator proposing the system shall be in possession of such a certification. Infrastructure and Connectivity:
   1. Local Sites and Buildings: The EACS workstations and controllers shall reside on the building Local Area Network (LAN) or network segment. Coordinate with the Owner on the provision of LAN ports and network rights.
   2. Enterprise: Local LAN networks will be connected to the campus LAN/WAN, to establish EACS connectivity between campus sites and the Command Center. Coordinate with the Owner on the provision of LAN ports and network rights.
   3. The EACS shall be based a microcontroller based system of intelligent controllers operating in a multi-tasking, multi-user environment and communicating with the access control server located in the Data Center.
   4. The SMS shall seamlessly integrate the functions of access control, alarms monitoring and response, digital video imaging, badge design/creation, and visitor management. Licenses for all of these items (except for licenses for individual cameras) shall be included as part of the base price of the proposal, and not as extra-cost options.
   5. All SMS user interface components shall run in an integrated application environment as part of a single application executable. Systems which provide their user interface through multiple separate applications programs shall not be acceptable, except as specifically indicated below.
   6. Language packages in at least 3 languages shall be available at no extra charge.

C. Required Role-Based Logins

1. Contractor shall program role-based log-in profiles. Final permissions for each profile shall be coordinated with TRI-CITY MEDICAL CENTER. Profile definitions shall be included in submittals for review and approvals. At a minimum the profiles shall include:
   a. System Administrator
      1) Description: Overall system super-user with access to all site cameras, alarms, and reports. This user's functions will include not only utilizing the system as a client but also making changes to the system as an administrator.
      2) Permissions:
         (a) Full system access including viewing cameras of all sites across the entire video surveillance system and doors across the entire access control system.
         (b) Full system access for creating reports for devices and alarms across all sites.
         (c) Full administrator rights/permissions for adding and removing cameras from the system.
         (d) Full administrator rights/permissions for adding and removing access control devices from the system.
         (e) Full administrator rights/permissions for updating access control schedules.
         (f) Full administrator rights/permission for editing user groups and assigning users to groups.
         (g) Full administrator rights/permissions for exporting images and footage (watermarked as well as clean).
         (h) Full administrator rights/permissions for creating access control badges.
         (i) Additional system rights/permission as assigned by TRI-CITY MEDICAL CENTER Project Manager.
      3) Example user: Emergency Preparedness and Security Officer
   b. System General User
      1) Description: Overall system user with access to all site cameras, alarms, and reports. This user's functions will include only utilizing the system as a client.
      2) Permissions:
         (a) Full system access including viewing cameras of all sites across the entire video surveillance system and doors across the entire access control system.
         (b) Full system access for creating reports for devices and alarms across all sites.
         (c) Full user rights/permissions for updating access control schedules. Full user rights/permissions for exporting images and footage (watermarked).
         (d) Additional system rights/permission as assigned by TRI-CITY MEDICAL CENTER Project Manager.
         (e) Example user: Security Captain
         (f) Site General User
         (g) Description: Site specific system user with access to assigned site cameras, alarms, and reports. This user's functions will include only utilizing the system as a client.
         (h) Permissions:
         (i) Full system access including viewing cameras of the assigned site and viewing access control activity of the assigned site.
         (j) Full user rights/permissions for exporting images and footage (watermarked) for the specified site only.
         (k) Additional system rights/permission as assigned by TRI-CITY MEDICAL CENTER Project Manager.
      3) Example User: Security officer at site and/or TRI-CITY MEDICAL CENTER site manager/director or designee
   c. Mobile User
      1) Role-based login shall dictate permissions for viewing system on mobile devices.
      2) Mobile users may be a site admin, system admin, or general users.
      3) Example User: Anyone assigned a role-bases login.

D. Required Access Control Hardware Features

1. The SMS intelligent database controller shall support a minimum of 20,000 cardholders with expansion capabilities of up to 1,000,000 cardholders. Retrofit controllers shall support a minimum of 200,000 cardholders.
2. The SMS intelligent database controller shall support a minimum of 12,000 offline transactions. The option to provide for at least 65,000 transactions storage at the panel must be available. Retrofit controllers shall support a minimum of 16,000 offline transactions.
3. The SMS hardware shall be comprised of modular components that connect over standard interfaces to one another. There shall be database storage and processing module (DBU), and once data has been downloaded to the DBU it shall locally make access control decisions. Access granted or denied decisions shall be made in under 0.5 seconds.
4. The DBU shall store firmware in non-volatile flash memory to allow for convenient updates through firmware update application. The DBU shall store the cardholder and configuration database information in battery-backed memory so that loss of primary power will not cause the loss of the database.
5. The SMS hardware shall be capable of expansion via 2-, 4-, and 8- door controllers (DC). Door controllers shall support one or more input/output module expansion cards and provide a minimum of 8 monitored input points or 8 auxiliary output points. Retrofit hardware shall support expansion via 2-door and 4-door controllers and/or 8-door controllers.
6. The DBU shall support configurations that include: 16 card readers, 96 monitored input points, or 96 auxiliary output points. Retrofit DBU's shall support configurations that include: 16 F/2F interface card readers, 8 Wiegand interface card readers, 64 monitored points, or 64 output points.
7. System must support the installation of readers at any distance from 3 feet to 500 feet from the reader interface board. Systems that do not support this requirement, or that require additional, separately mounted components to achieve the requirement shall not be acceptable. This requirement does not apply to biometric reader devices or Wiegand readers.
8. Each supplied reader shall be continuously monitored for tamper (reader removed from backing plate or reader removed from wall). Tamper detection switch must be part of the reader and fit entirely within the reader housing. Use of external tamper switches shall not be acceptable. This requirement does not apply to biometric reader devices.
9. When using the vendor's proprietary readers, each supplied reader shall be actively and continuously monitored for communications loss by the SMS hardware. This monitoring shall consist of a two-way Poll-Response mechanism that insures the integrity of all signaling including LED and LCD (if equipped) data paths. Systems utilizing uni-directional "heartbeats" or not including active, continuous monitoring of reader communications shall not be acceptable. This requirement does not apply to biometric reader devices or Wiegand readers.
10. When using the vendor's proprietary readers, the SMS shall optionally annunciate door forced and held conditions using the reader's onboard sounder, Systems that do not offer this behavior, or that require additional wiring, use additional relay outputs, or require external sounders to accomplish it shall not be acceptable. This requirement does not apply to biometric reader devices or retained legacy readers.
11. The hardware shall be made with a lead-free manufacturing process to meet RoHS requirements.
12. Network Communications
    a. The first field panel in a chain of panels shall have the ability to communicate with its monitoring client PC over the local or wide area network. This shall be achieved by the addition of a network interface option module (except in the case of retrofit controllers) and provide a cost effective alternative configuration to a direct connection via a client PC's serial port. The network interface shall support "10 base T," "100 base TX," and "1000 base TX" (10/100/1000) communications speeds. The network interface shall support encryption utilizing AES algorithm.
    b. Retrofit controllers shall include a DBU integrated 10/100 Ethernet port with switchable AES (128 or 256 bit) encryption.
    c. An optional modem and telephone line shall be configured to provide an alternative path for the reporting of alarms in the case of unavailability of the network. The fallback to dial-up alarms reporting shall be automatic in the event of detecting a network communications failure.

13. Elevator Control
    a. The system shall have the ability to provide elevator access control by (1) using a card reader to activate the elevator call button, (2) using a card reader in the cab to activate the correct floor selection button, or (3) a combination of both of these functions. The system shall have special field panels specifically designed to handle inputs and outputs used to interface with the elevator controls.
    b. The panels specifically designed for elevator control shall support either a single elevator cab for up to 64 floors, or up to 4 elevator cabs for up to 16 floors each.
    c. Each cardholder shall then have floor permissions assigned as part of the normal access rights. The system shall provide outputs to the elevator controls to uniquely verify which floors are authorized for each cardholder. The system shall be capable of tracking which floor was enabled/selected by that person.
14. Elevator Destination Dispatch
    a. The system shall provide a two way TCP/IP based software interface between the Security Management System and the Destination Dispatch elevator system.
    b. The system must accommodate one or more computer driven kiosks as each elevator landing lobby connected to a computer based elevator controller.
    c. The system must display a free or secure status icon for each landing served.
    d. The system must direct the passenger to the appropriate elevator car that was dispatched based on passenger's permission level.
15. Database Synchronization
    a. To ensure synchronization of the distributed controllers' databases with a region's main database an internal checking process shall be provided within each controller. In the event of corruption of a controller's local database then it shall be able to detect this condition and automatically request the relevant data to be downloaded from its local server. This action shall not require Operator intervention.
    b. The system shall continue to provide access control functionality during this re-synchronization process.
16. Door lock release relays shall be minimally rated for 3 A @ 30 VDC for non-retrofit controllers, 2A@30VDC for retrofit controllers.
17. Readers supporting various technologies shall provide data from card presentations or biometric authentications through a door control unit (DCU) that includes the electrical interface to the reader as well as inputs for door sensors and form C relays for outputs.
18. The DCU shall support Wiegand communications to the reader. In order to provide higher levels of security, the DCU shall also support bi-directional, supervised communications to the reader. Door controllers that do not support encryption and supervision of reader communications are not considered equal.
19. The system shall support an option to store cardholder biometric information (e.g. fingerprint or hand geometry templates) at the panel (as part of the cardholder record). Storage of the template data at the reader shall be unacceptable. This requirement does not apply to edge network or retrofit controllers. An acceptable alternative is to store individual templates on secure smart cards.
20. The SMS hardware (except retrofit controllers and connected legacy devices) shall support all of the following options for supervision of the monitored input points:
    a. 2-state supervision – in which only secured and alarm state are indicated.
    b. 3-state supervision – in which the input state can be secure, alarm or open circuit.
    c. 4-state supervision – supports secure, alarm, short circuit and open circuit states.
    d. 6-state supervision – supports secure, alarm, short or open circuit for the sensor in addition to tamper alarm and tamper short circuit states.
21. Retrofit Controller - Modular
    a. The Retrofit Controller shall utilize a pluggable backplane architecture allowing for new and retrofit upgrades of legacy systems.
    b. The Retrofit Controller shall be interoperable with all other SMS controllers using a single SMS head-end software system.

c. The Retrofit Controller shall include an on-board cardholder database with support for up to 200,000 cardholders and up to 16,000 transactions. The database shall be maintained in battery-backed non-volatile memory to ensure that the controller will continue to operate in the event of database server or network infrastructure failure.
d. Each Retrofit Controller shall support a combination of up to 5 card reader, input, and output pluggable modules to support up to 16 F2F or Supervised F2F interface card readers, 8 Wiegand interface card readers, 64 monitored points, or 64 outputs.
e. Pluggable F2F/Supervised F2F card reader modules shall support up to 8 card readers each, with a maximum of 2 modules installed per Retrofit Controller. The maximum wiring length between the Retrofit Controller and each F2F/Supervised F2F card reader shall not exceed 500ft. (152m), except in cases where existing, functioning legacy wiring and readers are being re-used, in which case this restriction shall be waived.
f. Pluggable Wiegand/ Supervised F2F card reader modules shall support up to 2 card readers each, with a maximum of 4 modules installed per Retrofit Controller. The maximum wiring length between the Retrofit Controller and each Wiegand reader shall not exceed 325ft. (99m), except in cases where existing, functioning legacy wiring and readers are being re-used, in which case this restriction shall be waived.
g. Pluggable Auxiliary Input modules shall support up to 20 monitored points each, with a maximum of 4 modules per Retrofit Controller.
h. Pluggable Auxiliary Relay modules shall support up to 16 relay outputs each, with a maximum of 4 modules per Retrofit Controller.
i. The Retrofit Controller shall provide an integrated 10/100 Mbps Ethernet interface with selectable AES (128 or 256 bit) encryption. Additionally, each Retrofit Controller shall support communications to the SMS via optional hard-wired external modem or RS232 protocols. Encryption for each supplied Retrofit controller, and for the SMS Host software if applicable, shall be included as part of the base price of the proposal, and not as extra-cost options.
j. Each Retrofit Controller shall support LAN/WAN communications for up to 31 additional downstream Retrofit Controllers via serial connection to minimize consumption of network resources. This downstream communications must utilize existing wiring and terminations. Systems requiring re-termination or re-wiring of downstream chains will not be acceptable.
k. The Retrofit Controller enclosure shall include an integrated pre-wired tamper switch and cover lock. The removable enclosure cover shall incorporate illuminated indicators allowing controller power, CPU status, and communications Status to be monitored without opening the enclosure.
l. The Modular Retrofit Controller shall be field-convertible between access control and elevator control functionality. This conversion shall be through settings in the host software, combined with installation of the proper I/O boards. Systems requiring a different controller type for elevator control shall not be acceptable.

22. Enclosures and Power Supplies
    a. All electronic circuits supplied, with the exception of retrofit controller or those which are PoE powered or within a client or server or recorder PC, shall be mounted on standoffs inside the manufacturer-supplied enclosures. All such enclosures must include a key lock on a hinged door, and must include a tamper switch to detect when the door is opened. Systems without key locking of enclosure doors or without doors which are both hinged and removable shall not be acceptable.
    b. All electronic circuits supplied for the access control system, except those which are PoE powered, are components of the retrofit controller, or are within a client or server or recorder PC, shall be powered through a manufacturer supplied 120VAC fully insulated isolating transformer. The transformer shall be mountable inside the supplied enclosure.

E. High Availability and Disaster Recovery
    1. The SMS shall support a variety of High Availability (HA) and Disaster Recovery (DR) solutions including:
        a. Fault tolerant servers for 99.999% rated availability
        b. Microsoft clustered server support for 99.99% rated availability

c. Remote redundancy through backup servers of general purpose nature or as in 1.6E.1.a and 1.6E.1.b synchronized through software monitoring the operation of the paired server.

2. To provide greater client software availability, software shall be installed so that in the event of a database server failure, client machines will quickly and without operator intervention, automatically connect to a standby server machine.
3. The SMS product shall be capable of supporting options for 99.99% and 99.999% availability.
4. The SMS product shall support a disaster recovery solution using off-site database replication.

F. Encryption

1. Encryption falls into two distinct areas, firstly between clients and their Server, secondly between client and local area network panels (LAN Nodes). LAN node links shall support AES encryption between the supervising client PC and its LAN Chains.
2. For client to server connections, the SMS shall support a solution using industry standard network cards supporting IPSec and 3DES encryption.
3. Web-based (thin client) SMS clients shall support SSL encryption.

G. Required Standard Software Features - The following software features shall be part of the standard product offering without requiring additional purchase or licensing:

1. The installation of the server and client software shall utilize a “wizard” interface to guide users through the appropriate installation steps.
2. The server and client software shall utilize a software-based licensing scheme. Systems requiring hardware based keys or dongles, except to store encryption keys, shall not be acceptable.
3. The SMS shall start up as part of the Operating System.
4. The SMS shall support a Graphical User Interface that minimizes training needs for even inexperienced users. The software shall include on line help displays to eliminate operator reference manuals.
5. It shall be possible to select any function, within a given Operators permission, independent of the currently displayed screen. Functions will be accessed via tool bar Icons, which will include Help prompts that will appear when the mouse pointer dwells on the selection button.
6. The SMS shall support an unrestricted number of hour’s definitions. An hour definition is a description of the times during a 24-hour period during which a function will be active. The system shall support a minimum of 10 intervals per hour definition.
7. The system shall support an unrestricted number of time codes. A time code is defined as a set of hour definitions – one assigned to each day of the week (including Saturday and Sunday) as appropriate, and assigned to the various types of holidays (exceptions) defined in the system.
8. The system shall support a minimum of 9 holiday types. A holiday type shall be assignable to an unrestricted number of dates on the calendar.
9. Operator Permissions
   a. System operators shall be associated with a log in Name and Password. A system option will determine whether strong operator passwords will be used. The minimum definition of a strong password shall be a password that contains at least one upper case character, one lower case character, one numeral and one punctuation mark, with a minimum password length of six characters. Additionally the password cannot contain any full word of the operator’s username.
   b. The operator’s account shall be assigned to a role in the system. The role is a permission profile. This will determine the functions that shall be available to that operator when logged-on to the system. The system shall support an option to hide Personal Identification Numbers of cardholders when an operator is viewing a record.
   c. The system shall show each operator only features and options for which he or she is authorized. Features and options for which the operator does not have permission must be hidden or rendered inactive, with a visual indication; i.e.: greying out the selection.
   d. Card record data entry shall be divided into operator permission areas, allowing separate permission categories to be assigned for the viewing of personal data, ID badge printing and access right management.
   e. The SMS shall support an unrestricted number of operator accounts and operator roles.

f. The system shall store operator preferences based on logon information. This feature shall allow an operator to work with their preferred configuration independent of which workstation they occupy.
g. The system shall support an option to reset all window layouts to a pre-defined “Home Screen”.

10. Video Badging
    a. The system shall incorporate video imaging as a fully integrated function to customize access control cards by printing an identity badge directly onto the card. The badge design and image capture capabilities shall combine with the latest technology card printers to allow the production of an ID badge pass for each card holder at the time of registration.
    b. For each cardholder both a facial image and a signature shall be able to be captured, or imported, and stored as part of the card record. These images shall be captured from a supported USB webcam or standard CCTV camera connected to the computer via a Video Card supporting DirectX 8 (or later) or MCI format, or imported if available as a bit map or JPEG file. The system shall use data compression techniques to ensure efficient use of the available hard disk space to maximize the number of images that can be stored on the hard disk.
    c. System shall provide the ability to crop the image (live capture or imported from JPG, BMP, or WMF) to the desired area maintaining the proper aspect ratio.
    d. Additionally, a signature may be imported from a signature capture terminal connected to the system via an RS-232 com port or USB port of the client PC local to where the card is being issued.
11. Badge Design and Printing
    a. A comprehensive integrated badge design facility shall be provided as a standard feature of the software, with no separate licenses or license fees required to activate the feature. The badge designer must allow an unrestricted number of custom badge layouts to be defined then saved with a suitable description as a reference. This shall make full use of the card record details such as name, card number, inactive date as well as allowing personal data to be included in the badge design. Company logos shall be imported as bitmaps (BMP) or JPEG images to provide a personalized corporate appearance to the card.
    b. All elements incorporated into the design shall be able to be rotated.
    c. Each badge design shall contain either a single sided design or a double-sided design. Each side of the card shall also be designated as being blank, or magnetic stripe side, or smart chip side, to ensure the designer is aware of the available space where printing may be incorporated for each card combination. The badge designer function shall be capable of supporting portrait, landscape, standard and custom-sized card designs.
    d. When creating a new card record a badge preview screen shall also be included that displays the specific card’s details on the selected badge design to allow confirmation prior to requesting the badge to be printed.
    e. Each new cardholder record shall have the option to be flagged for future printing. Cards flagged in this manner shall be easily recalled at a later stage and processed for output to the printer in a single action. Selecting multiple cards for bulk printing shall also allow each card to be printed either with its specific badge design, as defined within each card’s record, or alternatively printed with a selected common badge design. Encoding of magnetic stripe cards shall also be included as part of the bulk printing process.
12. Identity Verification
    a. Identity verification shall include the ability to monitor up to 9 lanes; each lane shall comprise a single entry point.
    b. There shall be up to three live video camera views available per lane on the same window to verify that each card offered is in fact being used by the person to whom it was issued. (for monitoring vehicles approaching and arriving at the entry point of each lane for example).
    c. A method of granting access to the individual at each entry point with a single mouse click shall be provided.
    d. Each lane shall automatically display the stored image for a card when used at a reader.

e. The operator shall be provided with a means to quickly search cardholder records by name to manually compare and verify basic card information.
f. Each lane shall provide configurable cardholder information to be displayed when a card is presented at the entry point reader (for example card expiry date and personal data)
g. This screen shall provide manual operation of pre-defined commands as a means of rapid response to events for each lane.
h. Intercom station call and answer functionality shall be provided for each lane.

13. Report Generation
    a. Extensive history reporting shall be a standard integrated feature; and shall include the ability to review all system alarms, access control activity, and operator actions. These reports shall be made available for review via the operator's display screen, or to a printer, or to another disk media. Extensive sort parameters shall include by any of the "Personal Details" fields or Titles, for example by "Department", and only Names commencing with "SM*".
    b. The system shall support generation of reports detailing the system operation. The following reports shall be available in the software:
        1) Cards on site
        2) Hours on site
        3) Cardholders with access to each door
        4) Access rights of each cardholder
        5) System Configuration
        6) Scheduled and Conditional Commands defined
        7) System operator transaction history
    c. It shall be possible to replay video clips associated with events by directly interacting with the report as published to the computer screen.
    d. The system shall demonstrate the ability to export data, for example reports, to other standard office word processing packages such as Microsoft Word®.
    e. The system shall provide system management reporting, including detailed listings for all the operator actions and the current cardholder database for output to the display screen, printer or disk media.
    f. The system shall have the ability to save frequently used report configurations and associate them with a "Title". Such predefined reports shall be available from a list to simplify the report selection. It shall be possible to request these reports to run immediately or schedule them to occur at a specified date and time.
    g. Scheduled reports shall additionally have the option to be automatically repeated by specifying the number of days and reporting period to be included, for example a weekly report of Alarms to run at 10:30 am each Monday and including the previous 7 days of Alarms.
    h. The system shall allow custom reporting options by providing an interface to a commercially available 'off the shelf' reporting product, such as Crystal Reports. The interface shall present all database fields in a structured format, which does not require detailed knowledge of the database design and table relationships.
    i. History Reporting
        1) Extensive reporting shall be included to provide the ability to review all system alarms, access control activity and operator actions. These reports shall be available for review on the operator's display, to a printer, or to a file.
        2) Extensive sort parameters shall include any of the personal details fields of information such as by department, job title, vehicle registration, contractor company name or any other reference appropriate for each site.
        3) Frequently run report configurations shall be saved allowing them to be selected and run on demand, or scheduled to run automatically as required. When scheduled to run automatically this shall have the ability to be repeated.
        4) Total Hours Spent On-Site: This report shall provide a detailed audit of the arrival and departure times for cardholders and calculates the total time spent on site for the chosen reporting period. This report shall be filtered by any of the personal data fields of information associated with each cardholder.

5) Cards On-Site Reporting: This report shall provide a list of cardholders currently on the site. This may be for all persons within the site or just who, for a particular department or a particular contractor company, is currently present. The report may also be run to cover just a part of the site, for example, cardholders in a particular building or room.
6) Report Auditing/Archiving: The SMS shall have the option to automatically and without user intervention keep a separate archival copy of each generated report, whether the report is sent to screen, printer, or file. The archival copy must be generated at the time of each request and stored unmodified thenceforth. Systems that attempt to reconstruct the archival copy only when it is requested are not acceptable.

14. Clients
    a. The system shall support an unrestricted number of clients to suit growing enterprise requirements. The system shall provide the means for multiple operators to simultaneously administer the system from convenient locations connected via a local area network (LAN) or across a wide area network (WAN).
    b. Systems that operate on the SQL Express database server that restrict the number of clients shall be upgradeable to a fully unrestricted version of the software.
    c. Clients shall not use mapped drives for server connections.
    d. Clients shall not use UDP messaging.
    e. System shall support a minimum of two pc monitors per client. The system shall additionally store the last position and size of all open dialog boxes and screens upon exiting the application on a per operator basis. The next time the operator logs into the application, the screen positions shall be restored. Such operation shall be independent of which workstation the operator uses.
    f. The capability shall be provided to “lock” the window arrangement for each operator individually, such that each time they log on they have a fixed arrangement of windows that they do not have the ability to alter.
15. Addition of Cardholders to the System Database
    a. The system shall provide a means of assigning access control rights to each cardholder. Access control rights determine which access points are accessible to the cardholder based on date and time of day. The system shall support an unrestricted number of access rights.
    b. The software shall also provide an ALTERNATE set of Access rights to a cardholder on a temporary basis. The change may be initiated at any time by an authorized operator, or automatically between specified dates. This shall provide the facility of automatically changing a card’s rights between a specified date range, after which the card will revert to its normal Doors and Times. Alternate access rights shall be able to be configured for multiple date ranges.
    c. Each cardholder shall either be associated with standard door timings for door release, door open and door pre-held, or be given extended timings for disabled persons or someone who has to push a cart.
    d. Cardholders who have not used a reader for some time shall be readily listed to allow their card’s status to be reviewed. An additional feature shall allow cardholders to be automatically set inactive and therefore access denied should the card have not been presented at any reader on the system for a defined number of days.
    e. Cardholders shall be assigned an expiration date, and more specifically an expiry time, after which a card shall automatically become inactive and therefore be rejected at all readers on the system. To further simplify card administration, the system shall have the ability to be configured to automatically purge expired cardholder records after a configurable number of days from the date of expiration.
    f. Cardholders who have mislaid or forgotten their issued card(s) shall be provided with a means of temporary card assignment. All cards issued for the cardholder shall automatically be inactivated whilst the temporary card is active.
    g. The system shall allow for the definition of Access control rights to be associated with a badge design. Each user that selects that badge design shall be provided with the associated access control rights that can further be customized for the specific cardholder.

h. The system shall allow access control rights to be defined for a cardholder on a reader basis. A timecode will be associated with each reader as it is assigned to the cardholder's access control rights.
i. The system shall allow access control rights to be defined for a cardholder on a reader group basis. Reader groups are groups of readers. A timecode will be associated with each reader group as it is assigned to the cardholder's access control rights.
j. The system shall allow access control rights to be defined for a cardholder on an access code basis. An access code is a group of access control rights.
k. The system shall have a note field associated with each cardholder record. The note field shall be free form text and shall support a minimum of 256 characters. The note field shall further support the ability to attach a file (of any type or size) to the cardholder record.
l. When viewing a cardholder record the last twenty-five (25) valid door access transactions shall be displayed to help locate a cardholder.
m. A driver's license scanner shall be supported to simplify data entry of cardholder information. The scanner support shall include, at a minimum, the ability to automatically read, through optical character recognition, the most common fields from valid driver's licenses issued by all 50 states; and populate these fields into the appropriate user-defined personal data fields in the cardholder record.
n. The system shall support a field for assigning an approving official to the cardholder record that defines the individual who authorized the assignment of a credential. Approving officials shall have an associated validity period and image of their signature. As an option, the assignment of an approving official shall be mandatory.
o. The SMS shall allow the user to enroll biometric data as part of the cardholder enrollment process. The number of verifications to determine applicability of the enrolled biometric data shall be configurable.

16. Cardholder Details
    a. Cardholder information shall include first and last name, card number, PIN code and valid period to provide automatic expiration. Each cardholder record shall also incorporate at least 50 user-defined personal data fields, independent of user-defined fields for visitor management.
        1) PIN numbers shall be configurable from 4 to 8 digits in length.
    b. Data entry shall be simplified by remembering previous entries of personal data and allowing selection from a pick list to minimize repetitive typing when creating each cardholder's record. The cardholder database and the history log shall also be sorted by any of the additional fields of information making them a powerful tool for filtering data.
    c. Personal data fields shall support free entry text, picking an entry from a previously configured list, or picking an entry from an updatable list. Each of these entries shall further be categorized as a date, a time, general input, card inactive date or customized input. Each category shall support the masking of input data to assure data integrity. For instance, a date mask might look like "mm/dd/yyyy" to indicate that the date input should be a two-digit month followed by a two-digit day followed by a four-digit year all separated by the slash character. The mask shall be required for customized input.
    d. Personal data fields shall have the option of being configured as mandatory.
17. Locator
    a. This feature shall provide a quick method of locating cardholders by displaying the last 25 valid history events along with the time, date and access point used. This information shall be available for an individual or group of persons by name, card number or by personal data.
18. Card Watch Feature
    a. Any cardholder shall be easily tracked as they move around a large site by selecting card watch. As the person uses their access control card, the system shall have the ability to automatically notify the operator of the person's presence at each location.
19. Key Card Mode
    a. Key card mode authority shall be assigned to special cardholders, such as site key holders, and can be enabled on a per reader basis. This shall allow a person when vacating an area or building to change the reader's mode of operation from normal access control to Key Card Out operation.

b. When in this condition only persons with key card privileges shall gain access through the door, all non-key card users are rejected regardless of their card's current access rights.
c. This special feature shall be activated/deactivated by the key cardholder, using a card swipe followed by a special code entered via the reader's keypad.

20. Serial Device Interface
    a. The software shall allow the definition of ASCII commands to be sent out over a computer serial port (physical or virtual) or through the RS-232 interface of the DBU. These serial commands shall be available through the user interface as well as in the conditional logic described herein.
21. Automatic Holiday Override
    a. The software shall be programmed by the operator to recognize special or holiday dates, which in turn can be linked to operational changes in how the site is to be managed on these specific days. This feature shall notify a system operator of individual holiday dates up to seven days prior provides a useful check on the date's current validity. Multiple types of holiday dates shall also be provided so that partial days or early closing requirements on specific dates can be accommodated.
    b. Cardholder definitions shall be provided with the ability to add vacations in a quick and convenient manner. Dates and time periods shall be defined during which access is denied to all access points and an alarm generated if access is attempted.
    c. The SMS shall provide a calendar function to enable scheduling of events up to five (5) years into the future.
    d. The SMS shall provide the ability to schedule one-time events for up to five (5) years into the future.
22. System Partitioning
    a. The access point readers, monitor points, and auxiliary outputs shall be managed on a partition basis by simply defining which devices are to be included in a partition.
    b. The SMS shall be supplied with the ability to manage up to 64 partitions, and shall have an option to manage up to 999 partitions.
    c. Multiple private or public entities shall be able to share the system with database segregation for card records and ownership of readers, monitor point inputs and switching outputs dependent upon the operators assigned permissions. Each company partition shall allow for autonomous system administration, allowing partitioned card administration, reports, and alarms.
    d. Operator permissions shall be created and assigned globally or by the owning company. When created and assigned globally an Operator's password shall be associated with one or more companies.
    e. Alarm reporting shall be routed to a client located at the company owning the monitor point or reader and can be automatically redirected to a different PC at pre-programmed times and selective days of the week.
    f. Common areas, such as the main entrance, shall have the ability to be shared so that all companies may access these doors, even when different card customer/site codes have been configured.
23. Alarm Management
    a. Alarm and activity management must be handled in the same executable program as other access control functions such as cardholder management, badging, and hardware configuration. Systems utilizing a separate application for alarm handling shall not be acceptable.
    b. Alarms must be displayed in a separate window from (non-alarm) activity. Systems which display both alarms and non-alarm activity in a single window shall not be acceptable. It must be possible to display the alarm window, the activity window, or both at any time.
    c. The Alarm window shall provide a method to filter alarms for all available alarm field parameters. Configured filters shall be saved per user with the option of sharing to all users. Filtered records shall be displayed in a separate view within the alarm window.
    d. The system must provide separate permissions for alarms and activity, and allow users to be individually granted rights to view and or process either, neither, or both. Systems which cannot separately grant privileges for alarms and for non-alarm activity shall not be acceptable.

e. Alarm handling shall be efficiently managed with up to 99 priority levels and user definable instruction messages to ensure the operator monitoring the site takes appropriate responses. The facility shall have the ability to customize audible alerts for each type of alarm is provided using standard or custom generated multimedia wave files. Each alarm type shall also be presented in a user-defined color.
f. To provide additional information when reviewing alarm signals, the operator shall either enter custom comments or simply select from a predefined pick list to provide a time-stamped record of all the actions taken throughout the incident. Predefined manual commands shall be uniquely assigned for each alarm, and readily activated by the operator via a command button provided on the alarm acknowledgement screen. Additionally automatic conditional commands shall be configured to automatically operate in response to any given alarm condition.
g. The SMS shall be optionally configured to require operator comments when acknowledging alarms.
h. The SMS shall support the ability to selectively choose alarms to acknowledge and/or clear.
i. Each alarm shall be configurable to have a specified color and sound.
j. Each alarm shall be capable of linking video from network video recorders (if applicable) for incident playback.
k. The Alarm Monitor screen shall provide an indication that cardholder information is available for a specific alarm. A “Card” button shall be available that when pressed will display the cardholder badge image.
l. Alarm monitor screen shall support the display of alarm statistics, shall provide up to ten alarm filters to be displayed in different tabs on the alarm screen, and shall provide the ability to sort based on each different column.
m. Each alarm shall be time-stamped in the local time zone (not the server time zone), and the system shall support the additional display of labels associated with different geographical time zones such as PST, EST, GMT, etc. The labels for time zones shall be customizable.
n. The system shall permit the routing and display of real time activity at any standard client machine. Activity shall be shown in a dedicated activity window that is updated automatically when new transactions occur. This option shall not be limited to routing transactions to one location and shall support the simultaneous routing and display of real time activity at multiple locations.
o. Alarms shall be capable of being routed to specific client machines by time of day or day of week.
p. Unacknowledged alarms shall be capable of being routed to alternate client (or Email – see Software Options below) based on age and priority of alarm.
q. The display of reader door alarms shall be automatically enabled or disabled by the use of timed commands, either by reader or by a group of readers.
r. The system shall support a generic ASCII input capability that allows the system administrator to define specific ASCII input strings as alarms to be displayed in the alarm monitoring window as well as on the graphical map interface if so configured.

24. Task Management
    a. A method to allow any ad-hoc or regular tasks to be completed by operators shall be provided.
    b. Tasks shall define actions to be completed by specific users, or any user with a specified user role.
    c. Each task shall be assigned a due date and time, if the task is not marked as completed before the due time is reached its status shall automatically change to ‘overdue’.
    d. The tasks selection window shall show all completed and uncompleted tasks, each task displaying subject, due date and time, the user name or role that the task is assigned to and current status.
    e. The tasks window shall provide filters for viewing task records and the ability to add new tasks, or open existing tasks (to mark them as complete or add comments for example).
    f. Tasks shall allow alarm generation when they become overdue or on the immediate creation of a new task.
    g. It shall be possible to add details to each task (for example, how to complete the task) and comments to facilitate management.

h. Tasks shall be configurable for re-occurrence (for example every Tuesday or every day). Once the task is completed a new instance of the task shall be created.
i. A means to attach files to tasks shall be provided.
j. Overdue tasks appearing in the alarm window shall be cleared by opening the alarm and selecting 'complete'. If the task is configured as 're-occurring' a new task shall be generated depending upon the settings in the tasks recurrence window tab.
k. Completed tasks shall be deleted automatically after the period specified by the 'Purge daily logs after' value configured for the SMS.
l. The number of unacknowledged task alarms shall be displayed in the SMS status bar along the bottom edge of the main window -a blue background shall distinguish them from system alarms.
m. The task Manager shall be a standard feature of the SMS with no separate licenses or license fees required to activate the feature.

25. E-mail Alarms
    a. The SMS shall support the ability to automatically e-mail alarm condition messages.
    b. Each alarm definition shall allow a destination e-mail address to be defined. The e-mail address may be an address group as defined in the e-mail MAPI application.
    c. E-mail alarm messages shall be controlled by time of day and day of the week. For example, e-mail to the Facility Security Supervisor would only be generated when alarms occur during after-hours times.
26. Graphical Site Maps
    a. To further enhance the presentation to the operator, the system shall have the ability to import and use graphical maps. Maps shall be linked together using a tiered tree structure. To speed the location of an incident, each map level shall contain a clearly visible indicator as to which sub map the operator should select next to find the device that is in alarm.
    b. Maps shall also have the ability to be configured to appear automatically on presentation of a new alarm, providing the operator with prompt visual indication that an alarm has occurred.
    c. The status of readers, doors, monitor points and auxiliary outputs shall be requested from any map by simply selecting the icon representing the device and its current state will be displayed.
    d. The icons on the graphic map shall dynamically indicate the status of the device they represent. For example, a door icon shall change to show the door open when the door position sensor indicates such, and shall change to the original icon when the door is again secure. Additionally, monitor points shall also change to show their current state.
    e. Should the operator wish to change the current setting, simply pressing the right mouse button shall cause the appropriate command options list to appear for selection.
    f. Having selected a command, confirmation shall be provided by reflecting the change in status on the display.
    g. Maps shall be created using standard office tools such as Paint® or drawing packages such as AutoCAD®. It shall be possible to import drawings in the following formats: JPEG, Bitmap, Windows metafile or DXF.
    h. Icons representing access points, monitoring points, switching outputs, alarm inputs, cameras or intercom call stations shall be placed on any map at the required location in a drag and drop manner.
    i. It shall be possible to define on the map the location of readers, access doors, alarm monitored points, output switching relays, cameras, intercom call stations and alarm panel devices. The map display shall allow the operator to switch the video display of any defined CCTV camera to any defined CCTV monitor. The map display shall allow the display of live and stored Digital Video Clips.
    j. It shall be possible to define on the map the location of reader groups and camera groups. Such groups shall be placed and appear as a single icon, but actions taken on them shall affect the entire group.
    k. It shall also be possible to change the status of readers, reader groups, floor groups, alarm monitored points or output switching relays and confirm the successful execution of such commands from the map display. This functionality shall be capable of being restricted per device based on operator permission.

l. The map display shall include the option to display a group of similar devices as a single icon. Once devices are grouped it shall be possible to change their status. For example, it shall be possible to unlock all entrance doors by executing a single command from the map display.
m. It shall be possible to display a device on any map, on multiple maps, or on no maps. It shall also be possible to display the same device in multiple locations on the same map. Systems that do not allow devices to be placed multiple times on the same or multiple maps shall not be acceptable.

27. Manual and Automatic Commands
    a. Operators shall be provided with a wide choice of manual commands embracing the control of readers, monitor points, output switching relays and door locking devices. Also the operator shall have the ability to check the status of single, or multiple devices. This shall ensure the operator is always able to check the operational status of the system and make any adjustments as requirements change. When graphical maps are utilized, status requests shall be simply initiated by “clicking” on the device icon within the map. This functionality shall be capable of being restricted per device based on operator permission.
    b. Automatic commands shall be included and may operate on a timed or event basis.
    c. Scheduled commands shall easily be defined linking complimentary commands to occur at the start and stop times of any chosen timecode.
    d. Event triggered commands shall provide an extremely powerful means of creating IF/THEN/WHEN associations encompassing a wide selection of IF conditions to the automatic execution of THEN commands subject to a WHEN timecode being active. A minimum of 10 THEN actions shall be available per trigger command.
    e. Devices shall be managed on a partition basis by grouping readers, monitor points and auxiliary outputs. This feature shall allow multiple devices to be actioned by a single command when using manual, timed and conditional commands. This functionality shall be capable of being restricted per device based on operator permission.
    f. The SMS shall support an unrestricted number of automatic (scheduled and trigger) and manual commands. These commands shall be capable of spanning across multiple field controllers.
28. Card Initiated Commands
    a. The software shall allow authorized cardholders to initiate powerful trigger commands manually from selected reader locations when certain models of readers are used in conjunction with the field panels.
    b. Up to 99 predefined commands shall be invoked by an authorized card allowing, for example, a patrolling guard to switch on outputs, disable monitor points, lock doors, providing remote management of the system during a patrol of the site.
    c. The system shall only permit assigned users to enter command codes at keypad readers. Such assigned users shall not be restricted as to when or where they can enter a command code – such restrictions may be placed on the commands themselves.
29. User Code Mode
    a. The SMS shall support the ability to put a keypad-equipped reader into User Code Mode. This feature shall allow a cardholder to gain access by entering a valid card’s number at a reader keypad, therefore not requiring the holder to carry a card.
    b. User code mode shall be enabled on a per reader basis.
    c. This mode shall support card number only, or card number and its assigned PIN code.
30. Visitor management
    a. Visitor Management shall be incorporated as a standard feature of software, with no separate licenses or license fees required to activate the feature. Operators shall be able to pre-enroll visitors using a Web (thin) or Standard (thick) client. The thin client shall connect to the server via Microsoft™ Terminal Services, Microsoft IIS Services, or similar web server, and Microsoft™ Internet Explorer or Google Chrome to permit any operator with visitor permissions assigned the ability to pre-enroll visitors without the need to install client software on their local machine.

b. Visitor Management shall be fully integrated with other key areas of the system, such as access, alarms management, muster and Video ID Badging. Visitor records shall have 50 personal data fields with user definable data titles independent from the personal data fields defined for cardholders. All visitor transactions and movements shall be recorded and may be reported on and filtered, using the extensive reporting capabilities of the software. Visitors may exist without being assigned a card number if access control is not required.
c. Data entry shall be simplified by remembering previous entries of personal data and allowing selection from a pick list to minimize repetitive typing when creating each visitor's record. The cardholder database and the history log shall also be sorted by any of the additional fields of information making them a powerful tool for filtering data.
d. Personal data fields shall support free entry text, picking an entry from a previously configured list, or picking an entry from an updatable list. Each of these entries shall further be categorized as a date, a time, general input, or customized input. Each category shall support the masking of input data to assure data integrity. For instance, a date mask might look like "mm/dd/yyyy" to indicate that the date input should be a two-digit month followed by a two-digit day followed by a four-digit year all separated by the slash character. The mask shall be required for customized input.
e. Personal data fields shall have the option of being configured as mandatory.
f. Visitor time of arrival and time of departure shall be tracked by the system. This feature shall be available even if a visitor is not issued a card or card number in the system.
g. It shall be possible to configure a reader to automatically inactivate presented visitor cards ready for reuse.
h. The system shall support a driver's license scanner including optical character recognition to ease data entry.
i. The SMS shall support capture of a business card image.
j. The SMS shall support the inclusion of a custom message for each visitor record.

31. Area Occupancy Monitor
    a. The system shall include the ability to monitor the occupancy of an area.
    b. Occupancy thresholds shall be configured for the maximum and minimum values, and associated with automatic conditional commands. These shall be used for applications such as to disable the entry readers when all the garage spaces are occupied and switch a garage full indicator sign on.
    c. Complementary commands shall also be provided to enable the entry readers and turn off the indicator as a vehicle leaves the garage. Similarly when the garage is empty, the lights could be automatically turned off.
32. Device Configuration
    a. The system shall support a notes field to be associated with each device configured on the system. The notes field shall be free-form text, and shall support a minimum of 256 characters. The notes field may be used for detailed device descriptions or for maintenance history.
    b. The system shall allow a unique set of arbitrary files of any type to be associated with each device.
    c. The system shall provide a hierarchical tree view of the system configuration supporting expansion and collapse of any and all branches.
33. History Archive and System Back up
    a. The system shall be capable of retaining at least 25 years of activity in its online log file, disk storage space permitting. Systems that require offline storage of historical events shall not be acceptable.
    b. The system shall allow on line archiving of history logs, along with database back up of system configuration and cardholder details. To further ease the burden of remembering to back up your system's database, this function shall be able to be automated to occur without intervention at a pre-set time.
    c. The system backup and history archive shall be to a local or remotely accessible UNC path.
34. Support for Smart Cards and Biometrics

a. The system shall have the integrated capability to capture at least two forms of biometrics – preferably fingerprint and hand geometry.
b. Any proposed fingerprint solution shall support the enrollment and use of at least two fingerprints, which shall allow the cardholder to present either finger to gain entry.
c. On a timed or manual basis the system shall be configurable to allow entry using the smart card only, smart card plus fingerprint or smart card plus two fingerprints, thereby raising or lowering the level of security as required.
d. The system shall allow the assignment of a fingerprint for normal entry and a different fingerprint for duress entry. The cardholder shall have the ability to trigger a silent duress alarm by presenting the duress fingerprint. This provides the cardholder with a safe way to indicate a duress condition, without alerting anyone locally that the alarm has been triggered.
e. An option to recall the fingerprint acceptance threshold from the smart card to override the threshold stored at the reader shall be provided. By recalling the threshold from the smart card, overall site security is not compromised by a poor quality fingerprint, which would normally require a low acceptance threshold to be set at the reader.

35. The manufacturer of the SMS shall make available documentation on Server Hardening, which shall, at a minimum, detail the TCP/IP ports that are utilized by the system to allow other ports to be closed.
36. Anti-Passback
    a. The system shall support both “hard” anti-passback and “soft” anti-passback alarm reporting modes.
        1) If the cardholder has access rights at a reader, but creates an anti-passback alarm, if the reader configured as hard anti-passback sends an anti-passback alarm and denies access to the door/portal.
        2) Soft anti-passback sends an anti-passback alarm, but still allows access through the door/portal.
    b. The system shall support timed anti-passback. The principle of timed antipassback is simple: once a card has been used at a timed antipassback reader, the card causes an anti-passback violation if it is used again at the same or another timed anti-passback reader within a predefined period of time. The exception to this rule is when the antipassback reader has been defined to be for an exit route. In this case, the card can be used at any time without causing an alarm or event. This allows for situations where a person enters an antipassback-protected area, then wishes to exit the area immediately, perhaps, for example, because he or she forgotten something.
    c. The use of an exit antipassback reader also causes the time delay for reuse of the card to be zeroed, so in the example, the person can re-enter the antipassback-protected area immediately, without having to wait. The delay can also be zeroed from the Card Holders screen or by means of an antipassback command. Sending a command may be useful if, for example, people have passed through an exit during a fire drill and the delay is long.
    d. The system shall support zonal anti-passback. In the case of zonal antipassback, the building needs to be partitioned into zones. For example, zone 1 may be the main lobby, zone 2 the computer room, etc. For each reader that is defined as a zonal antipassback reader, you can specify which zone of the building the card is going from and which zone it is going to. For example, the reader may allow a card to go from zone 1 (e.g. main lobby) to zone 2 (e.g. computer room).

e. The system remembers which zone each card is in and updates this information whenever the card is used at a zonal antipassback reader. An antipassback alarm or event is generated if the reader's from zone does not match the card's currently-recorded zone. For example, an alarm or event is generated if the from zone of the reader is zone 3, but the card is currently recorded as being in zone 1. If a card's currently-recorded zone and the actual zone get out of step, either because of some violation of the system (e.g. a person has previously climbed over a turnstile) or for a legitimate reason (e.g. a person has passed through a fire exit during a fire drill), some means is obviously required to bring the two back into step. This can be accomplished from the Card Holders screen or by means of an antipassback command. Both methods put the card(s) into a "neutral zone", so that the next transaction at an antipassback reader is always accepted without violation, and the reader's to zone becomes the card's new zone.

37. Elevator Control
    a. Each cardholder shall have floor permissions assigned as part of the normal access rights. The system shall provide outputs to the elevator controls to uniquely verify which floors are authorized for each cardholder. The system shall be capable of tracking which floor was enabled/selected by that person.

H. Required Available Software Options
1. Threat Level Manager Option
    a. The TLM option shall provide the ability to make system-wide changes by simply changing the threat level.
    b. The Threat Level shall be selected from one of five levels that can be labeled and defined by the user. Each threat level shall also have a specified color associated.
    c. The present state of the system threat level shall be visible from any view within the software.
    d. The system shall restrict the ability to change threat level to the appropriate operator(s).
    e. The system shall allow the configuration option to require the approval of two authorized operators to change the threat level.
    f. The ability to change the threat level shall be integrated into the site map by right clicking on an appropriate icon.
    g. The system shall automatically disable access rights for individuals that have a threat level threshold below the selected level. The same access rights will automatically be enabled when the threat level changes to a level below their threshold.
2. Digital Video Monitoring and CCTV Matrix Switch Control Option
    a. The software shall allow operator to view live video from network cameras and encoders, and playback recorded video from NVR systems. The same software option shall allow the system administrator to configure NVR and VMS systems from all supported manufacturers simultaneously. The software shall allow instant replay of recently recorded video from any digital video source.
    b. An operator with appropriate privileges shall be able to control supported CCTV matrix switchers in order to display any available CCTV video source on any available CCTV video monitor.
    c. When the system is integrated with a Network Video recorder or VMS, it shall be possible to recall and replay stored video clips associated with the selected alarm using the alarms management screen.
    d. Live video from any configured camera shall be available and viewed within the SMS by right-clicking on an appropriate map icon.
    e. The video components including, but not limited to, analog cameras, supported network cameras, supported NVRs, and supported encoders shall be included in management reports. Management reports are to include, at a minimum:
        1) A tree view of all devices configured in the system,
        2) Camera Configurations,
        3) User audit trail of changes such as Who sent What commands that affected configuration (i.e. frame rate changes),
        4) Reporting of trigger operations.

f. The video management module shall provide a graphical time and calendar tool for configuration of frame rate, resolution, pre-sets and other features.
g. Virtual Matrix
   1) The system shall provide a “virtual matrix” interface that shall contain:
      (a) Software PTZF controls (only displayed when appropriate cameras are selected),
      (b) Ability to view up to 36 video feeds per virtual matrix (including cameras connected to supported NVR, supported IP cameras, cameras connected to supported encoders, and other URL including web page or web interface to other devices),
      (c) Ability to select from at least 25 pre-configured screen layouts,
      (d) Ability to display active alarms in virtual matrix screen,
      (e) Ability to display real-time events in virtual matrix screen,
      (f) Provide a tree view of all cameras and other multimedia (such as web pages) configured in the system,
      (g) Ability to save screen configurations and to restore previously saved screen configurations,
      (h) Ability to perform a virtual guard tour by sequencing live video from various cameras into the main cell.
      (i) The system shall support multiple instances of the virtual matrix.
   2) The live video management screen shall display software pan/tilt/zoom/focus (PTZF) controls for those cameras that support such features through a software interface. The software shall also have a means of sending the PTZ camera to a pre-set position. At least 999 pre-set positions shall be supported by the Video Management software.
   3) The video functions (live video display, instant replay of recently recorded video, playback of stored video, and configuration of the video functions) shall be available to any operator (with appropriate privileges) on any workstation connected to the system.
   4) System shall provide (through graphical map interface or through the virtual matrix) a simple means for a guard or other operator to quickly initiate recording on a specific camera (if it were not otherwise recording).
   5) The system shall permit the operator to use drag-and-drop functionality to select cameras from the tree view of available sources and place them in desired positions on the virtual matrix. A double-click operation shall display the video feed from the selected camera in the next available cell.
h. Video Playback
   1) The system shall provide a video playback interface that shall support the following functionality as a minimum requirement:
      (a) Ability to replay up to four recoded video streams simultaneously in a 2 x 2 virtual matrix.
      (b) Ability to synchronize the video playback time of up to four recorded video streams.
      (c) A video playback time line will show the start and end time of the selected video stream
      (d) The video playback time line shall highlight any gaps in the selected video.
      (e) The video playback time line shall indicate in a different color any alarm activity that relates to the recorded video.
      (f) The video playback timeline shall show the alarm description and time when the mouse is positioned over the alarm in the timeline.
      (g) Ability to change the video playback speed to include the following options: 0.5x, 1x, 2x, 4x, 8x, 16x, 32x, 64x, and 128x normal speed.
   2) The video management module shall support still image capture and video clip export from the video stream.
   3) The video management module shall support the export of video clips to CD or removable flash memory for archiving and for off-line review. The archived data shall playback on standard video viewers such as Microsoft Windows Media Player or Apple QuickTime Viewer.
i. The system shall limit operator access to video based on individual permissions.

j. Events received from Intrusion Detection Systems, Access Control, or others shall be capable of triggering video recording, to stop video recording, to display live video in the virtual matrix (or otherwise modify the view of the virtual matrix), and to display video playback.
k. The system shall allow the programming of event-based triggers to cause:
   1) Live video from a named camera to be displayed in a particular cell of the virtual matrix,
   2) Live video from a named camera to be displayed in the next available cell of the virtual matrix,
   3) Reconfiguration of the virtual matrix display based on previously stored data,
   4) Playback of pre- and post-event video.

3. Data Connect Option
   a. The system shall provide an option to import and/or export both cardholder details (including facial images and signatures) and system alarm information to/from an external source. This option may be used to speed initial commissioning of the security management system's database, or in some cases, to allow synchronization with other employee management systems. This option may also be used to pass common data to other employee-related systems or databases. It shall be possible to manually start or schedule the data import. It shall also be possible to start the data import process from an external application, thus providing the means for real time import.
   b. The interface requirements shall be fully defined and support either a comma delimited ASCII text file or a Microsoft SQL® database import mechanism. Fully detailed supporting documentation shall be provided to enable a third party to design and implement this facility without needing reference to the system's manufacturer.
   c. Imported data shall reside in an intermediary table within the database until an integrity check can be applied to the data. Only after satisfying this test will data be included in the SMS data tables.
   d. The data connect option will be provided without extra charge for the Enterprise Edition SMS,
4. XML Developers Toolkit Option
   a. The system shall support the ability to send and receive commands to/from external web services through an XML interface, the XML Developers Toolkit. All operations through this interface shall be accompanied by a logon username and password that will be associated in the security management system with operator privileges, which will limit what, is permissible. The interface shall use standard security provided by web services.
   b. The XML Developers Toolkit shall support the import of cardholder details. An external software system may use web services, for example, to add new cardholders, delete cardholders, modify existing cardholder data, make cards inactive, and change access rights.
   c. The XML interface shall allow an external software system to obtain the details of cardholders that are already in the SMS database.
   d. The XML interface shall allow an external software system to view, acknowledge, and clear outstanding SMS alarms.
   e. The XML interface shall allow an external software system to send a command to a device already defined in the SMS (e.g. to open a door or display video from a network camera).
   f. The XML interface shall allow an external software system to view the status of an SMS device (e.g. to determine whether a door is locked or unlocked).
   g. The XML interface shall allow an external software system to import alarms from external equipment, such as intrusion systems.
5. Smart Card Encoding Option
   a. The system shall provide the ability to encode contactless smart cards with access control information. The system shall support encoding either Mifare or DESFire.
   b. The software shall support the Philips Pegoda, GemPlus, and the OmniKey CardMan contactless card readers for the encoding and reading of Mifare and Mifare DESFire cards.
   c. The system shall be capable of capturing fingerprint biometrics and storing them on a contactless smart card, which will then be read and used to verify the cardholder during an access control transaction.

d. Any proposed fingerprint solution shall support the enrollment and use of at least two fingerprints, which shall allow the cardholder to present either finger to gain entry.
e. An option to store the fingerprint acceptance threshold in the smart card or at the reader shall be provided. By storing the threshold in the smart card, overall site security is not compromised by a poor quality fingerprint, which would normally require a low acceptance threshold to be set at the reader.

6. Magnetic Stripe Card Encoder Option
   a. A magnetic stripe card encoder shall be included. This shall allow magnetic stripe cards to be encoded by the user on site. The existing cards shall have the access control data added onto either track 1 or track 2 of such cards.
   b. The system shall encode the high security encrypted Micromax format, or be used to encode custom formats to suit specialized requirements. When a custom format is defined, this shall also be used by the system to allow card verification for the access control function, should spare tracks not be available specifically for the access control requirement.
7. Guard Tour Option
   a. This feature shall allow Guard Tour patrol sequences to be created consisting of a number of designated clocking points, which the patrolling guard has to visit.
   b. A guard tour sequence shall define the order in which the clocking points are to be visited and also how long the guard should take to move between each clocking point location. A window of tolerance shall be included to add a +/- value to these timings.
   c. The system operator shall initiate the required guard tour patrol and declares the guard who is to undertake the tour of the premises. The system shall then automatically monitor the guards progress around the patrol tour, reporting alarms if the clocking points are either out of sequence, or the guard arrives too early, or becomes overdue. The operator shall be notified as each point is clocked to allow the guard's progress around the site to be monitored. A patrol tour shall be able to be suspended, if required, and will automatically resume when the next point is then clocked.
   d. Guard tour patrols shall be configurable on a per company basis when multiple companies are required on a site. Management reports shall be created from the history log to confirm when each guard tour was carried out, including any deviations or incidents during the tour.
8. Mustering Option
   a. The SMS shall support an option to generate a muster report. The muster report shows a list of people who may be in the building (or on the site), including visitors. It is intended to be used during fire or other emergencies to support the emergency services identifying who may be left in the building, and where they may be located.
   b. The muster report shall support manual or automatic operation. The report shall be initiated manually from the operator workstation or automatically when a monitor point is triggered. Once initiated, the report will regenerate automatically until there is no one left on the report or the process is manually stopped.
   c. The system shall send the report automatically to nominated printers or to the screen.
   d. The system shall support the use of muster readers at the muster points. As soon as a person makes a transaction at a muster reader he/she is removed from the report. A set of muster readers can be defined by assigning a reader group. The system shall automatically enable and places these readers into card-only mode when the report is started.
   e. Cards with a status of inactive, expired or not yet valid shall not appear on the muster report. Once made active, the cardholder or visitor must perform a transaction at an on-site reader to be included in the report.
   f. If a cardholder has more than one card, each card shall be reported individually.
   g. The muster report shall include the date and time of each person's last transaction and the name of the reader used. The report shall support the ability to be subdivided/sorted according to a personal data title. For example, by choosing a personal data title of Department in the Configure/Muster screen, the report can list people under their respective departments.

h. The muster report feature shall support a time delay between starting the report and the first report appearing on the printer or on the screen. This shall give the majority of people enough time to leave the building and reach the muster point within a safe period of time. Thereafter, the report shall be automatically repeated at regular intervals. As people make a transaction at a muster reader (or other off-site reader), each new report should list fewer people than the previous. Reports stop being generated automatically when there is no one to include on the report.
i. The muster report feature shall support a delay of the first generated report until fewer than a specified number of people are left to muster.
j. The SMS shall support monitoring of the progress of the muster by using the View/Muster screen. This screen shall appear automatically if the muster starts automatically from a monitor point. This screen gives an immediate view of the number of people left on site.
k. The SMS shall support the ability to reset the muster once the emergency (or drill) is over. Resetting the muster shall automatically, if so configured, put all cardholders who had mustered back into the on-site group such that everyone would be included in another muster report, should it be started immediately after the one being reset.
l. A muster reset shall allow the operator to choose whether to disable the muster readers automatically after the reset and whether to set all cards to neutral for anti-passback.
m. For partitioned databases, the SMS shall support a mustering report for each partition independently.
n. Musters shall be configurable for different areas of a site. It shall also be permitted for different areas to overlap, be entirely contained within other areas or to be completely separate.

9. Dial-In/Out Alarms Option
   a. The SMS shall support a dial-out (alarm transmission) alarms reporting capability. A complimentary dial-in (alarm receipt) capability shall also be supported. This option would be used, for example, when an alarms monitoring client is unmanned outside of normal office hours and alarms generated at these times to be copied to a central manned system located elsewhere not on the LAN/WAN.
   b. The alarm messages copied to the alarms-receiving (dial-in) site shall be the same as those displayed at the local (dial-out) site. However, the alarm instructions (as displayed when acknowledging an alarm) may be different.
10. Intercom Integration Option
   a. The system shall support a serial or other high-level connection to an intercom system. The intercom system shall be accessed by users through a call station; typically sited outside the building at doors, parking barriers, etc.
   b. Visitors or other personnel generally ask permission to gain entry at the intercom call stations. These are known as call requests. The SMS shall allow call requests to be answered and managed by using a dedicated screen within the SMS application - the View/Intercom Control screen. The screen shall list all outstanding call requests, and allow the operator to communicate with the callers using simple screen buttons. The screen shall contain a Command button that is associated with commands programmed for use with the intercom. Typically, the command is used to open a door or barrier for the caller.
   c. It shall also be possible to answer a call request by using the Connect button in the Acknowledge Alarms screen (if the call request is set up as an alarm) and from maps in the View/Maps screen.
   d. Various alarm and/or event messages shall be associated with the use of the intercom interface. These shall be included in transaction reports generated by the SMS.
11. Integrated Intrusion Detection Option
   a. The system shall offer an option for basic area arming, disarming, and status without the need for separate or additional panels or hardware.
      1) This option does not apply to SR series retrofit controllers.
   b. Integrated Intrusion Detection shall provide comprehensive control and status capabilities at the reader, including but not limited to:
      1) Display area status at the reader
      2) Allow cardholder to arm or disarm the system, depending on permissions
      3) Provide visual and audible indication of entry and exit delays

4) Automatically disarm an area upon valid access grant at any entry reader in the area

c. The system shall prevent access control readers from granting access while an area is armed, unless programmed to allow certain readers and cardholders to automatically disarm on valid access grant.

d. The system shall allow multiple, individually controlled intrusion areas to be defined on a single DBU. Systems that allow only one area to be defined per DBU shall not be acceptable.
   1) The system shall allow any intrusion keypad reader on a node to control any area defined on the node.

e. For panels that include integrated intrusion, facilities shall be provided to lock out host-based modifications to configuration and access.

f. In addition to native intrusion functionality, the system must also simultaneously have the ability to control the arming and disarming of external DMP XR500 Intrusion panels from the system's native intrusion keypads. Solutions that do not allow arming and disarming of DMP panel intrusion areas from the system's native keypad readers shall not be acceptable.

12. Re-use of existing door wiring
    a. The system shall allow the re-use of existing wiring to door monitoring and control apparatus, without modification, rewiring, or need for additional conductors, as follows:
       1) Reuse of existing door strikes, locks, etc., and associated wiring
       2) Reuse of existing door position sensor(s) and associated wiring
       3) Reuse of existing request-to-exit sensor(s) and associated wiring
    b. Support shall be provided for at least the following types of door connections:
       1) Discrete, home-run individual wiring of lock, door position sensor, and request-to-exit sensor
       2) Discrete, home-run wiring of door lock, but a single pair loop connection of both door position sensor and request-to-exit sensor, utilizing existing loop resistances to differentiate between possible states of those sensors.
    c. Systems requiring modifications or additions to the existing door wiring, end-of-line resistors, or door sensors shall not be acceptable. Systems not supporting BOTH of the preceding methods of door sensor wiring in a single system shall not be acceptable.
13. Intrusion Detection Panel Integration Option
    a. The SMS shall support a high-level (serial or network interface) to an intrusion detection system (IDS). The third-party IDS shall be UL 1076 listed. The SMS shall support events to be recorded and displayed from the IDS system on the alarm management screen and in the transaction history reports.
    b. The integration to the IDS shall support, at a minimum, secondary monitoring of all IDS alarm transactions while allowing it to still be monitored by a central station, if desired.
    c. The IDS integration shall also include the ability to arm and disarm the IDS from the SMS user interface. This feature may not be available with all IDS products.
    d. IDS alarms shall be capable of triggering a series of SMS events. For instance, when the IDS reports that the system was armed, the SMS shall be able to lock all doors.
    e. IDS alarms shall be viewable on the SMS map interface.
    f. The communication with the IDS control panel shall be monitored, and the SMS shall produce an alarm in the event of a communications failure.
    g. The SMS must provide integration with both the DMP communication with the IDS control panel shall be monitored, and the SMS shall produce an alarm in the event of a communications failure.
14. Thin Client Access Option
    a. The system shall provide for an option of thin client access to the security management system. The thin client interface shall utilize Microsoft Terminal Services to provide the same look and feel of the thick client to minimize training time and expense. The thin client shall be capable of the same functionality of a thick client with the exception of functionality that requires access to ports on the thin client computer – Microsoft Terminal Services does not sufficiently support such access.
15. Thin Client Visitor Management Access Option

a. The system shall provide for an option of thin client access specifically for the visitor management system. The thin client interface shall utilize Microsoft Terminal Services to provide the same look and feel of the thick client to minimize training time and expense. The thin client shall be restricted to Visitor Management functions.

16. Browser Client
    a. The Browser Client shall allow users to easily manage cardholders, visitors and alarms from any standard web browser.
    b. Users shall be able to enter cardholder and visitor details, print and encode badges, sign visitors in and out, view card status, view the last 25 valid card transactions and manage alarms.
    c. Language translations shall be available together with a documented process for adding further languages at a later date.
    d. User interface language selection shall include the ability to manually override automatic system detection.
    e. Language selection shall determine localized input field formats (dates for example dd/mm/yyyy, mm/dd/yy etc.)
    f. There shall be no requirement to install additional software on the client machine hosting the web browser.
    g. The SMS shall provide the ability to create, find, view modify, copy or delete workflows.
    h. A workflow shall be triggered automatically when a selected alarm or task based action is performed such as opening or acknowledging a new alarm or task.
    i. When a trigger event occurs, the configured workflow action(s) shall be performed (for example, opening an SMS window, clearing a specified alarm type, displaying an instruction or sending an email)
    j. Each workflow trigger shall allow more than one action to be performed.
    k. Workflow actions shall allow question prompts and answer inputs. Answers shall be able to determine the path for further actions.
    l. The order in which the actions are placed within each workflow shall determine the order in which they are executed.
    m. Multiple Workflows shall be allowed for each trigger. The priority of multiple workflows for a single trigger shall be configurable.
    n. Workflow Manager shall utilize a graphical flow chart design.
    o. Workflow Manager shall be able to execute predefined commands.
    p. Different workflows shall have the ability to automatically initiate for any device or any alarm type.
    q. Workflows must have the ability to display alarm instructions.
    r. Workflows shall have the ability to send automated emails or create tasks in the Task Manager.

1.7 SUBMITTALS

A. Submit in accordance with the requirements of Section 280500: Common Work Results for Electronic Safety and Security, the following items:

1. Product Data: Product Data submittal shall be required.
    a. Include product data consisting of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). This data shall clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements.
    b. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded.
    c. Include delivery dates for equipment.
2. Shop Drawings
    a. General Shop Drawings for the project as described elsewhere.
    b. Provide other Shop Drawings only if specifically requested by TRI-CITY MEDICAL CENTER’s Project Manager.

3. Manufacturers Installation and Programming Instructions
   a. Provide Manufacturers Installation and Programming Instructions as requested in the various Specification Sections.
4. Project Record Drawings
   a. Definition: Project Record Drawings are drawings that completely record and document all aspects and features of the Work. (Also known as “as-built” drawings.)
   b. The purpose of Project Record Drawings is to provide factual information regarding all aspects of the Work, to enable future service, modifications, and additions to the Work.
   c. Project Record Drawings are an important element of this Work. Contractor shall accurately maintain Project Record Drawings throughout the course of this project. Project Record Drawings shall include documentation of all Work, including the documentation of existing equipment, wiring, conduits, and raceways that are to be reused in the Work.
   d. TRI-CITY MEDICAL CENTER’s Project Manager shall furnish Contractor with two (2) sets of site plans for Contractor's use in preparing Project Record Drawings. One set shall be used as a working set, the other shall be used to prepare the final record set.
   e. Contractor shall maintain the working set of Project Record Drawings at the project site throughout the course of the Work. The working set shall be updated on a daily basis as the Work progresses.
   f. Project Record Drawings shall accurately show the physical placement of the following:
      1) Equipment and devices.
      2) Conduit and raceways.
      3) Junction and pull box locations.
      4) End-of-line resistor locations.
      5) Interfaces to external equipment.
      6) Connections to power and telephone circuits.
   g. Project Record Drawings shall show the physical placement of each device and conduit or aerial center line, to be accurate to within one foot (1') of the nearest landmark. Where the site plan furnished by TRI-CITY MEDICAL CENTER’s Project Manager conflicts with actual conditions, Contractor shall amend site plan as required. Indicate exact description of conduit runs (above ground, two foot trench, along outside wall of building, etc.).
   h. Project Record Drawings shall show wire and cable runs, zone numbers, tamper circuit configuration, panel/circuit breaker numbers from which equipment is powered, and splice points. Such information may be shown on the site plans.
   i. Project Record Drawings shall be available for inspection by TRI-CITY MEDICAL CENTER’s Project Manager on a daily basis. Incomplete or inaccurate Project Record Drawings may be cause for delay of Contractor's payment.
   j. Upon completion of Work, and prior to Final Acceptance, Contractor shall prepare and submit to TRI-CITY MEDICAL CENTER Project Manager a final record set of Project Record Drawings. This set shall consist of all data transferred from the working set, supplemented by Riser Diagrams and other information. The final record set of Project Record Drawings shall be drafted by a skilled draftsperson, under the supervision of Contractor. All final Project Record Drawings shall be provided to TRI-CITY MEDICAL CENTER**.**
5. System Documentation
   a. Definition: System Documentation is a complete collection of all installation, programming, operation, and maintenance manuals and work sheets relating to the equipment provided as part of the Work.
   b. Contractor shall maintain a file of System Documentation at the project site throughout the course of the Work. Such file shall be updated with new information as equipment is received and installed. System Documentation shall be available for inspection by TRI-CITY MEDICAL CENTER Project Manager on a daily basis.
   c. Upon completion of Work, and prior to final Acceptance, Contractor shall prepare and submit to Consultant digital copies of System Documentation and one hardcopy to the Owner.
6. Closeout Submittals
   a. Provide a set of as-built drawings and manuals to the TRI-CITY MEDICAL CENTER Project Manager

1) As-Built Drawings
2) Mounting Details
3) Product Data
4) Installation Manuals
5) Operating Manuals
6) Maintenance/Service Manuals

b. Provide the TRI-CITY MEDICAL CENTER Project Manager- with all programming sheets, keys to the equipment cabinets, as-built drawings, operating manuals, maintenance/repair manuals, spare fuses, all programming sheets and keys to the equipment cabinets, tools for tamper-resistant enclosures and tools for manual resetting devices.

1.8 QUALITY ASSURANCE

A. Qualifications of Contractor

1. Contractor shall be an installation and service contractor regularly engaged in the sale, installation, maintenance and service of access control systems.
2. Contractor shall have three years' experience with the installation, start-up and programming of systems of a similar size and complexity to the one proposed.
3. Contractor shall be a factory authorized dealer of the system proposed for at least two years.
4. Contractor shall provide factory certified technicians to perform the installation of all intelligent controller components in this project. Evidence of the certification shall be in writing from the manufacturer and shall be on the technician's person at all times while on site.

B. Supervision of Work

1. Contractor shall employ a competent Foreman to be in responsible charge of the Work. Foreman shall be on the project site daily during the execution of the Work.
2. Contractor's Foreman shall be a regular employee, principle, or officer of Contractor, who is thoroughly experienced in projects of a similar size and type. Contractor shall not use contract employees or Subcontractors as Foremen.

C. Qualifications of Technicians

1. All electronic systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of specialty low-voltage electronic systems.
2. Journeyman Wireman electrical workers may be used to install conduit, raceways, wiring, and the like, provided that final termination, hook-up, programming, and testing is performed by a qualified electronic technician, and that all such Work is supervised by the Contractor's Foreman.
3. All incidental Work, such as cutting and patching, lock hardware installation, painting, carpentry, and the like, shall be accomplished by skilled craftsperson's regularly engaged in such type of work. All such Work shall comply with the highest standards applicable to that respective industry or craft.
4. All 120 VAC power wiring and connections are to be performed by a qualified Journeyman Wireman, licensed to perform such Work in the TRI-CITY MEDICAL CENTER**.**

D. Subcontractors

1. Definition: A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site.
2. Use of any Subcontractor is subject to the approval of TRI-CITY MEDICAL CENTER. The Contractor shall identify all Subcontractors on the Bid Form. The Contractor shall make no substitution for any Subcontractor previously selected without approval from TRI-CITY MEDICAL CENTER**.**
3. Contractor's Foreman shall be on the project site daily during all periods when Subcontractors are performing any of the Work. Contractor's Foreman shall be in responsible charge of all Work, including any Work being performed by Subcontractors.

4. By an appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Drawings and Specifications, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these documents, assumes toward TRI-CITY MEDICAL CENTER**.**

E. Supervision and Construction Procedures
1. The Contractor shall supervise and direct the Work, using his best skill and attention. Contractor is solely responsible for all construction means, methods, and techniques.
2. The Contractor shall employ a competent foreman who shall be in attendance at the project site during the progress of the Work. The foreman shall represent the Contractor and all communications given to the foreman shall be as binding as if given to the Contractor.

F. Regulatory Requirements
1. All Work is to conform to all building, fire, and electrical codes and ordinances applicable in the TRI-CITY MEDICAL CENTER. In case of conflict between the Drawings/Specifications and codes, the codes shall govern. Notify TRI-CITY MEDICAL CENTER Project Manager of any such conflicts.
2. Contractor shall secure and pay for all licenses, permits, plan reviews, engineering certifications, and inspections required by regulatory agencies. Contractor shall prepare, at Contractor's expense, any documents, including drawings that may be required by regulatory agencies.

G. Permits
1. The Contractor shall make application for and obtain any and all permits required by federal, state, county, city, or other authority having jurisdiction over the work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Security of Contractor’s Tools and Equipment: TRI-CITY MEDICAL CENTER is not responsible for the care, storage or security of any of the Contractor's tools or equipment.

1.10 PROJECT/SITE CONDITIONS

A. Environmental Conditions
1. Power: Electrical power will be supplied by TRI-CITY MEDICAL CENTER to the extent that the usage is compatible with available facilities in the vicinity of the work.
2. Telephone: Contractor may use a telephone designated by TRI-CITY MEDICAL CENTER for local and toll-free calls. The costs of long distance calls are the responsibility of the Contractor and shall not be charged to TRI-CITY MEDICAL CENTER**.**
3. Rest room Facilities: Contractor may use existing Rest room facilities designated by TRI-CITY MEDICAL CENTER**.**
4. Parking: TRI-CITY MEDICAL CENTER reserves the right to limit or restrict Contractor parking based upon the daily requirements of the other contractors on site.
5. Dust Control: Make provisions to control all dust, dirt, and foreign material caused by the performance of the Work.
6. Use of explosive type fastening equipment is prohibited.
7. Notify TRI-CITY MEDICAL CENTER immediately of any damage or possible damage to any other equipment.

B. Clean-Up
1. Contractor shall clean-up, on a daily basis as the Work progresses, all dirt, dust and debris caused by Contractor’s operations. Clean-up shall be completed by the end of each workday to the satisfaction of TRI-CITY MEDICAL CENTER's on-site representative.
2. In the event that Contractor fails to clean-up, TRI-CITY MEDICAL CENTER may elect to have clean-up performed by others, with the costs of such clean-up being charged to the Contractor.

C. Construction Aids

1. Definition: Construction Aids are facilities and equipment required by personnel to facilitate the execution of the Work. Construction Aids include scaffolds, staging, ladders, platforms, hoists, cranes, lifts, trenchers, core drillers, protective equipment, and other such facilities and equipment.
2. Contractor shall provide all Construction Aids required in the execution of the Work. Construction Aids that are the property of TRI-CITY MEDICAL CENTER or other contractors shall not be used without permission.
3. Storage of Construction Aids shall be coordinated with TRI-CITY MEDICAL CENTER's on-site representative.

D. Safety
1. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.
2. Contractor shall comply with all local, state, and federal regulations and laws for the safety of the work place.

E. Accident Reports
1. Serious or fatal accidents shall be reported immediately by telephone or radio to the **TRI-CITY MEDICAL CENTER**'s Project Manager.

F. Existing Conditions
1. TRI-CITY MEDICAL CENTER does not warrant the condition of any portion of the existing wiring, conduit or raceway systems. Prior to submitting his proposal, Contractor shall examine all existing conditions and determine to what extent the existing wiring, conduit, and raceway systems may be reused.
2. Contractor's proposal price shall include the cost of replacing existing wiring, conduit, and raceways as required.

1.11 SEQUENCING

A. Description
1. This implementation plan describes the general approach that shall be followed in order to minimize the time for the access control systems to be operational.

B. Approach
1. Contractor shall plan and schedule all work in such a sequence as to minimize the time before the system is operational. The following is a suggested work sequence:
   a. Order all equipment needed and notify any subcontractors to schedule their participation.
   b. Perform all system layout work.
   c. Insure there are an adequate number of power receptacles available to operate all security equipment and coordinate with TRI-CITY MEDICAL CENTER as to where power is available.
   d. Provide shop drawings to verify location of all equipment, conduit runs, power connections, etc. Submit shop drawings to TRI-CITY MEDICAL CENTER Project Manager.
   e. Coordinate with TRI-CITY MEDICAL CENTER to provide space in each building’s Communications Room for mounting of processors.
   f. Provide training on how to fill out the programming sheets for access levels.
   g. Prepare and pre-test all equipment to the greatest extent possible.
   h. Install all equipment.
   i. Provide training on the programming other various options.
   j. Test and inspect all systems.
   k. Perform all other Work as required.
   l. Perform the Acceptance Test.
   m. Provide training.
   n. Provide as-built drawings.

1.12 SCHEDULING

A. The Contractor, within five (5) days after being awarded the contract, shall prepare and submit for TRI-CITY MEDICAL CENTER's information, an estimated progress schedule for the Work. The progress schedule shall be related to the entire project, and shall indicate start and completion dates.

1.13 WARRANTY

A. Refer to Section 280500 1.12 for requirements.

1.14 SYSTEM STARTUP

A. Power shall only be applied to the system after re-checking for proper grounding of the system and measuring all loops for lack of shorts, grounds, and open circuits.

1.15 OWNER'S INSTRUCTIONS

A. Coordination with TRI-CITY MEDICAL CENTER
   1. Contractor shall closely schedule and coordinate his activities with designated TRI-CITY MEDICAL CENTER representatives.
   2. Contractor shall provide TRI-CITY MEDICAL CENTER's Project Manager with a work plan on a weekly basis. Such work plan will describe locations of intended activities, types of activities, and potential conflicts to facility operations.

B. TRI-CITY MEDICAL CENTER's Representatives
   1. The following is TRI-CITY MEDICAL CENTER's designated representative:
      a. PROJECT MANAGER – Matthew Jaffkey (TRI-CITY MEDICAL CENTER)

C. TRI-CITY MEDICAL CENTER's Right to Carry out the Work
   1. If the Contractor defaults or neglects to carry out the Work in accordance with the Project Drawings and Specifications and fails within seven days after receipt of written notice from TRI-CITY MEDICAL CENTER to commence and continue correction of such default or neglect with diligence and promptness, TRI-CITY MEDICAL CENTER may, after seven days following receipt of an additional written notice and without prejudice to any other remedy TRI-CITY MEDICAL CENTER may have, make good such deficiencies. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies.

D. Minor Changes in the Work
   1. TRI-CITY MEDICAL CENTER shall have the authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Project Drawing and Specifications. Such changes shall be provided by written order.

1.16 COMMISSIONING

A. Manufacturer shall provide the opportunity for Professional Services to assist Contractor with commissioning.

B. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall conduct a final inspection, and pre-test all equipment and system features. Contractor shall correct any deficiencies discovered as the result of the inspection and pre-test.

C. Contractor shall submit a request for the Acceptance test in writing to the TRI-CITY MEDICAL CENTER Project Manager, no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification from Contractor that all Work is complete and has been pre-tested, and that all corrections have been made.

D. During Acceptance test, Contractor shall demonstrate all equipment and system features to TRI-CITY MEDICAL CENTER. Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by TRI-CITY MEDICAL CENTER.

E. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications will be rejected. TRI-CITY MEDICAL CENTER Project Manager will prepare a list of any such deficiencies observed during the Acceptance test. Contractor shall promptly correct all deficiencies. Upon correction of deficiencies, Contractor shall submit a request in writing to TRI-CITY MEDICAL CENTER Project Manager for another Acceptance Test.

F. If, at the conclusion of the Acceptance Test, all Work is found to be acceptable and in compliance with the Project Drawings and Specifications, TRI-CITY MEDICAL CENTER Project Manager will issue a letter of Acceptance to Contractor and TRI-CITY MEDICAL CENTER.

1.17 MAINTENANCE

A. Provide full procedures for all database back-ups.

B. Provide full procedures for server/workstation hard drive maintenance, such as defrag, etc.

C. Provide full procedures for maintaining physical and software firewalls.

D. Provide full procedures for upgrading software.

E. Provide full procedures for testing battery condition on all field panels for adequate back-up time.

F. Provide full procedures for any other tasks that must be performed to ensure the warranty remains intact.

PART 2 PRODUCTS

A. All shall be new and unused, and shall be of manufacturer's current and standard production.

B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.

C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.

D. Product Availability
   1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
   2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.

E. Wire and Cable
   1. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
   2. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
   3. Comply with equipment manufacturers recommendations for wire and cable size and type.
   4. Comply with all applicable codes and ordinances.

F. Conduit and Raceway Systems
   1. Interior Conduit:
      a. Electrical Metallic Tubing (EMT)
      b. Flexible Metal Conduit
      c. Provide fittings and connectors as required for installation of EMT or flexible conduit.
   2. Surface Raceways:

   a. Sheet metal channel with fitted cover, suitable for use as surface metal raceway, WIREMOLD or approved equal.
   b. Provide fittings, elbows, and connectors designed for use with raceway system.
3. Exterior Conduit: (any of the following as determined by local code requirements):
   a. Rigid Steel Conduit
   b. Rigid Aluminum Conduit
   c. Rigid Nonmetallic Conduit (only if buried 18" below ground surface).
   d. Intermediate Metal Conduit
   e. Provide rain-tight fittings and connectors as required for installation of exterior conduit.
4. Exterior Flexible Conduit:
   a. Liquidtight Flexible Conduit: Flexible metal conduit with PVC jacket.
   b. Provide rain-tight fittings and connectors as required for installation of Liquidtight Flexible Conduit.

G. Junction and Pull Boxes
   1. Interior Boxes: Sheet Metal Outlet Boxes: Sizes to be determined in accordance with code requirements for conductor fill. No box shall be smaller than a single gang 1-1/2 deep. Provide box covers as required.
   2. Exterior Boxes: All exterior boxes shall NEMA 4 or NEMA 3R, watertight and dust-tight
   3. All interior and exterior boxes shall have their covers fastened using security screws.

H. Lightning Protection
   1. The Contractor shall provide suitable lightning protection for all processors/controllers.
   2. All lightning protection equipment shall be UL listed.

2.1 UNIFIED SECURITY PLATFORM

A. The system shall be a unified security platform for both video and access control applications.

B. USP – Unified Security Platform: A single executable file which has the ability to do access control, video surveillance, License plate recognition (not being used at this time, but possible for future usage), and SIP intercoms

C. The USP shall support the seamless unification of IP access control system (ACS), IP video management system (VMS), and IP automatic license plate recognition system (ALPR) under a single platform. The USP user interface (UI) applications shall present a unified security interface for the management, configuration, monitoring, and reporting of embedded ACS, VMS, and ALPR systems.

D. The USP shall be capable to have built in failover options for the VMS on both the directory Role, and the archiving role (not needed to be quoted at this time)

E. The USP shall be able to leverage the graphics processor of a workstation to decode video

F. The USP must have unified Threat levels, and be able to change the configuration of the entire system (access and video) at the touch of a button and/or be triggered from an alarm

G. Leverage a graphical map where access control transactions (with cardholder pictures displayed on granted access), and associated video can be displayed in real time, will be able to zoom all PTZ's in a designated area off a single mouse click, and display/arm/disarm zones

H. The workflows to create, modify, and run a report shall be consistent for access control, and video reports.

I. The ACS shall support Mercury, AXIS, HID, ASSA Abloy, Salto, and Schlagle, and leverage a gateway appliance for potential cloud based access control in the future.

J. The USP shall support user authentication with claims-based authentication using external providers. External providers shall include:
   1. ADFS (Active Directory Federation Services)

K. Approved Manufacturer:

1. Genetec Security Center

2.2 ACCESS CONTROL SYSTEM - SYSTEM SPECIFICATIONS

A. Head-end Hardware
   1. SERVER
      a. NEC Express 5800/320c M4 Fault Tolerant Performance Server - Intel Xeon E5-2670 8 core 2.6GHz, 2U CPU/IO modules w/ Dual Port Gigabit NICs, 8GB Logical RAM, 300GB & 900GB HDD per CRU, Windows 2008 Enterprise Server (x64) w/ HyperV, 3 Year Warranty & Support, FT Service System Software, Rack mount (Tower kit available)
   2. Workstation
      a. Mini-Tower - Dell OptiPlex 3010, Intel Core i5 3470 3.2GHz, 4GB RAM, 1 TB HDD, 1GB Video, DVD+/-RW, Gigabit NIC, keyboard/mouse, 20" LCD or equivalent, Windows 7 Professional 64-bit, 3-year Next Business Day warranty.
      b. Substitution of equal or greater will be considered.

B. Software
   1. System provided shall be part of the unified security platform as defined in spec 281300 part 2.2 and spec 282300 part 2.2.
   2. Server Software capable of supporting a minimum of 50 clients, both dedicated and web-based.
   3. Client software – provide enough licenses for the client workstations shown on the plans.
   4. Reader Licenses – capable of supporting minimum of 500 reader licenses.
   5. Optional Web Management Platform
   6. The Access Control System shall be the following:
      a. Part of the Unified Security Platform
         1) Genetec Security Desk
      b. Approved Manufacturer
         1) Genetec Synergis.

C. Field Panels & Boards
   1. All field panels are to be wall-mounted.
   2. All field panels will be sized to accommodate the number of readers they are supporting.
   3. All field panels will have a dedicated 120VAC circuit provided by the contractor, to power both the access control panel and the power supply.
   4. All field panels will have a key lockable enclosure.
   5. All field panels will enclose the LAN drop from the owner’s network.
   6. All field panels will be mounted to fire-treated plywood.
   7. All field panels will have a tamper switch.
   8. Contractor shall provide all input, output, reader, and control boards to be located within the Access Control Panel for the number of devices
   9. Contractor shall provide all power supplies as shown on the drawings.

D. Approved Manufacturers
   1. Cards & Readers:
      a. HID Global multiCLASS SE series card readers
         1) RP15 Reader for mullion mount application
         2) RP40 Reader for wall mount application
         3) RPK40 for reader/keypad combo application
      b. HID Global MIFARE Cards
         1) Provide 5,000 cards
   2. Access Control Boards:
      a. Mercury based boards
         1) Intelligent Controller: Sy-EP1502
         2) Dual Reader Board: Sy-MR52
         3) Single Reade Board (Jonas Salk): Sy-MR51e
         4) Input Board: Sy-MR16IN
         5) Output Board: Sy-MR16OUT

3. Enclosures
   a. Hoffman enclosures, sized accordingly.
   b. Or approved equal

PART 3 EXECUTION

3.1 ACCEPTABLE INSTALLERS

A. The system shall only be provided by Contractors who are factory authorized to install, service and maintain the system by the access control manufacturer.

B. The Contractor must have been a factory authorized dealer with the proposed manufacturer for a period of at least two (2) years before the Bid Opening Date.

C. The Contractor's installers and technicians must also be factory trained and certified to perform such tasks.

3.2 EXAMINATION

A. The Contractor shall be required to visit the installation site prior to bidding the job.

B. The Contractor shall report any discrepancies between the Specifications, Drawings, and Site Examination prior to the Bid Opening Date.

3.3 PREPARATION

A. The Contractor shall order all required parts and equipment upon notification of award of the Work.

B. The Contractor shall bench test all equipment prior to delivery to the job site.

C. The Contractor shall verify the availability of power where required. If a new source of power is required, a licensed electrician shall be used to install it.

D. The Contractor shall arrange for obtaining all programming information including access times, free access times, door groups, operator levels, etc.

3.4 INSTALLATION

A. The Contractor shall coordinate with the TRI-CITY MEDICAL CENTER's IT Department if connecting to their network.

B. The Contractor shall carefully follow the instructions in the manufacturers' Installation Manual to insure all steps have been taken to provide a reliable, easy to operate system.

C. The Administrator Terminal shall be connected to the remote terminals before connecting to any card reader processors.

D. The Contractor shall provide all electrified door hardware as noted on the plans. Coordinate with TRI-CITY MEDICAL CENTER to meet their hardware standards.

E. Perform all Work as indicated in the Drawings and Specifications.

F. The Contractor shall install the appropriate cable from the CPU to readers, door contacts, request-to-exit devices, and electric locks at each door and/or gate.

G. All communications cables shall be kept away from power circuits.

H. The Contractor shall install the power supply(s) for electric locks in locations where they won't interfere with other operations.

I. The Contractor shall also execute adequate testing of the system to insure proper operation.

J. The Contractor shall provide adequate training of the system users to insure adequate understanding to prevent operating errors.

3.5 WORKMANSHIP

A. Comply with highest industry standards, except when specified requirements indicate more rigid standards or more precise workmanship.

B. Perform Work with persons experienced and qualified to produce workmanship specified.

C. Maintain quality control over suppliers and Subcontractors.

D. Quality of workmanship is considered important. TRI-CITY MEDICAL CENTER Project Manager will have the authority to reject Work which does not conform to the Drawings and Specifications.

3.6 EQUIPMENT PRE-TEST

A. All equipment shall be bench tested prior to delivery to job site and prior to installation. Bench test per manufacturer's installation instructions.

3.7 WIRE AND CABLE

A. Design, layout, size, and plan new wire and cable runs as required.

B. All wire and cable from the processors to all devices at each door shall be "home-run" unless otherwise specified.

C. All wire and cable, including any wire and cable that is existing and will be reused in the Work, shall be installed in conduit or surface metal raceway, except as follows:

D. Wire or cable, in lengths of less than ten (10) feet, that is "fished" within walls, ceilings, and door frames.

E. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.

F. Avoid splicing conductors. All splices shall be made in junction boxes (except at equipment). Splices shall be made with an approved crimp connection. Wire nuts shall not be used on any low-voltage wiring.

G. Identify all wire and cable at terminations and at every junction box. Identification shall be made with an approved permanent label, Brady or equal.

3.8 WIRE AND CABLE TERMINATIONS

A. Identify all inputs and outputs on terminal strips with permanent marking labels.

B. Neatly dress and tie all wiring. The length of conductors within enclosures shall be sufficient to neatly train the conductor to the terminal point with no excess. Run all wire and cable parallel or normal to walls, floors and ground.

C. Install connectors as required by equipment manufacturers.

D. Terminations shall be made so that there is no bare conductor at the terminal. The conductor insulation shall bear against the terminal or connector shoulder.

E. Do not obstruct equipment controls or indicators with wire or cable. Route wire and cable away from heat producing components such as resistors, regulators, and the like.

3.9 CONDUIT AND RACEWAY INSTALLATION

A. Design, lay-out, size and plan new conduit and raceway systems as required.

B. Indoor Requirements:

1. Route exposed conduit and raceway parallel and perpendicular to walls and adjacent piping.
2. Maintain minimum six (6) inch clearance between conduit and piping.
3. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
4. Use conduit bodies to make sharp changes in direction, as around beams. Fasten conduits and raceways to structural steel using approved spring clips or clamps.

5. Where conduit penetrates fire-rated walls and floors, seal opening with UL listed fire rated sealer or other methods as approved by codes.
6. No exposed conduit, raceway, or junction box shall be installed within any office area.
7. Install all boxes straight and plumb.
8. Do not support conduit from mechanical, plumbing, or fire sprinkler systems.
9. Drill or core drill all holes in walls, ceilings, or floors where required for new conduits. Do not cause damage to any structural steel or other structural support member by drilling or cutting.
10. Do not use flexible conduit in lengths longer than six (6) feet.

C. Outdoor Requirements:

1. Where conduit penetrates exterior walls, seal opening around conduit in an approved manner to make watertight.
2. Use galvanized straps and fasteners on all exterior conduit.
3. All exterior boxes will only be used to aid in pulling the cable between points.

3.10 PENETRATIONS

A. Do not penetrate any roof, flashing, exterior wall, or parapet without prior approval from **TRI-CITY MEDICAL CENTER**'s designated Construction Project representative.

B. When penetrating a fire wall for passage of cables and/or conduit, always provide a fire-stop system that complies with code and the local authority having jurisdiction.

3.11 FIRE RATED DOORS AND FRAMES

A. Do nothing to modify a UL. rated door or frame that would void the UL. Label or fire rating.

3.12 GROUNDING

A. Provide earth-grounding of equipment as required by equipment manufacturer. Earth ground shall be connected to ground rod or approved cold water pipe. Electrical or telephone ground connections shall not be used as earth grounds. Connections to mounting posts or building structural steel shall not be used as earth grounds.

3.13 POWER TO SECURITY EQUIPMENT

A. Power all equipment from 120 VAC circuit dedicated for security use, except as noted. Mark all panel circuit breakers with labels worded “Security Equipment - Do Not Operate”, or equivalent.

B. All plug-in transformers shall be located at the security control panels. Secure all low-voltage plug-in transformers to outlet with screw or strap. Clearly label all transformers to identify purpose and use.

3.14 CUTTING AND PATCHING

A. The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work.

3.15 PAINTING

A. All surface raceway systems shall be painted to match the surfaces they are attached to. All surfaces damaged by the installation shall be repaired and painted by The Contractor.

3.16 PLYWOOD BACKING

A. Install the processor(s), power supplies, and all other related equipment on a plywood backboard for testing in the shop. The mounted assembly will then be transported “as is” to the job site for mounting in the Communication Room.

B. Fasten the plywood backing to the wall using a hanger bolt at the four corners which align with pre-drilled holes in the plywood. Secure with flat washers and a nut.

C. Paint plywood without disrupting the materials fire rating. Coordinate color with Owner.

3.17 FIELD QUALITY CONTROL

A. Upon reaching Substantial Completion, perform a complete test and inspection of the system. If found to be installed and operating properly, notify TRI-CITY MEDICAL CENTER of your readiness to perform the formal Test & Inspection of the complete system.

B. Submit the Record Drawings (as-builts) to TRI-CITY MEDICAL CENTER for review prior to inspection.

C. During the formal Test & Inspection (Commissioning) of the system, have personnel available with tools and equipment to remove devices from their mounts to inspect wiring connections. Provide wiring diagrams and labeling charts to properly identify all wiring.

D. If corrections are needed, the Contractor will be provided with a Punch-List of all discrepancies. Perform the needed corrections in a timely fashion.

E. Notify TRI-CITY MEDICAL CENTER when ready to perform a re-inspection of the installation.

3.18 INITIAL PROGRAMMING AND CONFIGURATION

A. Contractor shall provide initial programming and configuration of the security management system. Programming shall include defining hardware, doors, monitor points, clearance codes, time codes, door groups, alarm groups, operating sequences, camera call-ups, and the like. Input of all program data shall be by Contractor. Contractor shall consult with Security Consultant and Owner to determine operating parameters.

B. Contractor shall develop and input system graphics, such as maps and standby screens. Owner shall provide floor plan drawings as the basis for the creation of maps. Development of maps shall include the creation of icons for all doors, monitor points, and tamper circuits. Owner shall provide floor plan drawings, in the form of AutoCAD .DWG or .DXF files, as the basis for the creation of maps.

C. Owner, with the cooperation and assistance of Contractor, will input the cardholder data for each access card.

D. Contractor shall maintain hard copy worksheets which fully document the system program and configuration. Worksheets shall be kept up to date on a daily basis by Contractor until final Acceptance by Owner. Worksheets shall be subject to inspection and approval by Owner. Provide final copies to Owner prior to Project Close-out.

E. Contractor shall maintain a complete, up-to-date magnetic tape backup of the system configuration and cardholder database. Backup shall be maintained throughout programming period until final Acceptance by Owner. Submit back-up tapes to Owner upon Final Acceptance.

3.19 TRAINING

A. Refer to section 280500 3.4 for training requirements.

3.20 OPERATOR TRAINING

A. Contractor shall provide complete operator training on the Security Management System. Two types of operator training shall be provided:
   1. System Administrator Training: Three-day comprehensive training course for system managers and maintenance personnel. Provide two (2) separate on-site training sessions.
   2. Operator Training: Three-day comprehensive training course for system operators. Provide two (2) separate on-site training sessions.

B. Training sessions shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.

C. Contractor shall provide written training materials for each of ten (10) people at each training session.

D. Training sessions are to be held at Owner's facility, and are to be scheduled at the convenience of Owner. Some training sessions may be required to be held during evening hours and on weekends to accommodate users whose schedule does not permit attendance during regular hours.

E. Contractor shall provide written training outline and agenda for each training session prior to scheduling.

3.21 MANUFACTURER PROFESSIONAL SERVICES

A. Contractor shall coordinate with the manufacturer to provide the manufacturer's professional services team to assist the Owner in coordinating the interfaces between the security management system and other on-site systems as necessary.

B. Professional Services personnel shall be employed by the manufacturer of the security management system and shall be thoroughly knowledgeable of the security management system applications.

C. Professional Services personnel shall be on-site and available to meet with Owner's representatives for a period of not less than two consecutive days. On-site visit shall be scheduled at the convenience of the Owner.

END OF SECTION

SECTION 282300 - VIDEO SURVEILLANCE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Providing materials, equipment, submittals, fabrication, installation, labor, programming, configuration, and testing in conformity with applicable Codes and Authorities Having Jurisdiction for the following:
   1. A complete Video Surveillance System as described in the Specifications and as shown in detail on the Drawings.
   2. Complete Video Surveillance System is defined as all labor and materials required to complete the Work described herein and on the Drawings including but not limited to: conduit, raceways, cables, cabling, wiring, connectors, riser blocks, patch panels, patch cables, network interfaces, back boxes, IP Network Cameras using PoE, analog cameras using digital video encoders, camera lenses, KVM's (video monitors, keyboards, mice), Network Video Recorders, attached data storage hard drive arrays (SAN/NAS), PoE switches, programming, power supplies, power distribution units (PDU's, plug strips), enclosures, tamper switches, latches and locks, mounts, arms, housings, stands, relay interfaces and equipment rack cabinets or rack shelves.
   3. Products, equipment, materials, systems, assemblies, software and accessories as specified herein define the minimum standards. Specifications and Drawings do not show or list every item, accessory, fastener, bracket, sub-assembly and appurtenance to be provided. When an item not shown or listed is clearly necessary for proper installation, operation and functioning of the equipment and systems the Security Contractor shall provide, install, test and certify the item at no increase in Contract price.
   4. Provide all software, licensing, hardware, cabling, and programming required for the installation, connection, programming, customization, and functional operation of the new Video Surveillance System equipment.
   5. Provide and install system video media converters for the existing RG59 cable infrastructure.
   6. Provide installation, testing, adjustment and initial configuration programming for all equipment and systems.
   7. Provide configuration programming to import floorplan graphical maps of the project sites and to populate the maps with functional device icons in the Video Surveillance System.
   8. Coordinate data network connections, programming, and power requirements with Owner's IT department.
   9. Conduit, wire, and cable installations performed under this Section shall comply with all applicable Local Building Codes and National Electrical Code with California Amendments.
   10. Security Contractor is responsible for fully implementing the Work described in the Specifications and shown on the Drawings to create a fully functional and completely operational Video Surveillance System.

1.2 RELATED SECTIONS

A. 280500 Common Work Results for Electronic Safety and Security Systems

B. 280800 Commissioning of Electronic Safety and Security Systems

C. 281300 Access Control

1.3 REFERENCES

A. Published specifications, standards, tests and codes and recommended standards of trade, industry or governmental organizations apply to Work in this Section including:
   1. ADA – Title 3 of the Americans with Disabilities Act
   2. ASCII – American Standard Code for Information Interchange
   3. ASTM – American Society for Testing and Materials
   4. CCR – Titles 19 and 24 of the California Code of Regulations
   5. EIA – Electronic Industry Association

6. NEMA – National Electrical Manufacturers' Association
7. NFPA – 2010 National Fire Protection Association Standards
8. CEC – 2008 National Electrical Code with 2010 CA Amendments
9. CBC – 2009 International Building Code with 2010 CA Amendments
10. CFC – 2009 International Fire Code with 2010 CA Amendments
11. CMC – 2009 International Mechanical Code with 2010 CA Amendments
12. UL – Underwriters Laboratories, Inc.

B. Electronic devices radiating "RF" energy shall comply with Federal Communication Commission regulations, particularly Part Fifteen, and shall meet Class "B" requirements. Provide FCC certificate numbers indicating that the FCC has approved the products.

1.4 QUALITY ASSURANCE

A. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacture.

B. All items of a given type shall be the products of the same manufacturer.

C. All items shall be of the latest technology; no discontinued models or products are acceptable.

D. No “beta” products will be accepted.

E. Security Contractor shall:
   1. Stock a full complement of parts of the same manufacturer and model as installed per these Specifications.
   2. Offer service during normal working hours as well as emergency service on all equipment installed per these Specifications.
   3. Supply parts and service without delay and at reasonable cost.

F. Security Contractor shall be certified for asbestos work (if applicable to this Project).

G. Security Contractor shall be capable of performing service and maintenance on the specified systems.

H. Security Contractor’s lead technician shall be trained and certified by the Video Surveillance System manufacturer and the wireless camera manufacturer. Certifications shall also be held for all aspects of the installation and testing as noted in sections 3.02 A, 3.05 A, and 3.08 C of this specification.

I. Security Contractor shall possess all required Contractor's licenses.

J. The contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein.

K. The contractor shall utilize the authorized manufacturer components and distribution channels in provisioning this Project.

L. Contractor shall have a minimum of five (5) years of recent experience on structured cabling systems of similar type and size.

M. Contractor and design firm shall be in compliance with all federal, state and local statutes regarding qualifications of firms.

N. The contractor shall be experienced in all aspects of this work and shall be required to demonstrate direct experience on recent systems of similar type and size.

O. The contractor shall own and maintain the tools and equipment approved by the cabling system manufacturer for successful installation and testing of Category 6A balanced twisted pair distribution systems.

P. The contractor shall have personnel who are adequately trained in the usage of such tools and equipment.

1.5 SUBMITTALS

A. Submit in accordance with the requirements of Section 280500: Common Work Results for Electronic Safety and Security, the following items:
   1. Project Schedule
   2. Product Data and Shop Drawings
   3. System Programming
   4. Operation & Maintenance (O&M) Manual
   5. “As-Built” Record Drawings
   6. Contractor shall submit a resume of qualification with the Contractor's proposal indicating the following:
      a. A list of recently completed projects of similar type and size with contact names and telephone numbers for each
      b. A list of test equipment proposed for use in verifying the installed integrity of metallic and fiber optic cable systems on this project.

B. Unless otherwise noted or required by the Owner, all submittals shall be supplied in Adobe Acrobat “.pdf” format and/or in native Microsoft Office Word “.doc” or Excel “.xls” format.
   1. All delivery of required project submittals shall be accompanied by dated transmittal listing the contents.

C. Submittals must be complete. All security system submittals shall be in a similar format for ease of review. The Owner and Security Consultant reserve the right to reject any submittals determined to be incomplete. Rejection of submittals for failure to meet these requirements shall not be considered grounds for claims of delay.

D. Submit the following Project Schedule submittal to the Owner and Security Consultant for review and approval prior to commencement of Work:
   1. Proposed construction schedule detailing the timeline for the Project. Obtain Owner approval of finalized construction schedule before the commencement of Work.
   2. Confirm sequence of site work and illustrate how multiple concurrent site projects will overlap. Provide and detail float as contingency. Include Owner activities in the schedule.
   3. When Work is performed in a sensitive area or in areas occupied with ongoing activities, coordinate with the Owner and the affected site’s representative to determine the best time to perform the Work required. Sequencing and scheduling of this type is normal on a Project of this nature and shall not be considered grounds for claims of delay.

E. Submit the following Product Data and Shop Drawings submittals to the Owner and Security Consultant for review and approval prior to commencement of Work:
   1. Manufacturer's name, brand name, exact part number, options, accessories and catalog references for all equipment supplied including cabling. Indicate UL Listings for all system components.
   2. Complete wiring diagrams for all components, including cable types and quantities, routings, floor plans indicating device locations, conduit sizes, point-to-point termination and riser diagrams.
   3. Master Device Legend Table on the shop drawings that identifies the symbols used for all devices including mounting heights, back box requirements, part and model numbers, operating voltages (if applicable), wire and cabling requirements, wire label verbiage, and panel termination points.
   4. Fully dimensioned shop drawings including plan views, elevations and details of all security device installations, equipment rooms and closets, consoles, controllers, racks, enclosures, control panels, and fabricated equipment, showing locations of all major components including mounting details. These Drawings shall be 1/4 inch scale at a minimum.
   5. Bill of Materials.
   6. MSDS for fire stopping materials and sealants.
   7. Written certification letter from each manufacturer affirming that Security Contractor is approved for systems installation and service for all systems in this Section.
   8. Partial or “Typical” Drawings will not be accepted. All shop drawings shall be done in AutoCAD.

F. Submit the following System Programming submittals to the Owner and Security Consultant for review and approval prior to commencement of Work:
   1. Submit for review and approval proposed programming, including device names and text descriptions, frame rates, resolutions, IP addresses, and sequence of operations at least 30 days prior to the actual programming of the system.
   2. Approved device naming conventions shall be reflected on the “As-Built” Record Drawings and on device and cable labeling exactly as programmed into the system.

G. Submit the following Operation & Maintenance (O&M) Manual submittals to the Owner and Security Consultant for review and approval upon completion of Work:
   1. Updated product data and shop drawings submittals reflecting the actual accurate “As-Built” conditions.
   2. Warranty letter with start and end date. Clearly note the date of written notification of acceptance by the Owner.
   3. Troubleshooting checklist information.
   4. Replacement parts and consumables ordering information, including the contact information for local sources.
   5. Warranty service and maintenance contact information: including names, address, phone number and website address. Provide specific instructions or forms as required to initiate a trouble ticket or work order request.
   6. Training program, including name and qualifications of trainer(s), schedule of training, and curriculum. O&M’s shall be provided as the written training materials and shall be turned over to the attendees upon completion of training.

H. Submit the following “As-Built” Record Drawings submittals to the Owner and Security Consultant upon completion of Work:
   1. Maintain a complete set of “As-Built” Record Drawings updated with mark-ups inserted as the Work is performed. As Work is installed carefully mark on “As-Built” Record Drawings in colored pencil the correct location of all Work including depth of underground runs and concealed Work with their dimensions from clearly identified points on permanent buildings, fixtures, walls, or walks. Wiring diagrams, risers and details shall be included and updated.
   2. Upon completion of the Project transfer hand-drawn information to CAD Drawings. Copy updated CAD Drawings onto compact disc in “.dwg” and Adobe Acrobat “.pdf” formats and submit to the Owner and Security Consultant. No hand-drawn “As-Built” Record Drawings will be accepted.
   3. “As-Built” Record Drawings shall be provided in three (3) full-size hardcopy plotted sets as well as on compact disc to the Owner. One (1) additional complete full-size hardcopy plotted set shall remain on the Project site at the primary security equipment location at the District Office.

1.6 SUBSTITUTIONS

A. All equipment, products and systems shall conform to the Specifications and Drawings. No substitute equipment, products or systems may be used unless previously accepted in writing by the Owner and Security Consultant.

B. Substitution requests must be submitted in writing for review and approval by the Owner and Security Consultant. Requests must clearly show a line by line comparison of the relevant product technical specifications to demonstrate that the proposed substitution meets or exceeds the technical specifications of the specified product. The Owner and Security Consultant reserve the right to accept or reject substitution requests.

C. Manufacturers listed as acceptable are normally engaged in the type of Work specified. The listing of equipment and product part numbers or particular types of systems by specific manufacturers is to establish a minimum standard for the performance, quality, and parameters of the equipment, products and systems specified. The Owner and Security Consultant must approve all substitutions in writing prior to any substitute equipment, products or systems being incorporated into this Project.

D. Any substitute equipment, products or systems incorporated into this Project without prior written approval from the Owner and Security Consultant will be considered defective and may be rejected at the discretion of the Owner. Rejected items shall be promptly removed from the Project and replaced with the specified materials and equipment by the Security Contractor at no increase in Contract price and shall not be considered grounds for claims of delay.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Ship equipment in original manufacturer packaging to prevent damage or entry of foreign matter. All handling shall be in accordance with manufacturer recommendations. Provide protective covering of installed items during construction. All equipment is to be protected from dents, bumps, and scratching.

B. Replace, at no increase in Contract price, all equipment, products, or systems damaged during shipping, handling, distribution, storage, or installation or during subsequent construction.

C. Products delivered to the Project site and stored, whether on the Project site or in an off-site location previously approved in writing by the Owner, shall be protected from weather, dust, dirt, and foreign matter. Storage shall be locked and secured at all times when not under direct supervision and use.

1.8 PROJECT WARRANTY

A. Refer to Section 280500 1.12 for requirements.

PART 2 – PRODUCTS

2.1 NETWORK CAMERAS

A. Network Cameras will transmit images over the Local Area Network (LAN). Contractor to provide an excel sheet, listing cameras and their locations to the Owner to provide the IP addresses/host names as part of the base bid.

B. All network cameras will be IP-based cameras. No analog cameras will be used/approved/accepted for the purpose of this scope of work.

C. All network cameras will terminate in their designated IDF rooms or closets. The location of these rooms/closets shall be per the drawings and field verified. If discrepancies occur, contractor shall coordinate with IT.

D. All cameras shall be vandal resistant with vandal/tamper proof screws. Contractor shall provide (2) of each type of driver bit needed for the special vandal/tamper proof screws.

E. All cameras that require wide dynamic range (WDR), per specifications below, shall meet or exceed a range of 100 dB unless otherwise noted.

F. All shall be a minimum of IP66 rated water-resistant/dust-tight and IK10 rated vandal-resistant.

G. Integrated on-board analytics to trigger alarms based on user-defined rules for monitoring a doorway for access beyond approved hours.

H. All cameras shall have a minimum operating temperature range from -40° F to 122° F.

I. All cameras must have drivers compatible with the VMS Software, beyond onVif integration.

J. Mini Dome Cameras:
   1. Will be Day/Night with WDR per manufacturer specs.
   2. Cameras will have built in support for Power over Ethernet.
   3. Will be equipped with Varifocal lenses
   4. H.264 compression or better shall be used. If deviating from H.264, written approval shall be obtained from LACOE-IT.
   5. Exmor CMOS sensor with integrated image stabilizer to minimize vibration effects on image.
   6. Built in IR illuminators. Minimum illumination of 0 lx in B/W and 0.1 lx in Color.

7. These will be flush, surface, wall and corner mounted as indicated in the device schedule and via field verifications at the responsibility of the contractor.
8. These cameras will be located in the following areas:
   a. Interior Spaces
   b. Perimeter entry areas.
9. Approved Manufacturers:
   a. Axis P3365-V
   b. Or approved equivalent

2.2 NETWORK VIDEO RECORDERS (NVR)

1.01 STORAGE (Provided by Contractor)

A. Hardware shall be sized to store 90 days of video at 1080P resolution and 10fps with 70% motion-based retention.

B. Hardware shall contain the following minimum requirements:

1. Intel Xeon E5 Processor or better, 8GB DDR3 RAM or better, 8x DVD+/-RW or better, 10 Gigabit Optic NIC, keyboard/mouse, Windows 10 Professional 64-bit, 3-year Onsite Service After Remote Diagnosis

C. Approved Manufacturers:

1. BCDVideo

2.3 UNIFIED SECURITY PLATFORM

A. The system shall be a unified security platform for both video and access control.

B. USP – Unified Security Platform: A single executable file which has the ability to do access control, video surveillance, License plate recognition (not being used at this time, but possible for future usage), and SIP intercoms

C. The USP shall support the seamless unification of IP access control system (ACS), IP video management system (VMS), and IP automatic license plate recognition system (ALPR) under a single platform. The USP user interface (UI) applications shall present a unified security interface for the management, configuration, monitoring, and reporting of embedded ACS, VMS, and ALPR systems and associated edge devices.

D. The USP shall be capable to have built in failover options for the VMS on both the directory Role, and the archiving role (not needed to be quoted at this time)

E. The USP shall be able to leverage the graphics processor of a workstation to decode video

F. The USP must have unified Threat levels, and be able to change the configuration of the entire system (access and video) at the touch of a button and/or be triggered from an alarm

G. Leverage a graphical map where access control transactions (with cardholder pictures displayed on granted access), and associated video can be displayed in real time, will be able to zoom all PTZ's in a designated area off a single mouse click, and display/arm/disarm zones

H. The workflows to create, modify, and run a report shall be consistent for access control, and video reports.

I. The USP must have the ability to push video to the cloud for storage leveraging Microsoft Azure, and have a hybrid cloud model

J. The USP shall support user authentication with claims-based authentication using external providers. External providers shall include:
   1. ADFS (Active Directory Federation Services)

K. Approved Manufacturer

1. Genetec Security Center

2.4 PATCH PANELS AND JUMPER CABLING

A. Patch Panels will be provided by the contractor where necessary.

B. Owner to provide the patch cords to be connected from the patch panel to the Network Switch. Network switch will be provided by Owner.

2.5 WIRE AND CABLE

A. Wire and Cable Specifications
   1. Security Contractor shall follow the manufacturers' recommendation for cabling or the minimum requirements of the Specifications and Drawings, whichever provides for the most stringent requirements.
   2. Wire and cable sizes, number of conductors, shielding, or other data listed in this Specification or shown on Drawings are a guide to the correct product required to achieve a working system and represent the minimum acceptable equipment.
   3. Cables are to be shielded as necessary to preclude any outside noise or interference from entering the cable and degrading system performance. All cables shall be U.L. Listed, and appropriate for the application.
   4. Use proper grounding practices to eliminate shorts, ground faults, ground loops, RF interference, voltage fluctuations, foreign voltages and open circuits.
   5. Coordinate with the Owner’s IT department for data network connections, terminations, dressing, routing, patch panels, and jumpers.
   6. Cables run underground, under slab, or in slab shall be installed in conduit and environmentally rated for such application.
   7. Cables above hard ceiling or inaccessible areas shall be installed in conduit. Stub up conduits from within walls into accessible spaces.
   8. All cables run in environmental air handling spaces shall be plenum rated. Provide proper J-hooks or cable trays for cables not run in conduit.
   9. Mixing of security low voltage cables with data network or telecomm cables or the cabling of other systems will not be permitted.
   10. Security low voltage cables and Ethernet Category 6 cables shall be provided in colors as selected by the Owner.
   11. Cables shall be routed along walls and at right angles. Cabling shall not be draped loosely or resting on pipes, HVAC ductwork and equipment, or suspended tile ceilings. Avoid routing cabling bundles across or within 18” of lighting fixture ballasts.
   12. When installing cable do not pull or stretch cabling beyond the manufacturer’s maximum tensile strength.
   13. Do not cinch tight cable bundles (especially Ethernet cables) with tie wraps. Bundle cables together using Velcro straps.
   14. Cable shall be run in unbroken homerun lengths of 300 feet or less. No cable runs shall be over 300’will be accepted. Cable splices are not allowed.
   15. Wiring shall be grouped and harnessed to facilitate access to all equipment, as well as maintenance and replacement of equipment.
   16. Cabling shall be sized and installed according to California Electric Code requirements.
   17. Cabling shall be West Penn, Belden, Connect-Air, or approved equal.

B. Communication/Network Cabling
   1. All network cable used shall be purple in color.
   2. Twisted-pair network cable shall meet or exceed Category 6A requirements in ANSI/TIA-568-C.2
   3. Any fiber optic cable shall meet or exceed requirements in ANSI/TIA-568-C.3 as applicable per the approved type of fiber.
      a. If fiber cables are required due to distance limitations, this shall be identified, specified, priced, and submitted to LACOE-IT for approval with your original bid documents.

C. Quality Assurance

1. 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.
2. 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 or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the owner or the owner representative.
3. 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 cabling.
4. Material and work specified herein shall comply with the applicable requirements of:
   a. ANSI/TIA/EIA – 568-B Commercial Building Telecommunications Cabling Standard, 2000-2004
   b. TIA – 569-B Commercial Building Standard for Telecommunications Pathways and Spaces, 2004
   c. ANSI/TIA/EIA – 606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2002
   d. ANSI-J-STD – 607-A Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, 2002
   e. NFPA 70 – National Electric Code, 2005
   f. BICSI – Telecommunications Distribution Methods Manual, 10th Edition, 2003
   g. NEMA – VE-1 – Metal Cable Tray Systems, 2002
   h. NEMA – VE-2 – Metal Cable Tray Installation Guidelines, 2001

PART 3 – EXECUTION

3.1 REQUIREMENTS

A. Video Surveillance System shall be fully functional and completely operational.

B. All wall, floor, and ceiling penetrations, regardless of the fire rating of the partition, must be properly sleeved with EZ-Path or conduit penetration assembly and properly sealed using approved fire stopping materials and sealants.
   1. Exterior penetrations shall be properly sealed using approved weather-proof fire stopping materials and sealants.

C. Provide seismic restraint for all equipment, including equipment racks and consoles.

D. Security equipment, devices, brackets, mounting arms or pendants, junction boxes, cabinets, and enclosures shall be installed utilizing stainless steel tamper-resistant fasteners and mounting hardware.
   1. Tamper-resistant fasteners shall be pin Torx.
   2. Provide two (2) driver bits and hand tools to the Owner’s representative for each type and size of pin Torx security fastener provided.

3.2 CABLE

A. General (applicable to all cable types Cable shall be installed in strict compliance with the manufacturer's recommendations.

B. Maintain separation from other conductors (power, fire alarm, etc.) per NEC requirements and TIA/EIA standards.

C. The bending radius and pull strength requirements of all cable as detailed in the TIA/EIA standards and the manufacturer’s installation recommendations shall be strictly observed during handling and installation.
   1. Pull cables simultaneously where more than one cable is being installed in the same raceway.

2. Use pulling compound or lubricant where necessary. Use compounds that will not damage conductor or insulation (Polywater, or approved equal).
3. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cable or raceway.

D. Cable jackets shall not be twisted during installation. Cables showing evidence of twisting shall be replaced at no additional cost to the Owner, regardless of the outcome of cable testing.

E. Cable shall be installed in a continuous (non-spliced) manner unless otherwise indicated.

F. Cable installed in conduit and/or ducts:
1. Fill ratios shall not exceed NEC requirements.
2. Cable shall not be pulled into conduit/ducts until the conduit/duct ends have been prepared for cable installation (i.e. reamed to eliminate sharp edges and insulated throat bushings installed). Cables pulled into conduit/ducts prior to conduit/duct end preparation shall be replaced at no additional cost to the Owner.
3. Reinstate pull-wires in conduits and ducts after use to facilitate future addition of cables.
4. Standard in-wall communication outlets shall be installed in a 4” x 4” x 2.4” device box with 1” conduit stubbed to above ceiling.

G. Cable installed in cable tray:
1. Cable shall not be attached to the cable tray (i.e. cable shall be left “loose”) with the exception of cable installed in cable tray (cable runway) within Telecom Rooms (see “Cable in Telecom Rooms” below).
2. For performance reasons, station cable in tray shall not be combed.
3. Cable shall be laid in tray in such a way as to present a neat and professional appearance

H. Cable NOT installed in conduit/ducts or cable tray:
1. Cables shall be strapped or fastened for support. Staples and plastic cable ties are not acceptable.
   a. Straps and fasteners shall not be over-tightened. Cables showing evidence of over-tightening shall be replaced at no additional cost to the Owner, regardless of the outcome of cable testing.
   b. Straps, fasteners, and tie-wraps installed in plenum spaces shall be plenum rated.
   c. Reusable Velcro hook and loop style cable straps/fasteners shall be used within Telecom Rooms. The use of plastic tie wraps is not acceptable within Telecom Rooms (see “Cable in Telecom Rooms” below).
   d. Cables shall be bundled by application (horizontal or backbone) and by cable type (Cat 3, Cat 6 UTP, MM Fiber, SM Fiber, etc.). Cable applications and types shall not be intermixed within a bundle.
2. Cables in suspended cable runs shall be supported at varying intervals. Cable spans shall be limited to 5 feet or less, and the length of spans shall vary along the cable path (i.e. a given span should not be exactly the same length as the span preceding or following it – “exact” spans can degrade cable performance).
3. Cable installed on exposed surfaces or structural members shall be installed parallel and perpendicular to the surfaces. Surface contours shall be followed wherever possible. Cables shall be attached to surfaces at intervals not to exceed 3 feet.
4. Attaching cables to pipes, electrical conduit, mechanical items, existing cables, or the ceiling support system (grids, hanger wires, etc. – with the exception of ceiling support anchors) is not acceptable.

I. Cable installed in Telecom Rooms
1. Cable on backboards:
   a. Lay and dress all cables to allow other cables to enter raceway (conduit or otherwise) without difficulty at a later time by maintaining a working distance from these openings.
   b. Cable shall be routed as close as possible to the ceiling, floor, sides, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations.

c. Lay cables via the shortest route directly to the nearest edge of the backboard from mounted equipment or blocks. Secure all similarly routed and similar cables together and attach to D-rings vertically and/or horizontally, then route over a path that will offer minimum obstruction to future installations of equipment, backboards or other cables.

J. Cable terminating on patch panels located on racks.
   1. Route cables in Telecom Rooms to patch panels on racks by routing across cable runway to top of rack and then down vertical cable management sections to patch panel.

K. Cable Slack:
   1. Provide cable slack (service loops)
   2. Provide slack length as follows:
      a. At the device box: Provide a minimum of 6 feet.

3.3 FIELD LABELING REQUIREMENTS

A. Labels shall be printed on self-adhesive labels.
   1. Hand written labels or writing directly on equipment or cabling is not acceptable.

B. Label all networked equipment with the host name as shown on the drawings the drawings.
   1. Security device addresses and text descriptions shall be reflected on the labeling and on the “As-Built” Record Drawings exactly as programmed into the systems in accordance with the approved System Programming submittal.
   2. Cameras shall not be labeled.

C. Cables shall be individually labeled at origin and termination at both ends as close as possible to their termination point, referenced to a master cable legend schedule as shown on “As-Built” Record Drawings.

D. Cabling homerun routing and Security Terminal Cabinets (STC) locations, if any, shall be noted on “As-Built” Record Drawings.

E. Cable labels shall be affixed to individual cables in the “flagged” position.
   1. This means that the associated approved device address label is printed twice on a self-adhesive label with sufficient space between the duplicate text to wrap around the cable.
   2. The printed label is then wrapped around the individual cable and affixed to itself.
   3. This results in a “flagged” position label so that the complete device address label can be read from either side of the label.

3.4 TRAINING

A. Refer to section 280500 3.4 for training requirements.

3.5 PROGRAMMING

A. All system programming shall be by the Security Contractor.

3.6 CATEGORY 6A CABLE TESTING

A. Ethernet Category 6A Cabling shall be field tested after installation.

B. Documentation shall be submitted for review and approval by the Owner and Security Consultant to demonstrate that all cabling meets or exceeds ANSI/TIA/EIA 568-B.2-1 Commercial Building Telecommunications Cabling Standards and Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling.

C. Deficiencies shall be corrected prior to utilizing the installed cabling as a component of the Video Surveillance System.

3.7 TESTS AND REPORTS

A. System testing and reporting will occur in two phases.

B. Security Contractor shall perform System Functionality Testing and correct all deficiencies prior to performing the Commissioning Testing with the involvement of the District Representative, Owner-IT, and Security Consultant.

C. Perform System Functionality Testing using manufacturer-certified personnel who have attended a manufacturer's training school for installation and testing of the systems. Perform testing with the test instruments and methodology as required by the manufacturer; testing by means other than the manufacturer's procedures will not be acceptable unless agreed to by the Owner and Security Consultant and manufacturer.

D. Security Contractor shall perform System Functionality Testing and document these tests for review and approval by the Owner and Security Consultant prior to the Commissioning Testing.

E. If testing will require monitors, mouse, and keyboards, contractor is to provide their own equipment at no extra cost to the client. Monitors, mouse, and keyboards are not provided by Owner-IT at any of the IDF rooms or IDF closet locations.

F. At a minimum, perform System Functionality Testing to demonstrate and document:
   1. Cameras
      a. The camera video feed displays on client workstations without flickering due to excessive latency greater than half of a second.
      b. The camera video feed displays on client workstations without pausing or freezing.
      c. The camera auto-focuses to display clear image acceptable by Owner-IT.
      d. The day/night interior and exterior cameras adjust properly between day and night lighting conditions.
      e. The Wide Dynamic Range and auto-backlight compensation cameras adjust properly to challenging lighting conditions to produce clear, bright, and focused images.
      f. The camera produces a stable picture with no roll, flutter or ghosting.
      g. The camera resumes operation and produces clear, bright, and focused images when PoE power or network connectivity is restored from a failure.

G. Upon completion of the System Functionality Testing Security Contractor shall submit written reports including but not limited to the following information:
   1. Certification that all devices and equipment meet or exceed the requirements of the System Functionality Testing.
   2. Certification that all equipment is properly installed, programmed, fully functional and completely operational, and conforms to Specifications and Drawings.
   3. Complete Bill of Materials of all equipment installed including quantity, make and model as well as serial numbers, MAC addresses, and IP addresses/host names of major components. The bill of materials shall be broken down by building and include all cameras, card readers, access control panels, workstations, servers, and video wall components.
   4. Technician’s field test reports of all cameras, cables, devices, and equipment.
   5. Test technician's name, company and date(s) of test.
   6. Exceptions shall be clearly noted in a Punch List.

H. Following review and acceptance of the System Functionality Testing report by the Owner and Security Consultant, the Security Contractor shall perform Commissioning Testing of all security system equipment and software in the presence of the Owner and Security Consultant.

I. Commissioning Testing shall include performance testing and functionality testing to demonstrate to the Owner that each system software and hardware component functions as required by the Specifications and Drawings. The Security Contractor shall be responsible for all additional costs to the Owner and Security Consultant if retesting is required.

J. At a minimum, perform Commissioning Testing in the presence of the Owner and Security Consultant to demonstrate and document:

1. Each camera, cable, data network switch, NVR, server, and client computer workstation functions as an integrated element of the Video Surveillance System.
2. Fully functional and completely operational condition of the cameras, client computer workstations, NVR's, and Video Surveillance System server.
3. An abnormal condition of any signaling or communication circuit, device malfunction, or image loss required to be electrically supervised will result in activating the specified trouble or tamper alarm notification signal.
4. All Video Surveillance System software functions properly in accordance with manufacturer's written specifications and all equipment is fully programmed.

END OF SECTION

SECTION 32 17 23 – PARKING AREA STRIPING AND MARKINGS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Supplementary General Conditions and Division I apply to work of this section.

B. Furnish all labor, materials, services, equipment and appliances to perform all work to complete the Contract, including, but not limited to, these major items:
1. Layout work and field measuring.
2. Painting parking stall and cross striping lines as indicated on the Drawings.
3. Painting arrows, signs, and traffic markings on pavement.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 10 14 36: Non-Illuminated Signs and Graphics

1.03 REFERENCE STANDARDS

A. Standard Specification for Public Works Construction, Reference Specification (RS):
1. Section 210 Paint and Protective Coatings
2. Section 310 Painting Traffic Striping Pavement Marking and Curb Markings (except 310-5.6.10)

B. Federal Specifications (FS):
TT-P-115F Solvent Based Traffic Paint
TT-P-1952B Water Based Traffic Paint
TT-P-1952D Water Based Traffic Paint - Fast or Rapid Dry

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Complete lists of materials proposed for use giving the manufacturer's name, catalog number, catalog cut and MSDS sheets for each item.

C. Detailed shop drawings indicating sizes and layout of lines and markings.

D. Manufacturer's standard color palette.

E. Manufacturer's current technical data, specifications, installation instructions, including relevant limitations, safety and environmental cautions, application rates and equipment to be used, for each product specified

F. Test reports and certifications per Reference Standard Specification Subsection 210.1.7.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Perform work by skilled personnel regularly engaged and specializing in providing parking lot striping service for a minimum of two (2) years.

B. Regulatory Requirements: All paint shall comply with governing Air Pollution Control District APCD rules and regulations, and in accordance with the California Air Resources

Board (CARB) effect at the time of application, over airborne emissions and industrial waste disposal. Materials shall be in compliance with less than 150 (VOC) g/l.

C. Striping paint shall be either water based vinyl or acrylics or alkyd resin type traffic paints. Paints shall be compatible with asphaltic concrete. If a full cure time is required prior to application of the striping, the product is not to be used if it impacts construction scheduling.

D. Dry film thickness for striping and stenciled areas shall be gauged at 15 wet mils so that the end result is **10 dry mils minimum**. Dry film thickness may require being increased based on the amplitude / conditions of the surface to be coated and the resulting painted surface provided. The resulting painted surface is to be completely opaque with visible build. If required, Contractor shall make a second pass / application to deliver the required results, without additional cost to the Owner.

1.06 INSPECTION

A. After the Contractor has laid out pavement markings, and prior to application of paint materials, the surfaces to be painted shall be inspected. Deficiencies in layout and surface preparation shall be corrected by the Contractor. The inspection shall not relieve the Contractor of the responsibility for accurate and acceptable work.

B. Obtain Architect's approval of chalk layout prior to commencement of striping. Notify Architect 72 hours in advance of layout.

C. Owner reserves the right to modify striping layout prior to layout by Contractor.

1.07 REGULATORY REQUIREMENTS

Comply with all requirements for handicap accessibility in accordance with California Building Code with Title 24 CCR Amendments, applicable section of Chapter 31A, Chapter 11B, and current ADA regulations. Refer also to "The California Access Compliance Source Accessibility Standards Interpretive Manual", CalACS. Blue paint for the symbol of accessibility shall be in conformance with Federal Standard, (FS 595 B) and CCR, Title 24. CBC.

1.08 PROJECT CONDITIONS

A. Take precautions necessary to avoid and mitigate the effects of wind drift in the application of liquid materials.

B. Do not apply marking paint when weather is foggy or rainy, or ambient temperatures are below 50 degrees F., nor when such conditions are anticipated during eight hours after application.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Manufacturer's original, unopened containers with labels and MSDS sheets in legible condition. The Architect reserves the right to inspect the containers prior to their opening, to review the accompanying bills of lading, and to reject materials in opened containers.

B. Storage: Store all materials off-ground and as required, under cover. Protect materials from adulteration by infiltration. Conform to the manufacturer's environmental requirements relative to storage and handling of materials in compliance with OSHA.

2.00 PRODUCTS

2.01 MATERIALS

A. Traffic Surface Paint: Provide water-based or low V.O.C., acrylics or alkyd resin type traffic, semi-gloss paints per Federal Specifications (FS) as listed hereinbefore.
   1. Dunn-Edwards Stripe, W-801 Vinyl-Stripe.
   2. Frazee, 506 Traffic Line Paint
   3. Sherwin-Williams, TM Series Setfast Traffic Marking Paint
   4. Vista Paint 6800, 6801 (1952B) 6900, 6901 (1952D)
   5. TMT/Pathway 2000 (fast dry) series.
   6. J.E. Bauer
   7. Pervo 3080 Series

   White color for stalls and cross hatching
   Yellow (black interior) for directional markings inside parking structure
   White for directional markings on surface parking lot
   Yellow for traffic markings
   Red for fire lane curbs as noted in Drawings
   Blue and white for handicapped parking symbols.
   - Handicapped Symbol of Accessibility and Lettering: Blue traffic paint. Color shall match No. 15090 in Federal Standard 595B (similar to royal blue), in conformance with CCR Title 24, Section 2-1720 and California Building Code Section 11B-502.6.4.1.

3.00 EXECUTION

3.01 WEATHER LIMITATION

Painting shall be performed only when the atmospheric temperature is above 50 deg.F, and the weather is not excessively windy, dusty, foggy, or humid.

3.02 LAYOUT OF MARKINGS

A. The Contractor shall layout the markings at the locations and to dimensions indicated on the approved Shop Drawings.
B. Word marking, letters, numerals and symbols shall be applied using stencils, templates, forms and guidelines.

3.03 SURFACE PREPARATION

A. Before application of paint, the pavement surface shall be dry, free of dirt, grease, oil, acids, laitance or other foreign matter, or surface contaminants, and from loose, peeling, or poorly bonded paint, which would reduce the bond between the paint and the pavement. Areas needing cleaning, shall be scrubbed with a water solution of trisodium phosphate (10 percent Na3 Po4 by weight) or other cleaning solution approved by paint manufacturer. After cleaning, the surface shall be rinsed with water and dried before painting.

B. Unless otherwise specified, markings on new and existing pavements shall be removed by an approved method.

3.04 EQUIPMENT

Pressurized, self-contained paint machine capable of applying a straight line from 2 inches to 6 inches wide, with consistent coverage of a minimum of 100-110 square feet per gallon, gauged as specified hereinbefore.

3.05 APPLICATION

A. Do not apply paint when air or surface temperature is below 50 degrees F, or when surfaces are damp and/or there is a chance of rain within 24 hours after application

B. Paint shall be mixed in accordance with the manufacturer's instructions. Paint shall be applied to the pavement surfaces at the proper temperature, in its original consistency without the addition of any paint thinner to the minimum gauged thickness specified.

C. Paint shall not be applied to bituminous surfaces before 2 days after the bituminous material has been placed. The paint shall not bleed, curl or discolor when applied to bituminous surfaces. If bleeding or discoloring occurs, the unsatisfactory areas shall be repainted at Contractor's sole expense.

D. Machine-paint lines at a rate to cover not more than 100 square feet of surface per gallon of paint or as required to completely opaque (equivalent to approximately one gallon for 350 lineal feet of 4 inch wide strip). Dry film thickness for striping and stenciled areas shall be **10 mils minimum**. Rate can increase to a maximum of 400 linear feet per gallon based on conditions of surfaces to be coated, so long as the dry film thickness remains above the minimum required.

E. Striping: Provide straight-edged uniform line width of 4 inches, unless noted otherwise on the Drawings. Provide hairpin 3” wide stripe hatching between handicap parking stalls, spaced as code requires per local authority.
   1. Stall Divisions: Provide between standard size parking stalls, two white 4 inch wide solid stripes, spaced as indicated on Drawings. At handicap stalls provide blue stripes as indicated on drawings.
   2. Arrows and Pavement Signs: Paint directional arrows with stencils or other approved method. Strokes of letters as indicated. Islands and "No Parking" areas shall have 4" stripes as indicated on Drawings.

F. Accessible Symbol: Install accessible signs and pavement marking at each accessible parking space. Apply 3'-0" by 3'-0" square International Accessible Symbol on pavement surface. On concrete surfaces, paint white reflectorized symbol on blue background square.

G. Apply fire lane markings in accordance with Local Fire Marshal / SFM requirements. Use approved stencils for lettering.

H. Traffic Markings: Provide 4 inch wide yellow markings as indicated in Drawings. Paint traffic markings with stencils or other approved method.

3.06 TOLERANCES

Width of stripes shall not vary more than one-quarter inch, plus or minus from the width shown on Drawings. The alignment and straightness of stripes shall not deviate more than one-half inch in fifty feet. Deviations in excess of the tolerances stated herein shall be removed and the painting redone at the Contractor's sole expense.

3.07 PROTECTION OF EXISTING FACILITIES

Where pavement markings are applied adjacent to existing facilities, the Contractor shall protect adjacent surfaces from disfigurement. Disfigurement or paint stains shall be removed by the Contractor.

3.08 CLEANUP

Over-spray, dripped, and splattered paint shall be removed as soon as possible before curing, by means which will not damage the applied surface. Remove excess materials and waste from the site.

END OF SECTION

SECTION 32 17 26 – SURFACE APPLIED DETECTABLE WARNING MATS

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Special Conditions and Division I apply to the work of this Section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including, but not limited to, these major items:
   1. Surface applied detectable warning mat where indicated, using an exterior grade tactile warning surface described herein.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finishes
B. Section 09 65 19: Resilient Flooring

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)
   ASTM D2047 Test Method for Static Coefficient of Friction of Polish Coated Floor Surfaces.

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Product Data: Submit manufacturer's literature describing products, installation procedure and routine maintenance.

C. Samples: Submit three (3) samples 6" x 6" of surface applied tactile mat of the kind proposed for use.

D. Shop drawings are required for products specified showing fabrication / profile details, plans of mat placement including location of joints and edge conditions.

E. Material Test Reports: Submit test reports from qualified independent testing laboratory indicating that materials proposed for use are in compliance with requirements and meet the properties indicated.

F. Maintenance Instructions: Submit copies of manufacturer’s specified maintenance practices for each type of tactile tile and accessory, as required.

1.05 QUALITY ASSURANCE

A. Provide surface applied tactile mat, adhesives and component accessories as manufactured / distributed by a single manufacturer.

B. Installer’s Qualifications: Experienced installer qualified for installation of this type who has successfully completed warning tile/mat installations similar in material, design and extent to that indicated for this Project.

C. Americans with Disabilities Act (ADA): Provide tactile warning surfaces that comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title 49 CFR Transportation, Part 37.9' Standards for Accessible Transportation Facilities', Appendix A, Section 4.29.2 'Detectable Warnings on Walking Surfaces'. In addition products must comply with California Title 24 CBC Section 11B-705.1.2.5 requirements regarding patterns, color and sound on cane contact.

D. Prior to approval of alternate manufacturers and/or system materials incorporated into the work, 'Alternate' manufacturers shall submit products that have documented field-testing results that meet or exceed the criteria established by the ADA and California Title 24 requirements and whose service and performance characteristics have been demonstrated acceptable for a minimum period of two years.

E. Tactile mat incorporating truncated domes shall conform to the following:
1. Water Absorption of mat when tested by ASTM-D570 not to exceed 0.36% -after vacuum.
2. Slip Resistance of mat when tested by ASTM-C1028 the combined wet/dry static co-efficient of friction not to be less than 0.90.
3. Tensile Strength of mat when tested by ASTM-D412 not to be less than 1,100psi.
4. Tear Strength of Tile when tested by ASTM-D624-00e1 not to be less than 200psi.
5. Chemical Resistance of mat when tested by ASTM-D1308-87 (1998): No change
6. Smoke Density of mat when tested to ASTM- E662: 245 (@ 4 minutes)
7. Flammability of mat when tested to ASTM- E648: 1.12 watts/ cm. sq
8. QUV Exposure results when mat tested with “B” Bulbs for 200 hrs.: No change
9. Freeze-Thaw Cycling when tested to ASTM- C1026-87: Unaffected.
10. Hardness of mat when tested to ASTM-D2240: 90 (Shore A).
11. Specific Gravity of mat when tested to ASTM-D792: 1.22
12. Weight loss of mat when tested to ASTM- D1044 (Taber Abrasion H-22 Wheel, 1000gms/1000 cycles) 150 mgs.

1.06 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum air and surface temperature of 55 degrees F and rising in spaces to receive tactile tiles prior to installations, during installation, and for not less than 2 hours after installation. Store materials in spaces where they will maintain minimum temperature of 55 degrees F for at least 24 hours prior to installation.

B. Provide barricades or fencing / partitions to protect pedestrians / the public.

1.07 EXTRA STOCK

Deliver extra attic stock to the Owner. Furnish new materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identification. Provide not less than 2% of the supplied materials for each type, color and pattern installed.

1.08 DELIVERY, STORAGE AND HANDLING

A. Mat and adhesive materials shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy wrappings and shall be identified by model designation or number. Mats shall be kept dry and away from sources of heat. Store on flat level surface.

B. Use all means necessary to store, handle and protect the materials of this Section before, during and after installation.

C. Mat and adhesives shall be delivered to location at building site for protected- storage

prior to installation.

1.09 WARRANTY

Surface applied detectable warning mat materials shall be warranted in writing against section failure due to excessive wear, cracking, peeling, color fade beyond established acceptable tolerances or loss of adhesion, for a period of five years from date of final completion.

2.00 PRODUCTS

2.01 MAT MANUFACTURER

A. The pre-molded tactile dome sheet composed of fiber-reinforced, polymer modified cement and coated with an acrylic resin emulsion is based on the product /system 'SSTD-Traditional Mat System', manufactured by Safety Step TD, (866) 723-3883. Alternate engineered ADA and California Title 24 field-tested products in service for a minimum of 5 years that are in compliance with these specified requirements and meet or exceed the specified test criteria and characteristics may be submitted for review to be incorporated in the work.

B. Color: Color shall be as selected by the Architect from the manufacturers standards. Where not indicated assume that the mat is to be 'Yellow' conforming to Federal Color No. 33538. Color shall be homogenous throughout the mat.

2.02 INSTALLATION MATERIALS

A. Bond coat adhesive SSTD-589: Water based acrylic emulsion resin adhesive.

3.00 EXECUTION

3.01 EXAMINATION

A. Examine floor / deck (flatwork paving) substrates to assure that tolerances are level within 1/8" in 10'-0", that floor / deck (cured hardscape) finishes are conducive to adhesive setting and that the concrete substrates have not been cured with a curing compound that might inhibit the adhesion of the setting adhesive.

B. Check to assure that utility rough-ins (that run below the) for plumbing, mechanical or electrical work (of this Section) have been installed and tested in the areas that could affect this paving work.

C. Do not proceed with installation of paving mats until reported deficiencies have been corrected.

3.02 INSTALLATION

A. Chalk line/tape line at top surface to be installed (to insure a straight installation of the SafetyStepTD Mat). Pre-cut SafetyStepTD Mat to fit area of installation. Keep mat ¼" from all concrete joints.

B. Install tape ¼" larger than mat at all perimeters.

C. Mark orientation lines on all corners of mat surface for proper alignment.

D. Install SSTD-589 (adhesive) base coat on surface, using a 1/8" or 3/16" notch towel. Keeps joints free of adhesive.

E. Install fitted SafetyStepTD Mat in wet STD-589 base coat. Use a push broom to flatten and insure a positive bond. Walk on entire mat surface then use stiff bristle push broom.

F. Brush all edge or float to hide seams. Let dry to touch. Do not leave excessive SSTD-589 base coat on tape.

G. Using a ¾" nap roller apply SSTD-589 base coat evenly over the entire SafetyStepTD Mat.

H. Broadcast SSTD-NSGS-30 onto wet SSTD-589 100% evenly to refusal (Let Dry). Blow off un-bonded sand for texture.

I. SSTD-100 apply color coat, using a ¾" nap roller, roll on color evenly and pull tape (Let Dry).

J. SSTD-1250 clear protective coat/spray with (garden sprayer) or roll evenly. Allow light foot traffic when surface is dry to the touch (24 hrs. for heavy traffic).

3.03 CLEANING AND PROTECTION

A. Protect mats against damage during construction period. Comply with manufacturer's specifications.

B. Protect mats against damage from rolling loads following installation by covering with plywood.

C. After completion of work, detectable mats shall be protected from the work of other trades by covering with non-asphalt building paper. After the work of all other trades has been completed the temporary protections shall be removed.

D. Clean mats by method specified by the manufacturer. Surfaces shall be washed with a neutral cleaner and all marks removed so that the detectable warning mats are ready to used.

END OF SECTION

SECTION 32 31 13 – CHAIN LINK FENCES AND GATES

1.00 GENERAL

1.01 SCOPE

A. Requirements of the General Conditions, Special Conditions and Division I apply to the work of this section.

B. Furnish all labor, materials, services, equipment and appliances required to perform all work to complete the Contract, including but not limited to these major items:
   1. Chain-link fencing, including gate(s) and related hardware and accessories as indicated on the Drawings, or as required and specified herein for a complete installation.
   2. Miscellaneous hardware as required including hinges, closers, etc.

1.02 RELATED WORK IN OTHER SECTIONS

A. Section 03 30 00: Concrete and Concrete Finish
B. Section 04 22 00: Concrete Masonry Unit
C. Section 08 70 00: Finish Hardware

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials

ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
ASTM A153	Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
ASTM A392	Standard Specification for Zinc Coated Steel Chain Link Fence Fabric
ASTM A641	Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.
ASTM F626	Standard Specification for Fence Fittings.
ASTM F669	Standard Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence Structures.
ASTM F1083	Standard Specification for Pipe Steel, Hot Dipped, Zinc Coated (Galvanized) Welded for Fence Structures.

B. Chain Link Fabric Manufacturers Institute (CLFMI).

1.04 SUBMITTALS

A. Provisions: Comply with Section 01 30 00.

B. Materials list and catalog cuts of materials, equipment, hardware and other items proposed to be provided under this Section.
   1. Posts, wire and other fittings shall be identified as to manufacturer, kind of base metal, (steel), kind of base coating and conformance to reference standards.
   2. Equipment shall identify make, model, HP, power rating, capacity, etc.
   3. Hardware shall identify make, model, finish, keying, etc.
   4. Access equipment shall identify make, model, function, activation, interface, etc.

C. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

D. Shop Drawings:

1. Shop drawings shall include plans, elevations, sections, gate swings or other required installation and operational clearances, and details of post anchorage, attachments,
2. Provide drawings indicating fence, each gate, details and swing of each gate in compliance with CBC requirements for access and egress, posts, rails, hardware, operation and accessories. Indicate materials, dimensions, sizes, weights and finishes of all components specified and proposed foundations.
3. Indicate the interface of work of this Section with the work of other sections.

E. Manufacturer's recommended installation shop drawing detailing, once reviewed by the Architect will become the basis for accepting or rejecting actual installation procedures used in the work.

1.05 QUALITY ASSURANCE

A. Material manufacturers shall be in good standing with the American Galvanizers Association (AGA) and in conformance with ASTM reference standards.

B. Fence fabric must be galvanized after weaving (GAW) with a minimum Class 1 (1.2 ounce zinc coating per sq. ft.) requirement.

C. Materials to be new products of recognized, reputable manufacturer. Used, re-rolled or re-galvanized materials are not acceptable. Like products shall be supplied by a single source.

1.06 WARRANTY

Provide manufacturer's standard warranty for defects in material and workmanship against structural fatigue or for premature corroding of the base materials and applied finish, for a minimum period of ten (10) years from the date of acceptance by Owner.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

Materials shall be delivered to the site in an undamaged condition. Store materials off ground to provide proper protection against oxidation caused by moisture.

2.00 PRODUCTS

2.01 MANUFACTURE

Fabrication of chain link fencing and assembly components shall be by Allied, Anchor U.S. Steel Cyclone Fence, Master-Halco, Inc., or equal.

2.02 MATERIALS - Match existing framework and component materials existing on-site, adjoining the work of this Contract.

Item	Height	Nominal Pipe Size Inches	Outside Diameter Inches	Weight Pounds per foot		
Top Rail, Brace Rails and Transom Rails	Up to 10’-0”	1-1/4	1.660	2.27		

Line Posts						
	8’-1” to 10’-0”	2-1/2	2.875	5.79		
Terminal, Corner, Angle & Pull Posts						
	8’-0” to 10’-0”	2-1/2	2.875	5.79		
Pedestrian Gate Posts	Up to 8’-0”	2-1/2	2.875	5.79		
Gate Frames	Up to 8’-0”	1-1/2	1.900	2.72		
Driveway Double-Leaf Swing Gate Posts: Opening						
Up to17'-3-1/2"						
17'-4" to 20'-3-1/2"	Up to 8’-0”	3-1/2	4	9.11		

A. Type I – Framework: Posts, Top, Middle and Bottom Rails, Brace Rails and Gate Frames are to be standard weight, galvanized, welded or seamless steel pipe conforming to ASTM A53/ A1083, Schedule 40 pipe with a minimum yield strength of 35,000psi. and ASTM F1043 internal and external coating Type A, consisting of not less than 1.8 oz/sq. ft. zinc.

B. Chain Link Fabric: One piece fabric widths, 2" mesh, 9 gage. Wire shall be galvanized steel wire, (1.25 ounce zinc per square foot), complying with ASTM A392 Class I, Type II. Selvage to be knuckled at top and bottom.

C. Stretcher Bars: Mild carbon steel flats not less than 3/16 inch x 3/4 inch, galvanized, Class B1 per ASTM A153.

D. Flat Band (Stretcher) Ties: Mild carbon steel flats, not less than 1/8 inch x 1 inch, except tension bands in gates shall be 1/8 inch x 3/4 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch x 1-1/2 inch, hot dip galvanized steel, Class B3 coating per ASTM 153.

E. Wire Fabric Ties: 7 gage 0.148 diameter, hot dipped steel, Class B3 coating per ASTM A641. Aluminum ties #6 gauge for fastening fabric to posts, top rails and brace rails. At bottom tension wire #9 gauge galvanized hog rings shall be used.

F Accessories: Wire tires, hog rings, adjustable truss rods, post tops, stretcher bars and bands, and other items as required to conform with CLFMI Manual.

1. Gate Hardware: Furnish the following hardware and accessories for each gate.
   a. Hinges: Size and material to suit gate size, non-lift-off, weld on type, offset to permit 180° gate opening. Provide three hinges for each leaf over 6'-0" nominal height. Coordinate assembly and fabrication.
   b. Latch: Provide typical cast or forged steel hinged latch fork with integral lock receiver and integrated cane bolt assembly for anchorage to grade slab, capable of retaining gate in closed position and having provision for padlock.

c. Keeper: Provide keeper / cane bolt for each gate leaf over 5' wide. Gate keeper shall consist of mechanical locking device for securing free end of gate when in full open position.

G. Mounting slip joints collars are to be 2.875" O.D. Class 1, steel pipe, schedule 40, 5.79 lbs/ft or of dimension required to allow for fabricated units to slip inside collar and move freely with maximum 3/16" clearance all around. Collars are to be continuously welded to 1/4" steel plates ASTM A6 galvanized by hot dip zinc process. Provide holes for mounting by 1/4" expansion bolts. Refer to Drawings for fabrication and erection details.

H. Post Caps: Malleable iron, (ASTM A 47, Grade 32510), designed to fit snugly over posts with a minimum projection of 1-1/2 inch below top of posts. Post caps shall be made with curved top.

I. Eye Tops: Malleable iron, (ASTM A 47, Grade 32510), designed to fit over line posts, and for through passage of top rail.

J. Expansion Sleeve Couplings for Top Rails: Steel, 6 inch long, designed to fit tightly on inside of rail, fitted with raised center.

K. Rail Ends for Top Rails and Brace Rails: Malleable iron, (ASTM A 47, Grade 32510), with holes to receive 3/8 inch bolts for securing to rail end bands.

L. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, bolts, and other metal parts and fittings to be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform with the requirement of applicable ASTM specifications, such as ASTM A 569 Standard Specification for steel Carbon (0.15 percent maximum), hot-Rolled Sheet and Strip commercial Quality, ASTM A 47 Standard Specification for Ferritic Malleable Iron Castings.
1. Galvanizing: Chain link fabric per ASTM A392, Class 1 - 1.25 oz/sq. ft
2. Framing to be coated with a uniform triple layer of zinc, chromate and clear organic coatings. Weight of zinc shall be 1.8 oz/ft$^{2.}$
3. Galvanizing Repair Material: Z.R.C. "Cold Galvanizing Compound", "Drygalv" by American Solder and Flux, or equal hot applied repair material, or Anodic-rich galvanizing repair paint conforming to Mil. Spec DOD-P-21035.

M. Swing Gates: Galvanized steel pipe welded fabrication in compliance with ASTM F900. Gate frame members 1.90” OD ASTM F 1083 schedule 40 galvanized steel pipe. Frame members spaced no greater than 8 ft. apart vertically and horizontally. Welded joints protected by applying zinc-rich paint in accordance with ASTM Practice A780. Mortise lock and levers with latch bolt. Mortise lock shall be placed in hollow steel galvanized enclosure welded to post and frame of swing gate. Provide hollow steel galvanized vertical C-shape frame or equal welded to post for strike of gate lock. Galvanized malleable iron or heavy gauge pressed steel post and frame hinges. Provide lockable drop bar and gate holdbacks with double gates. Match gate fabric to that of the fence system. Gateposts per ASTM F1083 schedule 40 galvanized steel pipe. Gatepost diameter 2.875”, 5.79 lb/ft. Electrically operated gates must comply with ASTM F2200 and UL325.

N. Concrete: Per 2016 CBC Section 1905A.1.1, Provide minimum of 3,000 psi concrete.

2.03 FABRICATION

A. Coordinate details for exterior fencing and gate fabrication of units with existing on-site project specific conditions related to fabrication, installation and anchorage detailing. Unless detailed otherwise by existing conditions, fabrication of fencing and gate frame

assemblies shall have continuous top, middle and bottom rails, (in lieu of truss rods and tension wires) so that the installed maximum open spacing between framing members and adjacent structure is not greater than 3 inches; exclusive of the overlapping knuckled selvage.

B. Swing gate assemblies shall be with continuous horizontal and vertical frame members fabricated to the design, size and style indicated on the drawings. Refer to drawing elevations and sections for detailing.

C. Swing gates 3'-0" x 7'-0" on drawings are indicated as fabricated with transom panel above the head framing. Fabricate height of gate as required to coordinate with architectural detailing, with a transom, unless dimensioned otherwise.

D. Framing, pickets, rails and posts shall be fabricated using continuous one-piece lengths and cut to specified lengths. Cutting, punching and drilling shall be done prior to coating to facilitate assembly / erection without compromise to the integrity of the finish.

3.00 EXECUTION

3.01 GENERAL

A. Verify reviewed drawing dimensions with actual field conditions prior to fabricating assemblies. Inspect related work and adjacent surfaces. Report to the Architect any conditions that prevent proper execution of this work.

B. Design and fabricate work to support any normally imposed loads. Work shall conform to requirements of CLFMI Manual of Practice and AISC. Installation shall comply with ASTM F567.

C. Fabricate assemblies as complete as practical in the shop prior to field delivery. Do all cutting, drilling, fitting, etc. as required for installing and setting materials in place for a complete installation.

D. Install fences to heights indicated on drawings.

E. Coordinate with adjacent work affected by installation of this work.

F. All welds are to be ground smooth to the touch rendering connections without sharp residue. Touch up welded, cut or drilled surfaces with galvanized repair material.

G. Installation of assemblies shall be in strict accordance with the reviewed shop drawings. Erect units so that final positioning is vertically plumb and true alignment.

3.02 INSTALLATION

A. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 6 feet apart measured from center to center of posts. Set posts so that top of eye of post caps are level with top of fabric.

B. Install terminal posts at ends of runs of fencing. Install gate posts on both sides of gates. For gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3-1/2 inch.

C. Install fences with continuous top rail. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.

D. Provide one horizontal mid-rail and one horizontal bottom-rail, set in terminal end caps between posts continuously for the entire fence line. Mid and bottom rails are to be used in lieu of corner angle posts or tension tie-rods and/or bottom tension wires for a complete secure installation.

E. Provide a transom rail and fabric at top of 7'-0" where indicated. Ends of transom rails shall be welded to rail end fittings

F. Fabric:
1. Install fabric on outward facing side of posts / security side of fence. Anchor to framework so that the fabric remains in tension after pulling force is removed.
2. Provide approximately 1" between finish floor/concrete curb and bottom selvage, unless otherwise indicated. Install fence fabric with top edge projecting above top rail of fence a minimum of 1-1/2". Set bottom of fence fabric to clear finish grades.
3. Pull fabric taut and tie to posts, and rails. Install stretcher bars extending full height of fence by threading through fabric. Secure tension bars to posts with metal bands spaced 14" on centers. . Install all nuts for fasteners on side of fence opposite fabric side. Peen the ends of bolts to prevent removal of nuts.
4. Fasten fabric to line posts with 'U' shaped wire ties conforming to diameter of pipe attached clasping pipe and fabric firmly with ends spaced not more than 16 inches apart. Attach wire ties clasping pipe and fabric firmly with ends twisted at least 2 full turns. Bend wire inward to minimize safety hazard. Where #9 gage wire or #6 gauge aluminum ties are used, hook the tie at both ends. Use of hooked ties with links will not be permitted.
5. Fasten fabric to top rails, mid-rails, and bottom rails with ties spaced not more than 18 inch apart. Bend back ends of tie wires so as not to be a hazard.

G. Field welds shall be cleaned of flux and spatter, damaged galvanizing removed, hazardous projections ground off, properly prepared, then heavily coated with "Galviz" or "Galvabar" or equivalent, distributed by Prixair Ph. No. (800) 225-8247, Airgas Ph. No. (800) 224-7427. Apply coating in strict accordance with manufacturer's directions.

H. Fabrication of Gates:
1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.
2. Fabric: Attach fence fabric to the same side as the line fencing fabric. Attach to side members with tension bars and tension bands as specified, spaced not more than 14 inch apart. Tension bars shall extend full height of gate. Attach fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inch apart.
3. Latches: Weld gate latches and strikes to gate posts and frames. Welding shall be done before gate frames are galvanized or welds shall be finished as specified for field welds.
4. Hinges: Hinges, including bolts, of type allowing gate to swing back parallel to line of fencing. Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates.
5. Grind welds flush and smooth. Hot-dip galvanize, fabricated parts after welding or finish ground smooth welds as specified for field welds.
6. Install gates plumb, level and structurally secure for full opening without interference. Install ground-set items in concrete for anchorage as reviewed in the shop drawings. Attach hardware using tamper-resistant means. Adjust hardware for smooth operation, lubricate as necessary and verify that gate functions in compliance with CBC requirements for accessibility and egress especially if within the path of travel.

I. Fasteners: Install nuts for tension bands and carriage bolts on secure side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.03 INSTALLATION OF GATES

A. Provide gates of the sizes indicated on Drawings. Allow clearance on gates of 1-1/2 inch at bottom and 1 inch at top. Construct gates set in sloping areas to be horizontal with specified height at high end of opening. Provide an opening in each gate for access to locking device or padlock. Knuckle ends of fabric cut for opening to eliminate hazards.

B. Adjust gate to operate smooth and quiet, free from binding, warp, excessive deflection, distortion, non-alignment throughout the entire operating range. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Be responsible for the installation of all hardware and for proper function and operation. Adjust gate and jamb frame alignment prior to completion of work of this section.

3.04 COMPLETION

A. Clean exposed metal surfaces of cement, grout and other foreign substances.

C. As a condition of final acceptance of the work, adjust fabric tension, operational / functional parts, clean all shop and field welds of flux and spatter, remove damaged galvanizing and recoat galvanizing.

3.05 SURPLUS MATERIALS DISPOSAL

A. Fencing, including fabric, posts, parts and fittings, not used / reused in work, shall become property of Contractor and shall be removed from site, unless otherwise specified.

END OF SECTION