



Project Manual

for the

DAVIDSON MIDDLE SCHOOL HVAC UPGRADES

DSA Submittal NOT FOR CONSTRUCTION

March 15, 2021

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DOCUMENT 00 0107

PROFESSIONAL SEALS AND DSA IDENTIFICATION STAMP

DIVISION OF THE STATE ARCHITECT IDENTIFICATION STAMP



Date: 03/09/2021

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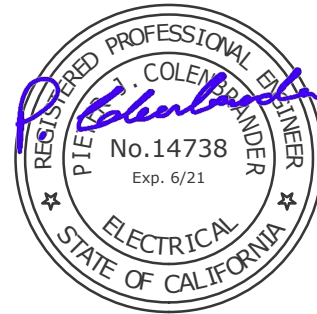


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DOCUMENT 00 0110

TABLE OF CONTENTS

00 0101 - COVER
00 0107 - PROFESSIONAL SEALS AND DSA IDENTIFICATION STAMP
00 0110 - TABLE OF CONTENTS
00 0115 - LIST OF DRAWINGS

DIVISION 00 PROCUREMENT AND CONTRACTING REQUIREMENTS
BIDDING AND CONTRACT DOCUMENTS TO BE PROVIDED AT BID TIME

TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

01 1100 - SUMMARY OF WORK
01 2100 - ALLOWANCES
01 2300 - ALTERNATES
01 2600 - MODIFICATION PROCEDURES
01 2900 - APPLICATIONS FOR PAYMENT
01 3200 - CONSTRUCTION PROGRESS SCHEDULE
01 3300 - SUBMITTALS
01 3500 - SPECIAL PROJECT PROCEDURES - HAZARDOUS MATERIAL ABATEMENT
HAZARDOUS MATERIALS ABATEMENT SPECIFICATIONS BY OTHERS
01 3546 - CONSTRUCTION INDOOR AIR QUALITY PLAN
01 3900 - COORDINATION AND MEETINGS
01 4000 - QUALITY CONTROL
01 4200 - REFERENCE STANDARDS
01 4523 - TESTING AND INSPECTION SERVICES
01 5000 - TEMPORARY FACILITIES
01 5600 - TEMPORARY CONTROLS
01 5800 - PROJECT IDENTIFICATION AND SIGNS
01 6000 - PRODUCT REQUIREMENTS
01 6116 - VOLATILE ORGANIC COMPOUND RESTRICTIONS
01 6116.01 - ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM
01 7000 - CONTRACT CLOSEOUT
01 7419 - CONSTRUCTION WASTE MANAGEMENT
01 7500 - STARTING OF SYSTEMS
01 7513 - EXECUTION REQUIREMENTS
01 8113 - SUSTAINABLE DESIGN REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

02 4119 - MINOR DEMOLITION FOR REMODELING

DIVISION 03 - CONCRETE

03 1000 - CONCRETE FORMING AND ACCESSORIES
03 2000 - CONCRETE REINFORCING
03 3000 - CAST-IN-PLACE CONCRETE

DIVISION 04 - MASONRY

NOT USED

DIVISION 05 - METALS

05 1100 - STRUCTURAL AND MISCELLANEOUS STEEL
05 5000 - METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

06 1000 - ROUGH CARPENTRY
06 2000 - FINISH CARPENTRY

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 0150.91 - ROOFING REPAIR
07 6200 - SHEET METAL FLASHING AND TRIM

DIVISION 08 - OPENINGS

08 1416 - FLUSH WOOD DOORS

DIVISION 09 - FINISHES

09 2116 - GYPSUM BOARD ASSEMBLIES
09 9123 - INTERIOR PAINTING

DIVISION 10 THROUGH DIVISION 14

NOT USED

DIVISION 15 THROUGH DIVISION 22

NOT USED

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING (HVAC)

23 0000 - HVAC

23 0500 - GENERAL MECHANICAL
23 0593 - TEST AND BALANCE
23 0923 - CONTROLS

DIVISION 26 - ELECTRICAL

26 0500 BASIC ELECTRICAL REQUIREMENTS
26 0800 TESTING
26 2400 SERVICE AND DISTRIBUTION SYSTEM
26 2700 BASIC ELECTRICAL MATERIALS AND METHODS

DIVISION 27 - COMMUNICATIONS

NOT USED

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

NOT USED

DIVISION 31- EARTHWORK

31 1000- SITE CLEARING

DIVISION 32- EXTERIOR IMPROVEMENTS

NOT USED

DIVISION 33 - UTILITIES

NOT USED

DIVISION 33 THROUGH DIVISION 48

NOT USED

END OF TABLE OF CONTENTS

DOCUMENT 00 0115 - LIST OF DRAWINGS

GENERAL

G-0.1	COVER SHEET
G-0.2	ABBREVIATIONS AND NOTES

SITE

A-1.1	PROJECT SITE PLAN
A-1.2	PARTIAL ENLARGED PLAN & EXTERIOR ELEVATION
A-1.3	PARTIAL ENLARGED PLAN & EXTERIOR ELEVATION
A-1.4	ARCHITECTURAL DETAILS
A-1.5	ARCHITECTURAL DETAILS

ARCHITECTURAL

A-2.1	10S WING FLOOR PLAN
A-2.2	20S WING FLOOR PLAN
A-2.3	30S WING FLOOR PLAN
A-2.4	40'S WING FLOOR PLAN
A-2.5	50'S WING FLOOR PLAN
A-3.1	10S WING RCP
A-3.2	20S WING RCP
A-3.3	30S WING RCP
A-3.4	40'S WING RCP
A-3.5	50'S WING RCP
A-4.3	30S WING ROOF PLAN
A-4.4	40'S WING ROOF PLAN
A-4.5	50'S WING ROOF PLAN

MECHANICAL

M-1.1	MECHANICAL SCHEDULES & LEGENDS
MD-2.1	MECHANICAL 10 WING DEMOLITION FLOOR PLAN
MD-2.2	MECHANICAL 20 WING DEMOLITION FLOOR PLAN
MD-2.3	MECHANICAL 30 WING DEMOLITION FLOOR PLAN
MD-2.4	MECHANICAL 40 WING DEMOLITION FLOOR PLAN
MD-2.5	MECHANICAL 50 WING DEMOLITION FLOOR PLAN
MD-3.1	MECHANICAL 10 WING DEMOLITION ROOF PLAN
MD-3.2	MECHANICAL 20 WING DEMOLITION ROOF PLAN
MD-3.3	MECHANICAL 30 WING DEMOLITION ROOF PLAN
MD-3.4	MECHANICAL 40 WING DEMOLITION ROOF PLAN
MD-3.5	MECHANICAL 50 WING DEMOLITION ROOF PLAN
MP-2.1	MECHANICAL 10 WING FLOOR PLAN
MP-2.2	MECHANICAL 20 WING FLOOR PLAN
MP-2.3	MECHANICAL 30 WING FLOOR PLAN
MP-2.4	MECHANICAL 40 WING FLOOR PLAN
MP-2.5	MECHANICAL 50 WING FLOOR PLAN

MP-3.3	MECHANICAL 30 WING ROOF PLAN
MP-3.4	MECHANICAL 40 WING ROOF PLAN
MP-3.5	MECHANICAL 50 WING ROOF PLAN
MP-4.1	MECHANICAL DETAILS
MP-4.1	MECHANICAL DETAILS
M-5.1	CONTROL DIAGRAMS
M-6.1	10 WING PIPING AND WIRING DIAGRAMS
M-6.2	20 WING PIPING AND WIRING DIAGRAMS
M-6.3	30 WING PIPING AND WIRING DIAGRAMS
M-6.4	40 WING PIPING AND WIRING DIAGRAMS
M-6.5	50 WING PIPING AND WIRING DIAGRAMS

ELECTRICAL

E-0.1	SYMBOLS LIST, GENERAL NOTES & LIST OF DRAWINGS
E-1.1	SITE PLAN - POWER
E-3.1	10'S WING FLOOR PLAN - POWER
E-3.2	20'S WING FLOOR PLAN - POWER
E-3.3	30'S WING FLOOR PLAN - POWER
E-3.4	40'S WING FLOOR PLAN - POWER
E-3.5	50'S WING FLOOR PLAN - POWER
E-5.1	SINGLE LINE DIAGRAM - POWER
E-6.1	PANEL SCHEDULES
E-6.2	PANEL SCHEDULES
E-7.1	DETAILS

END OF SECTION

SECTION 01 1100
SUMMARY OF WORK

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work covered by Contract Documents.
- B. Work under separate contracts.
- C. Execution, correlation and intent.
- D. Acceptance of site.
- E. Related documents.
- F. Contractor's use of premises.
- G. Access.
- H. Existing conditions.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project name is:

Davidson Middle School HVAC Upgrades

as shown on the Contract Documents prepared by Quattrocchi-Kwok Architects and briefly described as:

UPGRADE TO MECHANICAL SYSTEMS, AND ELECTRICAL SERVICE
IMPROVEMENTS IN SUPPORT OF MECHANICAL WORK; INCLUDES
REPLACEMENT OF EXISTING MECHANICAL UNITS AT BUILDING WINGS 10
THROUGH 50, INSTALLATION OF GROUND MOUNTED UNITS OUTSIDE THE
PATH OF TRAVEL, AND SECURITY ENCLOSURES TO PROTECT UPGRADED
EXTERIOR MECHANICAL UNITS.

- B. The Work shall be constructed under **single** fixed-price Contract.
- C. The Work of the Contract includes but is not necessarily limited to:

1. Selective demolition and construction necessary for the upgrades to the existing school mechanical systems, including associated work as indicated in the Drawings and Specifications. The Project will involve barricading of work areas as required to separate construction areas from occupied spaces and as needed to accommodate the Owner's schedule and use of the site.
2. All other work as shown in the Contract Documents.
3. The Work shall include all labor, materials and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents, including but not limited to:
 - a. Home office overhead,
 - b. Off-Site supervision,
 - c. Project Administration including preparation, research and distribution of project correspondence and submittals,
 - d. Schedule preparation and maintenance,
 - e. Guarantys and warrantys,
 - f. On-Site supervision,
 - g. Temporary protection,
 - h. Temporary utilities and facilities, including mobilization and demobilization,
 - i. Material handling and storage,
 - j. Safety equipment,
 - k. Travel time to and from the Site to the Contractor's home office.
- D. Sequence the Work subject to **the Owner's use of the site**, the requirements of the Construction Phasing, Technical Specifications and the Contract provisions for Liquidated Damages found elsewhere in these documents.
- E. Perform work indicated or required to produce finished results shown.
- F. Contractor shall coordinate all work and shall be responsible for division of work among the various subcontractors.
 1. Coordinate the work of this Contract with the activities of the Owner, and with PG&E and other serving utilities.
 2. Coordinate the work of this Contract with the activities of the Owner's separate contractors, including those for removal or abatement of Hazardous Materials.
- G. Laws and Regulations: Intent of the Contract Documents is to construct the Work shown therein, in accordance with applicable codes and regulations.

1.03 WORK UNDER SEPARATE CONTRACTS

- A. Serving Utilities may be performing certain utility work concurrent with this Contract.

1.04 EXECUTION, CORRELATION AND INTENT

- A. Correlation and Intent
 1. Documents Complementary and Inclusive:
 - a. The Contract Documents are complementary and are intended to include all items required for the proper execution and completion of the Work.

- b. Any item of work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both.
- 2. Coverage of the Drawings and Specifications:
 - a. The Drawings and Specifications generally describe the work to be performed by Contractor. Generally, the Specifications describe work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work.
 - b. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown.
 - c. All materials or labor for Work, which is shown on either by the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor whether or not the Work is expressly covered in either the Drawings and/or the Specifications.
 - d. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by them.
- 3. Conflicts. In the event there is a discrepancy between the various Contract Documents, the Owner/Contractor Agreement shall control. Without limiting Contractor's obligation to identify conflicts for resolution by the Architect identified elsewhere in this Article it is intended that the more stringent, higher quality, and greater quantity of Work shall apply.
- 4. Conformance With Laws:
 - a. Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon application of either party the Contract shall be amended in writing to make such insertion or correction.
 - b. Before commencing any portion of the Work, Contractor shall check and review the Contract Documents for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents.
 - c. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with any such restrictions or special requirements of the Contract Documents, Contractor shall immediately notify Architect in writing of same and shall cause to be corrected any such violation or inconsistency in the manner provided hereunder.
- 5. Ambiguity:
 - a. Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements.
 - b. Contractor shall immediately notify Owner and Architect of any perceived or alleged error, inconsistency, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein.

- c. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Price or the time for performance.
 - d. If Contractor performs, permits, or causes the performance of any Work under the Contract Documents prepared by or on behalf of Contractor which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the Contract Price or the time for performance.
 - e. In no case shall any Subcontractor proceed with the Work if uncertain without the Contractor's written direction and/or approval.
- B. Addenda and Deferred Approvals
 - 1. Addenda. Addenda shall govern over all other Contract Documents. Subsequent addenda issued shall govern over prior addenda only to the extent specified. In accordance with Title 24, California Code of Regulations, addenda shall be approved by the DSA.
 - 2. Deferred Approvals. The requirements approved by the DSA on any item submitted as a deferred approval in accordance with Title 24, California Code of Regulations, shall take precedence over any previously issued addenda, drawing or specification.
- C. Specification Interpretation and Application:
 - 1. Titles. The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved.
 - 2. As Shown, Etc. Where "as shown," "as indicated," "as detailed," or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where "as directed," "as required," "as permitted," "as authorized," "as accepted," "as selected," or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.
 - 3. Provide. "Provide" means "provided complete in place," that is, furnished, installed, tested, and ready for operation and use.
 - 4. General Conditions. The General Conditions and supplementary general conditions are a part of each and every section of the Specifications.
 - 5. Abbreviations.
 - a. In the interest of brevity, the Specifications are generally written in an abbreviated form in the imperative tense and may not include complete sentences.
 - b. Omission of words or phrases such as "Contractor shall," "shall be," etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory and directed to the Contractor.
 - c. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.
 - 6. Plural. Words in the singular shall include the plural whenever applicable or the context so indicates.

7. Metric. The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1" (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the "International System of Units" (SI) and generally follow ASTM E 380, "Standard for Metric Practice."
8. Standard Specifications. Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization's standard specifications, which are in effect at the date of the Contractor's proposal.
 - a. If applicable specifications are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Architect, perform such Work in accordance with the revised specifications.
 - b. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.
 - c. Procurement of reference standards and standard specifications is the sole responsibility of the Contractor.
9. Absence of Modifiers. In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another shall not affect the interpretation of either statement.

D. Rules of Document Interpretation

1. In the event of conflict **or ambiguity** within the drawings, the following rules shall apply:
 - a. General Notes, when identified as such, shall be incorporated into other portions of Drawings.
 - b. Schedules, when identified as such, are complementary with other notes and other portions of Drawings including those identified as General Notes.
 - c. Larger scale drawings shall take precedence over smaller scale drawings.
 - d. General or Typical Details and Symbols apply at all locations where specifically noted; at all locations conforming to the title of the Detail; at all locations of similar or identical graphic indication; at all locations where similar conditions are not fully or specifically shown or identified and complement similar details of specific conditions.
 - e. Details and Notes apply at all locations of similar or identical graphic indications and at all locations where similar conditions are not fully or specifically shown or identified.
 - f. Limitation of Indication does not affect Extent of Application: Indications of notes, details, and symbols may be limited to promote clarity. No limitation of application is intended nor shall be construed unless specifically noted.
 - g. Figured, derived, or numerical dimensions shall govern. At no time shall the Contractor base construction on scaled drawings.
2. Specifications shall govern as to materials, workmanship, and installation procedures.
3. In the case of disagreement or conflict between or within standards, specifications, and drawings, the more stringent, higher quality, and greater quantity of Work shall apply.

1.05 ACCEPTANCE OF SITE

- A. Contractor shall accept the site in the condition in which it exists at the time it is given Notice to Proceed.

1.06 RELATED DOCUMENTS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 specifications apply to the Work of this Section.

1.07 CONTRACTOR'S USE OF PREMISES

- A. Confine operations on the site to areas indicated in the Contract Documents. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the Work while engaged in project construction.
- B. Contractor shall limit its use of the premises for work and storage to allow for work by other contractors.
- C. Maintain existing driveways and entrances serving the premises clear and available to the Owner and its employees at all times. Do not use these areas for parking or storage of materials.
- D. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to area approved by the Architect. If additional storage is necessary, Contractor shall obtain and pay for such storage off site without additional expense to the Owner.
- E. Do not overload structures with weight that will endanger them.
- F. Assume full responsibility for protection and safekeeping of materials and tools stored at the site. Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.
- G. Move any stored products, temporary facilities, controls or fencing, under Contractor's control, which interfere with operations of the Owner or separate contractors, on or off the site, without cost to the Owner.
- H. Contractor shall cooperate with Owner and governing authorities to minimize disturbance. Observe all local ordinances for timing of work.
- I. In entrance and exit of all workmen and in bringing in, storing and removal of equipment, Contractor shall avoid unnecessary dust, mud or accumulated debris, or undue interference with the convenience, sanitation or routine of Owner's activities.
- J. In connecting new utilities to existing, and similar operations, Contractor shall time and coordinate such operations so that there will be no interference with Owner's activities.
- K. Protect improvements on adjoining properties as well as those on the Owner's property.
- L. Restore any improvements damaged by this work to their original condition as acceptable to the Owner.

- M. Do not interfere with use of adjacent buildings. Maintain free and safe passage to and from.
- N. Contractor shall be responsible for safety and support of structure. Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored. Contractor shall assume liability for such movement, settlement, damage or injury.
- O. Provide, erect and maintain barricades and guard rails as required by governing regulatory agencies to protect occupants of building and workers.
- P. Where demolition, removal or rework occurs, take all necessary precautions to protect existing finished work remaining in place from damage. Finished work damaged by operations under this contract shall be repaired or replaced to the satisfaction of Owner and Architect at no extra cost to the Owner.

1.08 1.08 OWNER'S USE OF THE SITE

- A. Owner will remain in continuous occupancy of the site. Summer School, community use of athletic fields and other site programs will be concurrent with this Contract. Owner reserves the right to limit hours of construction access and deliveries to avoid traffic conflicts during peak periods.
- B. A portion of this work, including the completion of preceding contracts, may be constructed concurrently with this Contract. The District may have various additional contracts for summer work and other projects from time-to-time on the site concurrent with this Contract.
- C. Owner's Use of Concurrent or Related Contracts: The Owner may occupy certain portions of the work of other contracts listed above prior to the completion of the work of this Contract. Make all allowances and include all sums necessary in the Bid Proposal to accommodate the Owner's occupancy of these neighboring areas.

1.09 ACCESS

- A. During the life of the Contract, maintain access to the site, and within the site to the building, for fire-fighting equipment, ambulance and police vehicles in accord with local fire marshal regulations.
 - 1. The Work of this Contract shall be performed, and such temporary facilities and phasing of activities provided, so as not to interfere with access to adjacent facilities or new work areas, so as to cause the least possible interference with activities of other contractors, the Owner's personnel or the public, and so as to protect persons and property from harm. Required accessways, and other accessways not required but so designated by the Owner or the Contract Documents, shall not be blocked.

2. No utility service, such as water, gas, sewers, electricity, communication or fire protection system serving the project, or any part of it, shall be interrupted without prior written approval of the Owner.
- B. The DISTRICT has considered the totality of the circumstances concerning the Project and the CONTRACTOR and CONTRACTOR's employees (which includes Subcontractor employees) subjection to the FINGERPRINTING REQUIREMENTS of Education Code Section 45125.2.
Contractor shall comply with the determination regarding fingerprint certification as defined in the general conditions.
- C. Contractor acknowledges that access to the project following occupancy by the Owner shall be subject to the requirements of Education Code Section 45125.2 as set forth in the General Conditions of the Contract and further acknowledges that all sums necessary to implement such compliance are included in the Bid Proposal.
- D. Contractor is notified that the Site is congested, with limited access. It shall be the Contractor's responsibility to coordinate Contractor's Work with the Work of other Prime Contractors performing work on the site. Areas designated by the Owner shall remain off-limits to construction personnel and equipment during construction.
- E. Contractor is hereby notified that the project site borders a residential neighborhood. Contractor acknowledges that the Work shall be performed during regular business hours. Contractor shall make provisions for the safety of residents and the general public adjacent to the site while working in proximity to the these areas or while working off-site.

1.10 EXISTING CONDITIONS

- A. Intent of the Drawings is to show existing conditions with information developed from field surveys and Owner's records, and to generally show the extent and type of work required to prepare the existing areas for new work. The information shown on the Drawings is not a guarantee of existing conditions.

1.11 LIQUIDATED DAMAGES AND CONTRACT COMPLETION

- A. Liquidated Damages will be assessed beginning on the Date contractually required for Completion and shall continue to accrue until each of the listed conditions are fulfilled.
- B. Date of Completion and Beneficial Occupancy is defined as the Date of Completion of all punch list items, including, but not limited to the following:
 1. Confirmation of mechanical and electrical systems testing and balancing, control sequences and operations.
 2. Completion of final cleaning, paint touch-up and adjusting.
 3. Adjustment and Contractor's certification of the finish hardware operation.
 4. Removal of Contractor's temporary facilities and materials.
 3. Owner's acceptance of the Work.
- C. Owner's occupancy prior to completion of any or all of the above items, or other such missing or incomplete work as may occur, shall not be construed as acceptance of the Work or as Completion when defined for the purposes of assessing Liquidated Damages.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION
Not Used.

END OF SECTION

SECTION 01 2100

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cash allowances: Include cash allowance in Schedule of Values as separate line item of the specified amount.
- B. Cash allowance will be charged against for only the specified purposes under force account procedure described in the General Conditions.
- C. Cash allowance remaining at completion will be deducted from the Contract Sum by Change Order.

1.02 RELATED SECTIONS

- A. Section 01 2600 - Modification Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

- A. Costs Included in Cash Allowances: Cost of Work to Contractor or Subcontractor, less applicable trade discounts, applicable taxes, and including disposal fees.
- B. Costs Not Included in Cash Allowances: Handling at the site, including unloading, mobilization and storage; protection of Work from elements and from damage; temporary facilities and labor for finishing. Costs for these items shall be included in the Contract Sum.
- C. Architect/Engineer Responsibilities:
 - 1. Consult with Contractor for consideration concerning demolition and replacement-in-kind.
 - 2. Review force account receipts and submittals.
- D. Owner/Inspector of Record Responsibilities:
 - 1. Verify quantities and types of materials.
 - 2. Verify delivery tickets and cost verification back-up submittals.
 - 3. Verify labor quantities and rates.
- D. Contractor Responsibilities:
 - 1. Prepare documentation and offer recommendations to Architect.
 - 2. Arrange for and process force account submittals. Arrange for removal of demolished materials.
- E. Changes in materials quantities and labor will be adjusted by force account procedures.

1.04 PROCEDURES

- A. All labor and materials compensated under this Allowance shall be performed under the continuous observation of the Inspector of Record. Labor and materials quantities for a given period will be reviewed and signed by the Inspector of Record.
- B. Charges for these Inspector-approved quantities may be debited from the Allowance section of the Schedule of Values on the Application for Payment, AIA G703. . Include all signed original submittals as exhibits for the Application for Payment.
- C. Allowance sums remaining at completion will be deducted from the Contract Sum by Change Order.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 ALLOWANCES SCHEDULE

END OF SECTION

SECTION 01 2300

ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Alternative submission procedures.
- B. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED SECTIONS

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.
- B. Document 00 5200 - Contract: Incorporating monetary value of accepted alternatives.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted alternatives will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternative.

1.04 SCHEDULE OF ALTERNATES

- A. Alternative No. ____ - ____:
 - 1. Base Bid Item: Section _____ and Drawing number ____ including _____.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2600

MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Documentation of change in Contract Sum and Contract Time.
- C. Change procedures.
- D. Execution of change orders.
- E. Correlation of Contractor submittals.

1.02 RELATED SECTIONS

- A. Document - Agreement: Monetary values of established Unit Prices.
- B. Document - General Conditions and Supplementary General Conditions: Governing requirements for changes in the Work, in Contract Sum and Contract Time and percentage allowances for Contractor's overhead and profit.
- C. Section 01 2900 - Applications for Payment: Payment applications and Schedule of Values.
- D. Section 01 3200 - Construction Progress Schedules: Work schedule.
- E. Section 01 6000 - Material and Equipment: Product options and substitutions.
- F. Section 01 7000 - Contract Closeout: Project record documents.

1.03 SUBMITTALS

- A. Submit name of the individual in Contractor's firm authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The following submittals shall be made on forms prepared by the Architect:
 - 1. Request For Information Forms.
 - 2. Architect's Supplemental Instructions Forms.
 - 3. Request For Proposal Forms.
 - 4. Change Order Forms.

1.04 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Maintain detailed records of work done. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. Provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit.
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.

1.05 REQUEST FOR INFORMATION ("RFI")

- A. An RFI is a written request prepared by the Contractor asking the Architect to provide additional information necessary to clarify an item which the Contractor feels is not clearly shown or called for in the drawings or specifications, or to address questions which have arisen under field conditions.
 - 1. RFI's shall be submitted by the Contractor to the Architect on the form which is included in the project. Submittals not conforming to this requirement will be returned.
- B. The RFI shall reference all the applicable Contract Documents including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and/or interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Cost, Contract Time, or the Contract Documents.
- C. The Architect must respond to a RFI within fourteen (14) calendar days after receiving such request. If the Architect cannot respond to the RFI within fourteen (14) calendar days, the Architect shall notify the Contractor, with a copy to the Inspector and the Owner, of the amount of time that will be required to respond.
- D. The Contractor shall be invoiced by the Owner for any costs incurred for professional services, which shall be deducted from the next progress payment, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request.

1.06 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS ("ASI")

- A. An ASI is a written supplemental instruction issued and signed by the Architect for minor changes to the Work, without change in Contract Sum or Contract Time.
- B. Architect Authority;
 - 1. The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Sum, an extension of the Contract Time, or a change which is inconsistent with the intent of the Contract Documents.
 - 2. Such changes shall be effected by written Change Order and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

1.07 REQUEST FOR PROPOSAL ("RFP")

- A. An RFP is a written request prepared by the Architect asking the Contractor to submit to the Owner and the Architect an estimate of the effect of a proposed change on the Contract Price and the Contract Time.
- B. An RFP shall contain adequate information, including any necessary drawings and specifications, to enable Contractor to provide the cost breakdowns.
- C. Owner or Architect may initiate changes by submitting a proposal request to Contractor. Request will include:
 - 1. Detailed description of the change, products and location of the change in the project.
 - 2. Supplementary or revised drawings and specifications.
 - 3. The projected time span for making the change and a specific statement as to whether overtime work is, or is not, authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only and is not an instruction to execute the changes nor to stop work in progress.
- D. The Contractor shall not be entitled to any Additional Compensation for preparing a response to an RFP, whether ultimately accepted or not.

1.08 CHANGE ORDER REQUEST ("COR")

- A. Definition: A COR is a written request prepared by the Contractor asking the Owner and the Architect to incorporate a proposed change called for in an RFP or a claim into a Change Order.
- B. Changes in Price: Include breakdowns as required in the Article for FORMAT FOR CHANGE ORDER REQUEST to validate any change in Contract Price due to proposed change or claim.
- C. Changes in Time: A COR shall also include any additional time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project Schedule as defined in the General Conditions and Division 1 of the Specifications.
- D. Scope of Costs: Within ten (10) days or such lesser period of time as may be required by Owner after a request is made for a change that impacts the Contract Sum or the Contract Time, provide to the Owner and the Architect in writing an estimate of the effect of the proposed Change upon the Contract Price and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing the following required for the change: actual quantities and unit prices of materials, labor hours, wage rates, the effect upon the Contract Time of such Change.
- E. Determination of Cost: The amount of the increase or decrease in the Contract Price resulting from a CO, if any, shall be determined in one or more of the following ways as applicable to a specific situation:
 - 1. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

2. Unit prices stated in the Contractor's original bid, the Contract Documents, or subsequently agreed upon between the Owner and the Contractor;
 3. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
 4. By cost of material and labor and percentage of overhead and profit.
- F. Determination of Costs by Material and labor and Percentage of overhead and profit: If the value is determined by this method the following requirements shall apply:
1. Daily Reports by Contractor.
 - a. General: At the close of each working day, the Contractor shall submit a daily report to the Inspector, on forms approved by the Owner, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, the location of the Work, and for other services and expenditures when authorized concerning extra work items. An attempt shall be made to reconcile the report daily, and it shall be signed by the Inspector and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through the Contractor.
 - b. Labor: Show names of workers, classifications, and hours worked.
 - c. Materials: Describe and list quantities of materials used.
 - d. Equipment: Show type of equipment, size, identification number, and hours of operation, including, if applicable, loading and transportation.
 - e. Other Services and Expenditures: Describe in such detail as the Owner may require.
- G. Basis for Establishing Costs for Change Orders:
1. Labor will be the actual cost for wages prevailing locally for each craft or type of workers at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements.
 2. Labor Unit Productivity for a given task or trade shall not be calculated at a lesser productivity than that published by industry references as follows:
 - a. Mechanical Trades: SMACNA productivity rates increased by 30 percent (30 percent greater productivity for a given task than specified by the reference).
 - b. Electrical and Division 26 Trades: NECA productivity rates increased by 30 percent (30 percent greater productivity for a given task than specified by the reference).
 - c. All Other Trades: Lee Saylor Estimating Guide productivity using the "Open Shop Rate" for both labor and materials.
 3. Only costs for direct labor related to the Changed or Added Work shall be included. Supervision, Project Manager, Project Engineer, Assistant Superintendent, research and preparation of Change Order Requests and other similar classifications shall be included in the calculation for overhead and not listed separately as line items.
 4. The use of a labor classification, which would increase the extra work cost, will not be permitted unless the Contractor establishes the necessity for such additional costs.
 5. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.
 6. Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery.

7. The Owner reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Owner.
8. Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of \$100 or less.
9. Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the work is performed.
10. The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.
11. Necessary loading and transportation costs for equipment used on the extra work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Owner than holding it at the work Site, it shall be returned unless the Contractor elects to keep it at the work Site at no expense to the Owner.
12. Other Items. The Owner may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the request for payment.
13. Invoices. Vendors' invoices for material, equipment rental and other expenditures shall be submitted with the COR. If the request for payment is not substantiated by invoices or other documentation, the Owner may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.
14. Overhead. Overhead, including direct and indirect costs shall be included in the line item amount shown in the Article FORMAT FOR PROPOSED COST CHANGE, shall be submitted with the COR and shall include all of the following:
 - a. Home office overhead,
 - b. Off-Site supervision,
 - c. Change Order and Change Order Request preparation/negotiation/research,
 - d. Schedule delays,
 - e. Project interference and disruption,
 - f. Additional guaranty and warranty durations,
 - g. On-Site supervision, additional temporary protection,
 - h. Additional temporary utilities,
 - i. Additional material handling costs,
 - j. Additional safety equipment costs.

H. Contractor's Certification:

1. All proposed change order requests, including those originated by the Contractor or those filed as claims, must include the following certification by the Contractor:

"The undersigned Contractor approves the foregoing as to the changes in work, if any, and as to the contract price specified for each item and as to the extension of time allowed, if any, for completion of the project as stated herein, and agrees to furnish all labor, materials, and service and to perform all work necessary to complete any additional work specified for the consideration stated herein. Submission of claims which have no basis in fact or which Contractor knows are false are made at the sole risk of the Contractor and may be a violation of the False Claims Act, as set forth in Government Code Sections 12650 et seq. It is understood that the changes to the Contract Documents set forth herein shall only be effective upon approval by the governing board of the District.

"It is expressly understood that the value of the extra work or changes expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs, expenses, damages, or time extensions not included herein are deemed waived."

2. All proposed change orders requests shall be submitted on forms included in this project manual. Change Order Requests submitted on the Contractor's forms, altered, modified, or incomplete forms will be deemed waived.

- I. Format for Change Order Request: The following format shall be prepared by the Contractor to communicate proposed additions and deductions to the Contract.

CHANGE ORDER REQUEST NO. _____

	ADDED	CREDIT
GENERAL CONTRACTOR'S WORK		
1. Material (attach itemized quantity and unit cost excluding sales tax)	_____	_____
2. Labor (attach itemized hours and rates)	_____	_____
3. Equipment (attach invoices)	_____	_____
4. Subtotal	_____	_____
5. General Contractor's Overhead and Profit, not to exceed fifteen percent (15%) of line 4.	_____	_____
6. Subtotal	_____	_____
7. Liability and Property Damage Insurance, Worker's Compensation Insurance, Social Security, and Unemployment Taxes, not to exceed thirty-three percent (33%) of line 2.	_____	_____
8. Subtotal General Contractor Work (sum of lines 6 and 7.)	_____	_____
SUBCONTRACT WORK (Provide separate breakdown for each subcontract)		
9. Material (attach itemized quantity and unit cost excluding sales tax)	_____	_____
10. Labor (attach itemized hours and rates)	_____	_____
11. Equipment (attach invoices)	_____	_____
12. Subtotal	_____	_____
13. Subcontractor's overhead and profit on work performed by Sub-contractor, not to exceed fifteen percent (15%) of line 12.	_____	_____
14. Subtotal	_____	_____
15. General Contractor's Overhead and Profit on subcontract work, not to exceed ten percent (10%) of line 14.	_____	_____
16. Liability and Property Damage Insurance, Worker's Compensation Insurance, Social Security, and Unemployment Taxes, not to exceed thirty-three percent (33%) of line 10.	_____	_____
17. Total of Subcontract Work (sum of lines 14, 15 and 16)	_____	_____
18. Subtotal General Contractor and Subcontractor Work (sum of lines 8 and 17.)	_____	_____
19. Applicable Taxes (itemized by levy and by contract)	_____	_____
20. Subtotal (sum of lines 18 and 19)	_____	_____
21. Bond not to exceed one and one half percent (1 1/2%) of line 20.	_____	_____
22. TOTAL (sum of lines 20 and 21.)	_____	_____

- J. The value of such extra work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project. Any costs or expenses not included in the COR are deemed waived.
- K. Changes may be made by Owner by an appropriate written Change Order, or, at the Owner's option, such changes shall be implemented immediately upon the Contractor's receipt of an appropriate written directive.
- L. Notice required for Contractor-Initiated Change Order Requests: To request an increase in the Contract Price, or any extension in the Contract Time for completion, Contractor shall give the Owner and the Architect written notice thereof within ten (10) days after the occurrence of the event giving rise to the request, together with detailed estimates of the impact on the Contract Price and/or the Contract Time.
 - 1. This notice shall be given by the Contractor before proceeding to execute the Work.
 - 2. No request shall be considered unless made in accordance with this Article; however, the mere presentation of such claim shall not establish the validity of the cause giving rise to such request, or of the extension of the Contract Time, and/or the increase in the Contract Price.
 - 3. Contractor shall proceed to execute the Work even though the adjustment has been rejected or not agreed upon.
 - 4. Failure to provide the required notice within the stated time constitutes an express waiver of request.
 - 5. Any change in the Contract Price or extension of the Contract Time resulting from such request shall be authorized by a Change Order.

1.09 CHANGE ORDERS ("CO")

- A. No Changes Without Authorization;
 - 1. There shall be no change whatsoever in the drawings, specifications, or in the Work without an executed Change Order or an order by the Architect for a minor change in the Work as herein provided.
 - 2. Owner shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the same shall have been authorized by and the cost thereof approved in writing by Change Order.
 - 3. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order.
 - 4. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.
 - 5. Notwithstanding anything to the contrary in this Article, all Change Orders shall be prepared and issued by the Architect and shall become effective when executed by the Owner, the Architect, the Contractor, and associated Construction Change Document (CCD) approved by DSA.
- B. Owner will designate in writing the person who is authorized to execute change orders.
- C. Contractor may initiate changes by submitting a written notice to Architect containing:
 - 1. Description of the proposed changes.

2. Statement of the reason for making the changes.
 3. Statement of the effect on the contract sum and the contract time.
 4. Statement of the effect on the work of separate contractors.
 5. Documentation supporting any change in contract sum or contract time as appropriate.
- D. A Change Order is a written instrument prepared by the Architect and signed by the Owner, the Contractor, and the Architect stating their agreement upon all of the following:
1. a change in the Work;
 2. the amount of the adjustment in the Contract Sum, if any; and
 3. the extent of the adjustment in the Contract Time, if any.
- E. The following paragraph shall be a part of each Change Order:
1. The compensation (time and cost) set forth in this Change Order comprises the total compensation due the Contractor, all Subcontractors and all Suppliers, at all tiers, for the work or change defined in the Change Order, including all impact on unchanged work. By signing this Change Order the Contractor acknowledges and agrees, on behalf of themselves, all Subcontractors and all Suppliers, at all tiers, that the stipulated compensation includes payment for all work contained in the Change Order, plus all payment for the interruption of schedules, extended and unabsorbed overhead costs, delay, disruption, and all impact, ripple impact or cumulative impact on all other work under this Contract. The signing of the Change Order indicates that the Change Order constitutes full mutual accord and satisfaction for the changed work, and that the time and cost under the Change Order constitutes the total equitable adjustment owed the Contractor, all Subcontractors and all Suppliers, at all tiers, as a result of the change. The Contractor, on behalf of themselves, all Subcontractors and all Suppliers, at all tiers, agrees to waive all rights, without exception or reservation of any kind whatsoever to file any further claim related to this Change Order. No further claim or request for equitable adjustment of any kind whatsoever shall arise out of or as a result of this change or the impact of this change on the remainder of the work under this Contract.
- F. For a "close out" Change Order (i.e., the final Change Order on the project), add the following paragraph.
1. By execution of this Change Order the Contractor specifically waives, relinquishes, and releases any and all rights under Section 1542 of the California Civil Code which reads as follows:
- "A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS OR HER FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM OR HER MUST HAVE MATERIALLY AFFECTED HIS OR HER SETTLEMENT WITH THE DEBTOR."

1.10 EXECUTION OF CHANGE ORDERS

- A. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- B. Transmittal and Distribution:
 1. Architect will prepare and execute the Change Order and forward to Contractor.

2. Contractor shall execute the Change Order and forward to Architect. Architect will forward Change Order to Owner.
3. Owner will execute the Change Order and forward to the Architect.

1.11 CORRELATION OF CONTRACTOR SUBMITTALS

- A. 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/Price.
- B. 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.
- C. Promptly enter changes in Project Record Documents.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 ELECTRONIC PROCESSING PROCEDURES

- A. Modification requests shall be transmitted to the Architect using the project's cloud-based file sharing and storage service ("project's website") with electronic, editable (PDF) format attachments, as required. The cloud-based file sharing and storage service will be selected by the Architect. Contractor's failure to utilize, provide entries and processing through the Architect's cloud-based system will subject Contractor to hourly back charges associated with efforts required by others to perform work which is the contractual responsibility of the Contractor.
- B. Contractor's cost related to use of the project's website services shall be included in the Contractor's bid.
- C. Provide hardcopy submittals if requested by Architect.
- D. The Architect's review comments and/or direction will be made available on the project's website for downloading.
- E. Contractor will distribute a hardcopy of all reviewed request and direction to the Inspector of Record, Owner, and Construction Manager.

END OF SECTION

(MODIFICATION PROCEDURE FORMS FOLLOW)

REQUEST FOR INFORMATION
ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

REQUEST FOR PROPOSAL
POTENTIAL CHANGE ORDER
CHANGE ORDER



-O-1.4

Request for Information

Detailed, RFIs without Routing Information Grouped by RFI Number

Project Number:			
DSA Application:			
DSA File:			
			Date Created:
Answer Company	Answered By	Author Company	Authored By
Quattrocchi Kwok Architects			
636 5th Street			
Santa Rosa, CA 95404			
Co-Respondent		Author RFI Number	
Subject	Discipline		Category
Cost Impact	Amount	Schedule Impact	Days
			0
Drawing Impact			
Cost Impact Comments	Schedule Impact Comments		Drawing Impact Comments
Drawing/Specification Section Reference:			
Question			Date Required:
Suggestion			
Answer			Date Answered:

-O-1.5



Architect's Supplemental Instruction

Detailed, Grouped by Each Number

Project Number:	
DSA Application:	
DSA File:	
Number:	Date:
To:	From: Quattrocchi Kwok Architects
	636 5th Street Santa Rosa, CA 95404
Subject	
Reference Drawing/Detail	Attachments
Description	



-O-1.6

Request for Proposal

Project Number:
DSA Application:
DSA File:

RFP __

Please submit an itemized proposal for changes in the Contract Sum or Contract Time for proposed modifications to the Contract Documents described herein. Submit proposal within ten (10) days or notify the Architect in writing of the date on which you anticipate submitting your proposal. Proposal shall include all impacts related to this change and contractor is due no further completion than represented by proposal for change or any impacts related to change.

THIS IS NOT A CHANGE ORDER OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

Please provide itemized pricing for the following description of work:

Attachments:



Potential Change Orders

Detailed, Grouped by Each Number

Project Number:		
DSA Application:		
DSA File:		
PCO Number:	Title:	Status:
Date Created	Reference	
Full Description		
Schedule Adjustment		
Requested Days		Approved Days
Price Adjustment		
Proposed Amount	Approved Amount	Applied Amount

PROJECT:

Project No.:

Date:

DSA App. No.:

Page

of

Line TITLE:

ADDED

CREDIT

ALL LINES SHALL BE FILLED IN, (zero values acceptable).

GENERAL CONTRACTOR'S WORK

1 Material (attach itemized quantity and unit cost excluding sales tax)

2 Labor (attach itemized hours and rates)

3 Equipment (attach invoices)

4 **Subtotal**

5 General Contractor's Overhead and Profit,
not to exceed fifteen percent (15%) of line 4.

6 **Subtotal**

7 Liability and Property Damage Insurance, Worker's
Compensation Insurance, Social Security, and
Unemployment Taxes, not to exceed thirty-three percent
(33%) of line 2.

8 **Subtotal** General Contractor Work (sum of lines 6 and 7.)

SUBCONTRACT WORK (Provide separate breakdown for each subcontract)*

9 Material (attach itemized quantity and unit cost excluding sales tax)

10 Labor (attach itemized hours and rates)

11 Equipment (attach invoices)

12 **Subtotal**

13 Subcontractor's overhead and profit on work performed
by Sub-contractor, not to exceed fifteen percent (15%) of line 12.

14 **Subtotal**

15 General Contractor's Overhead and Profit on subcontract work,
not to exceed ten percent (10%) of line 14.

16 Liability and Property Damage Insurance, Worker's
Compensation Insurance, Social Security, and Unemployment Taxes,
not to exceed thirty-three percent (33%) of line 10.

17 **Total** of Subcontract Work (sum of lines 14, 15 and 16)

18 **Subtotal** General Contractor and Subcontractor Work
(sum of lines 8 and 17.)

19 Applicable Taxes (itemized by levy and by contract)

20 **Subtotal** (sum of lines 18 and 19)

21 Bond not to exceed one and one half (1 1/2%) of line 20.

22 **TOTAL** (sum of lines 20 and 21.) Copy to cover page.

* Attach additional copies of this page as required to summarize additional subcontracts.

**CHANGE
ORDER**

	Distribution to
<input checked="" type="checkbox"/>	OWNER
<input checked="" type="checkbox"/>	ARCHITECT
<input checked="" type="checkbox"/>	CONTRACTOR
<input checked="" type="checkbox"/>	IOR (copy)
<input checked="" type="checkbox"/>	ORS
<input type="checkbox"/>	

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00**

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PROJECT

Change Order No.

Zero (00)

Project No.

Initiation Date:

Contract For:

Contract Date

ORS File No.

ORS App. No.

OPSC App. No.

CONTRACTOR

You are directed to make the following changes in this contract: (Refer to Attached Summary)

*Reserved for Architect's Stamp**Reserved for DSA/ORS Approval Stamp*

The original Contract Sum was

Net change by previous Change Orders

The Contract Sum prior to this Change Order was

The Contract Sum will be UNCHANGED by this Change Order in the amount of

The new Contract Sum including this Change Order will be

The Contract Time will be UNCHANGED by this Change Order in the amount of

The Date of Completion as of the date of this Change Order:

Not valid until signed by both the Owner and the Architect.

Signature of the contractor indicates his approval herewith, including any adjustment in the Contract Sum or Contract Time.

The compensation (time and cost) set forth in this Change Order comprises the total compensation due the Contractor, all Subcontractors and all Suppliers, at all tiers, for the work or change defined in the Change Order, including all impact on unchanged work. By signing this Change Order the Contractor acknowledges and agrees, on behalf of themselves, all Subcontractors and all Suppliers, at all tiers, that the stipulated compensation includes payment for all work contained in the Change Order, plus all payment for the interruption of schedules, extended and unabsorbed overhead costs, delay, disruption, and all impact, ripple impact or cumulative impact on all other work under this Contract. The signing of the Change Order indicates that the Change Order constitutes full mutual accord and satisfaction for the changed work, and that the time and cost under the Change Order constitutes the total equitable adjustment owed the Contractor, all Subcontractors and all Suppliers, at all tiers, as a result of the change. The Contractor, on behalf of themselves, all Subcontractors and all Suppliers, at all tiers, agrees to waive all rights, without exception or reservation of any kind whatsoever to file any further claim related to this Change Order. No further claim or request for equitable adjustment of any kind whatsoever shall arise out of or as a result of this change or the impact of this change on the remainder of the work under this Contract.

By execution of this Change Order the Contractor specifically waives, relinquishes, and releases any and all rights under Section 1542 of the California Civil Code which reads as follows:

"A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY EFFECTED HIS SETTLEMENT WITH THE DEBTOR."

ARCHITECT

CONTRACTOR

OWNER

QUATTROCCHI KWOK ARCHITECTS

636 Fifth St.

Santa Rosa, CA 95404

By.

By.

By.

Date

Date

Date

SUMMARY OF ATTACHMENTS TO:

PROJECT

0

0

Change Order No. Zero (00)

Project No. _____

Contract For: _____

ORS App. No. _____

The Time for Milestone 1 will be UNCHANGED by this Change Order in the amount of

The Date of Milestone 1 as of the date of this Change Order therefore is

The Time for Milestone 2 will be UNCHANGED by this Change Order in the amount of

The Date of Milestone 2 as of the date of this Change Order therefore is

						Calendar Days Added to Contract			
No.	Reference:	Description:	C.O.R. #	Request by:	Amount	DoC	M1	M2	M3
TOTALS:					\$ -	0	0	0	0
1.									
2.									
3.									
4.									
5.									
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35.									
END OF SUMMARY									

SECTION 01 2900

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. Payment Procedures:
 - 1. Schedule of Values.
 - 2. Applications for Payment.
 - 3. Conditions of Payment.
 - 4. Final Payment.
 - 5. Contractor Submittals.
- B. Related Documents
 - 1. Document - Contract (Agreement Between Owner and Contractor): Lump Sum.
 - 2. Document - General Conditions: Progress Payments, Retainages and Final Payment, Applicability of Labor Compliance Program.
 - 3. District Labor Compliance Program, as applicable to the project.
 - 4. Section 01 2600 - Modification Procedures: Change Orders.
 - 5. Section 01 3900 - Coordination and Meetings.
 - 6. Section 01 3300 - Submittals: Submittal procedures.
 - 7. Section 01 3200 - Construction Progress Schedules.
 - 8. Section 01 7000 - Contract Closeout: Final payment.

1.02 SUBMITTALS

- A. On forms approved by the Owner, the Contractor shall furnish the following:
 - 1. Within ten (10) days of the award of the Contract, a detailed breakdown of the Contract Price (Schedule of Values) for each Project or Site;
 - 2. Within ten (10) days of the award of the Contract, a schedule of estimated monthly payment requests (cash flow) due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the Owner may require;
 - 3. Within ten (10) days, the name, address, telephone number, fax number, license number, and classification of all of its Subcontractors and of all other parties furnishing labor, material, or equipment for its Contract, along with the amount of each such subcontract or the price of such labor, material, and equipment needed for its entire portion of the Work.
 - 4. Five (5) days prior to the submission of a pay request, an itemized breakdown of work done for the purpose of requesting partial payments;
 - 5. Five (5) days prior to the submission of a pay request, the minutes of Coordination Meetings per Section 01 3900.
 - 6. Five (5) days prior to the submission of a pay request, updated Construction Progress Schedule per Section 01 3100.

7. For all public works projects subject to prevailing wage requirements of the Labor Code: submittal of electronic certified payroll records to the State Labor Commissioner maintained on a weekly basis, as required (Labor Code Section 1776), and penalties for failure to do so (Labor Code Section 1776(g)); The requirement includes and applies to all subcontractors performing work on projects even if their portion of the work is less than one half of one percent of the total amount of the contract.
- B. Owner Approval Required
 1. The Owner shall review all submissions received pursuant to paragraph 1.03 A. in a timely manner. All submissions must be approved by the Owner before becoming the basis of any payment.
- C. Submit itemized applications typed on Application and Certificate for Payment and Continuation Sheet.
- D. Provide itemized data on continuation sheet:
 1. Format, schedules, line items and values: Those of the Schedule of Values accepted by Architect.
- E. Obtain signature of Owner's Inspector on Application for Payment Continuation Sheet with each application prior to submittal to Architect.

1.03 SCHEDULE OF VALUES

- A. The Schedule of Values shall be used only as the basis for the Contractor's Progress Payments.
- B. Upon request of the Architect, support the values with data which will substantiate their correctness.
- C. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
 1. Contractor's construction schedule.
 2. Application for Payment form.
 3. List of subcontractors
 4. List of products.
 5. List of principal suppliers and fabricators.
 6. Schedule of submittals.
- D. Form of Schedule: Submit schedule on Application for Payment Continuation Sheet. Identify schedule with;
 1. Title of Project and location, and name of Owner.
 2. Architect and Architect's Project Number.
 3. Name and address of Contractor.
 4. Contract designation.
 5. Date of submission.
- E. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Modify detail as requested by Architect.
- F. Follow the table of contents of this Project Manual as the form for listing component items.

1. Identify each line item with the number and title of the respective section of the specifications.
 2. Include separate line items for each section of Division 01.
- G. For each major line item which has installed value of more than \$10,000.00, list sub-values of major products or operations under the item.
- H. For the various portions of the Work:
1. Itemize separate line item cost for each of following general cost items (if provided):
 - a. Performance and payment bonds.
 - b. Field supervision and layout.
 - c. Temporary facilities and controls.
 - d. Mobilization.
 2. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 3. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid.
 - b. The total installed value.
- I. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 APPLICATIONS FOR PAYMENT

- A. Procedure: On or before the twenty-fifth (25th) day of each calendar month during the progress of the portion of the Work for which payment is being requested, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized if the project is subject to a Labor Compliance Program, or if directed by the Owner for projects not subject to as Labor Compliance Program, and supported by all of the following, or such portion thereof as Architect requires:
1. The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;
 2. The amount being requested with the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;
 3. The balance that will be due to each of such entities after said payment is made;
 4. A certification that the Record Drawings and Annotated Specifications are current;
 5. The additions to and subtractions from the Contract Price and Time;
 6. A summary of the retentions (each Application shall provide for retention, as set forth above, of the amount due until completion of the Work of the Contractor and Final Acceptance thereof by Owner);
 7. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the Owner may require from time to time;
 8. The percentage of completion of the Contractor's Work by line item; and
 9. A statement showing all payments made by the Contractor for labor and materials on account of the Work covered in the preceding Application for Payment.
- B. Application Form:
1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.

2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
 3. Execute certification with signature of a responsible officer of Contract firm.
- C. Continuation Sheets:
1. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored.
 3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
 - a. List by Change Order Number, and description, as for an original component item of work.
- D. Purchase of Materials and Equipment: The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from Owner. Therefore, payment by the Owner for stored material shall be made only in unusual circumstances where the Architect specifically recommends, and Owner specifically approves, the payment in writing.
- Payments made on account of materials and equipment not incorporated in the Work shall be conditioned upon submission by the Contractor, Subcontractor, or vendor of:
- a. bills of sale and such other documents satisfactory to the Architect and the Owner to establish the Owner's title to such materials or equipment free of all liens and encumbrances, and otherwise protect the Owner's interest, and:
 - b. including, without limitation, provision of applicable insurance and transportation to the Site.
2. All stored items shall be inventoried, specified by identification numbers (if applicable), released to the Owner by sureties of the Contractor and the Subcontractor and delivered and suitably stored at the Site or at some other location agreed upon in writing by the Owner, if stored off-Site, stored only in a bonded warehouse.
- E. Warranty of Title: The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work.
- F. Progress Payments:
1. Payments to Contractor
 - a. Within thirty (30) days after approval of the Request for Payment, Contractor shall be paid a sum equal to ninety five (95) percent of the value of the Work performed up to the last day of the previous month unless a different retention percentage is stated in the Notice Inviting Bids, in which case that percentage applies, less the aggregate of previous payments. The value of the Work completed shall be an estimate only, no inaccuracy or error in said estimate shall operate to release the Contractor, or any bondsman, from damages arising from such Work or from enforcing each and every provision of this Contract, and the Owner shall have the right subsequently to correct any error made in any estimate for payment.

- b. The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for work performed, so long as any lawful or proper direction given by the Owner concerning the Work, or any portion thereof, remains uncompleted with. At any time after fifty percent (50%) of the Work has been completed, if the Owner, by action of its governing body, finds that satisfactory progress is being made, the Owner may make any of the remaining payments in full for actual work completed or may withhold any amount up to ten percent (10%) thereof as the Owner may find appropriate based on the Contractor's progress.
 2. Payments to Subcontractors: No later than ten (10) days after receipt, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.
 3. Percentage of Completion or Payment Information: The Owner will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor, and action taken thereon by the Owner, on account of portions of the Work done by such Subcontractor.
 4. No Obligation of Owner for Subcontractor Payment: The Owner shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.
 5. Payment to Suppliers: Payment to material or equipment suppliers shall be treated in a manner similar to that provided in paragraphs 1.05 F. 2., 3. and 4.
 6. Payment Not Constituting Approval or Acceptance: An approved Request for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of work not in accordance with the Contract Documents.
 7. Joint Checks: Owner shall have the right, if necessary for the protection of the Owner, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. In no event shall any joint check payment be construed to create any contract between the Owner and a Subcontractor of any tier, any obligation from the Owner to such Subcontractor, or rights in such Subcontractor against the Owner.
- G. Labor Compliance: A determination regarding whether this project is subject to prevailing wage requirements of the Labor Code is included in the Instructions to Bidders. Further information is contained in the General Conditions. The Contractor is responsible for enforcement of the terms and conditions of the Labor Code, including electronic certified payroll reporting and posting job site notices prescribed by regulation.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. Each and every Application for Payment shall be accompanied with the complete substantiating data specified in this Section in the article titled CONDITIONS OF PAYMENT.
- B. When the Owner or the Architect requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
 1. Project.
 2. Application number and date.
 3. Detailed list of enclosures.

4. For stored products:
 - a. Item number and identification as shown on application.
 - b. Description of specific material.

1.06 COMPLETION AND FINAL PAYMENT

A. Final Inspection

1. Contractor shall immediately upon receipt of the Punch List, initiate work on all items therein related to Contractor's Work and diligently complete the same. Upon receipt of Contractor's written notice that all of the Punch List items have been fully completed and the Work is ready for final inspection and acceptance, Architect shall inspect the Work and shall submit to Contractor and Owner a final inspection report noting the work, if any, required in order to complete the Work in accordance with the Contract Documents. Absent unusual circumstances, this report shall consist of the Punch List items not yet satisfactorily completed.
2. Upon completion of the Work contained in the final inspection report, the Contractor shall so notify the Owner, who shall again inspect such Work. If the Owner finds the Work contained in such final inspection report acceptable under the Contract Documents and, therefore, the Work fully completed, it shall so notify Contractor, who shall then submit to the Architect its final Application for Payment.
3. Upon receipt and approval of such final Application for Payment, the Architect shall issue a final Certificate of Payment stating that to the best of its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Architect in connection with the Work, such Work has been completed in accordance with the Contract Documents. The Owner shall thereupon inspect such Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (which, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the Owner shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of payment from Owner, pay the amounts due Subcontractors.

B. Retainage: The retainage, less any amounts disputed by the Owner or which the Owner has the right to withhold, shall be paid after approval of the Owner of the Architect's Certificate of Payment referred to in paragraph 1.07 A., after the satisfaction of the conditions set forth in paragraph 1.07 C., and after thirty-five (35) days after the acceptance of the Work and recording of the Notice of Completion by Owner. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to perform, in accordance with the terms and conditions of the Contract Documents.

C. Procedures for Application for Final Payment: The Application for Final Payment shall be accompanied by the same details as set forth in paragraph 1.05, and in addition, the following conditions must be fulfilled:

1. A full and final waiver of all liens in connection with the Work shall be submitted by Contractor, including a release of lien in recordable form, together with (to the extent permitted by law) a copy of the full and final waiver of all liens, including a release of lien in recordable form, in connection with the Work obtained by Contractor from each person to receive a payment thereunder, which waivers of lien shall be in a form as approved by Owner.

2. The Contractor shall have made, or caused to have been made, all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of Owner required under the Contract.
 3. Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.
 4. The Contractor shall deliver to the Owner reproducible final Record Drawings and Annotated Specifications showing the Contractor's Work "as built," with the Contractor's certification of the accuracy of the Record Drawings and Annotated Specifications, all guarantees, and operation and maintenance instructions for equipment and apparatus.
 5. Architect shall have issued a Final Certificate of Payment.
 6. The Contractor shall have delivered to the Owner all manuals and materials required by the Contract Documents.
 7. The Contractor shall have removed, or caused to be removed, all waste materials and rubbish from and about the Site, as well as all tools, construction equipment, machinery, surplus material, scaffolding equipment, and any other similar materials of the Contractor or any subcontractor, shall have cleaned, or caused to be cleaned, all glass surfaces, and shall have left the Work broom-clean, except as otherwise provided in the Contract Documents.
- D. Fill in Application form as specified for progress payments and present the final statement of accounting.
- E. Use continuation sheet for presenting the final statement of accounting as specified in Section 01 7000 - Contract Closeout.
- F. Fill out and submit with application for final payment:
1. Contractor's Affidavit of Payment of Debts and Claims.
 2. Contractor's Affidavit of Release of Liens.
 3. Consent of Surety Company to Final Payment.
 4. Release Form 3 Conditional Waiver and Release Upon Final Payment.
- G. Fill out and submit to Owner prior to receipt of final payment: Release Form 4 Unconditional Waiver and Release Upon Final Payment

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to Architect at the times stipulated in the Agreement.
- B. Number: Five copies of each Application, or four copies in addition to number required by Contractor.
- C. Each Application shall include all of the items listed in the Article titled CONDITIONS OF PAYMENT.

1.08 CONDITIONS OF PAYMENT

- A. Contractor submittal of the following items attached to the Application for Payment Transmittal following this Section with original signature of the Contractor's Project Superintendent, with each and every Application for Payment is a condition precedent to receipt of payment.
1. Certification of Review of Payment Application by original signature on the Application for Payment Transmittal of Contractor's Superintendent. This document shall be counter-signed signifying review and approval by Owner's Inspector of Record.
 2. Application for Payment with schedule of values for the period during which Work was performed.
 3. Completed Daily Reports for the applicable billing period. Contractors shall maintain daily records of their activities, subcontractors present, number of workers representing each subcontractor, number of workers employed by the Contractor, and any other information deemed pertinent by the Contractor. Architect is not required to review or comment on this information.
 4. Completed Schedule Update for the applicable billing period, with all attachments as may be required by Section 01 3100 for that submittal.
 5. Provide Certification by original notarized signature of Contractor's Project Superintendent on the Application for Payment Transmittal that the project is on schedule and that the Contractor has experienced no delays or schedule disruptions.
 - a. In the event that a Contractor has experienced delay or disruption in the period for which payment is applied, Contractor must so indicate in writing with original signature on Contractor's company letterhead attached to this certification stating the nature of the delay or disruption, the event that precipitated said delay, and the method of recovering the lost time and maintaining the schedule recommended by the Contractor. Failure to so timely indicate delay or disruption shall be construed as a waiver of claim for damages for same.
 6. Certification by original notarized signature of Contractor's Project Superintendent on the Application for Payment Transmittal that Contractor has updated all As-Built Drawings in the Project Superintendent's office.
 7. Completed Conditional Waiver and Release Upon Progress Payment Forms for the Contractor and any and all Subcontractors, second and third tier subcontractors and material suppliers or service providers.
 8. Completed Unconditional Waiver and Release Upon Progress Payment Forms for previous billing period, if any. Contractor to provide one Unconditional Waiver and Release Upon Progress Payment for every corresponding Conditional Waiver and Release submitted with previous Application for Payment.
 9. Copy of Verified Report Form SSS 6, as required during the applicable billing period.
- B. When Architect finds Application and all required submittal attachments properly completed and correct, he or she will transmit Certificate for Payment to Owner, with copy to Contractor. Incomplete or improper submittals will be returned to the Contractor without action.

1.09 REVIEW OF PROGRESS PAYMENT

- A. Owner Approval: The Architect will, within seven (7) days after receipt of the Contractor's Application for Payment, either certify such payment or notify the Contractor in writing of the Architect's reasons for withholding certification in whole or in part as provided above.

- B. Architect's Review: The review of the Contractor's Application for Payment by the Architect is based on the Architect's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the Architect's knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the review by the Architect will not be a representation that the Architect has:
1. Made exhaustive or continuous on-Site inspections to check the quality or quantity of the Work;
 2. Reviewed construction means, methods, techniques, sequences, or procedures;
 3. Reviewed copies of requisitions received from Subcontractors, material and equipment suppliers, and other data requested by the Owner to substantiate the Contractor's right to payment; or
 4. Made an examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.
 5. Reviewed or examined for accuracy or completeness any documentation submitted to comply with the Owner's Labor Compliance Program.

1.10 DECISIONS TO WITHHOLD PAYMENT

- A. Reasons to Withhold Payment: The Owner may decide to withhold payment in whole, or in part, to the extent reasonably necessary to protect the Owner if, in the Owner's opinion, the representations to the Owner required by the Article titled REVIEW OF PROGRESS PAYMENT cannot be made. The Owner may withhold payment, in whole, or in part, to such extent as may be necessary to protect the Owner from loss because of:
1. Defective Work not remedied;
 2. Stop Notices filed, unless the Contractor at its sole expense provides a bond or other security satisfactory to the Owner in the amount of at least one hundred twenty-five percent (125%) of the claim, in a form satisfactory to the Owner, which protects the Owner against such claims;
 3. Liquidated damages assessed against the Contractor;
 4. Reasonable doubt that the Work can be completed for the unpaid balance of any Contract Price or by the completion date;
 5. Damage to the Owner, another contractor, or subcontractor;
 6. Unsatisfactory prosecution of the Work by the Contractor;
 7. Failure to store and properly secure materials;
 8. Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, monthly progress schedules, shop drawings, submittal schedules, schedule of values, product data and samples, proposed product lists, executed change orders, and verified reports, certifications, certified payrolls, any submittals required by the Labor Compliance Program but not enumerated in this or other sections of these specifications, as applicable, and other submittals specified as conditions precedent to receipt of payment in the Article titled CONDITIONS OF PAYMENT;
 9. Failure of the Contractor to maintain record drawings;
 10. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;
 11. Unauthorized deviations from the Contract Documents; or

12. Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.
 13. Failure of the Contractor to conform to the requirements of the Labor Compliance Plan as applicable.
- B. Written Reasons for Withholding Provided: Upon request of the Contractor whose payment is deferred, the Contractor shall be given a written copy of Owner's reasons for withholding payment.
- C. Payment After Cure: When the grounds for declining approval are removed, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.
- D. Labor Compliance Penalties: In addition to the remedy of withholding payment, the Owner may assess penalties as described in the Labor Compliance Program or as otherwise required by law for failure of the Contractor to conform to the requirements of the Labor Compliance Plan.

1.11 SUBSTITUTION OF SECURITIES

- A. In accordance with § 22300 of the Public Contract Code, the Owner will permit the substitution of securities for any monies withheld by the Owner to ensure performance under the Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the Owner, or with a state or federally chartered bank as the escrow agent, who shall then pay such monies to the Contractor. Upon satisfactory completion of the Contract, the securities shall be returned to the Contractor.
- B. Securities eligible for investment under this section shall include those listed in Government Code § 16430, bank or savings and loan certificates of deposit, interest-bearing, demand-deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner.
- C. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.
- D. The escrow agreement used for the purposes of this Section shall be substantially similar to the form set forth in Public Contract Code § 22300.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

(APPLICATION FOR PAYMENT FORMS FOLLOW)
APPLICATION FOR PAYMENT TRANSMITTAL

Section 01 2900 - APPLICATION FOR PAYMENT

Page - 10

APPLICATION AND CERTIFICATE FOR PAYMENT
APPLICATION FOR PAYMENT CONTINUATION SHEET
CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
CONTRACTOR'S AFFIDAVIT OF RELEASE OF LEINS
CONSENT OF SURETY TO FINAL PAYMENT
RELEASE FORMS 1 THROUGH 4

WHEN NOTED IN THE GENERAL CONDITIONS AS PART OF THE PROJECT,
DISTRICT LABOR COMPLIANCE PROGRAM WILL BE
BOUND FOLLOWING THIS SECTION

RELEASE FORM 1
CONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT
(Civil Code Sec. 8132)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND
PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY
ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Through Date:

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:

Amount of Check: \$

Check Payable to:

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:
Date(s) of waiver and release:

Amount(s) of unpaid progress payment(s): \$

- (4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:

RELEASE FORM 2

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT
(Civil Code Sec. 8134)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Through Date:

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment:

\$

Exceptions

This document does not affect any of the following:

- (1) Retentions.
- (2) Extras for which the claimant has not received payment.
- (3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:

RELEASE FORM.3

CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT
(Civil Code Sec. 8136)

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND
PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELY
ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:

Amount of Check: \$

Check Payable to:

Exceptions

This document does not affect any of the following:

Disputed claims for extras in the amount of: \$

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:

RELEASE FORM 4

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT
(Civil Code Sec. 8138)

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant:

Name of Customer:

Job Location:

Owner:

Through Date:

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions

This document does not affect the following:

Disputed claims for extras in the amount of: \$

Signature

Claimant's Signature:

Claimant's Title:

Date of Signature:

APPLICATION FOR PAYMENT TRANSMITTAL

Distribution to:

<input checked="" type="checkbox"/>	OWNER
<input checked="" type="checkbox"/>	ARCHITECT
<input type="checkbox"/>	CONTRACTOR
<input checked="" type="checkbox"/>	INSPECTOR
<input type="checkbox"/>	

Distribution By:

<input checked="" type="checkbox"/>	FAX
<input checked="" type="checkbox"/>	MAIL
<input type="checkbox"/>	OVERNIGHT
<input type="checkbox"/>	HAND DELIVERY
<input type="checkbox"/>	

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A4P

P:\ProjectNo.ProjectName\Files\IO-CA\11-A4P\LCPr2.0\4/2003

PROJECT:	ARCHITECT:	Application No.
0	Quattrocchi Kwok Architects	Date:
0	636 Fifth Street	Arch. Project No.: 0
0	Santa Rosa, CA 95404	Contract For: Increment 1
0	Fax 707-576-0295	Contract Date: 1/0/1900
		DSA File No.: 0.00
OWNER:	Inspector of Record	DSA App. No.: 0
0	0	OPSC App. No.: 0
0	0	Contr. Project No.:
0	0	
Fax: 0	Fax 0	Phone: 0

The following documents are attached to this transmittal, in accordance with Section 01027 - Applications for Payment. This certification must accompany each Application for Payment.

	Completed (signed)
1 Application for Payment and Schedule of Values (AIA Forms G702 and G703)	_____
2 Contractor's Certified Payroll Report for billing period electronically submitted to DIR.	_____
3 Contractor's Complete Daily Logs for billing period noted.	_____
4 Completed Schedule update for the billing period noted.	_____
5 Complete Conditional Waiver and and Release upon Progress Payment form.	_____
6 Complete Unconditional Waiver and Release upon Progress Payment Form for month preceding.	_____
7 Original signature copies of DSA SSS-6 Verified Report Form (required for Release of Final Payment).	_____

<p>INSPECTOR:</p> <p>The undersigned has reviewed the attached Application for Payment and finds it representative of the work completed and material stored at the site. I recommend that the Architect certify and the District process payment to the Contractor as noted on the Application for Payment.</p> <p>All the above prerequisites for Progress Payment have been met by the Contractor.</p> <p>0</p> <p>0</p> <p>0</p> <p>By. _____</p> <p>original signature required</p> <p>Date: _____</p>	<p>CONTRACTOR:</p> <p>The undersigned certifies under penalty of perjury that the attached submittals are complete and correct; that the project is on schedule and has experienced no delays or disruption through the date of this transmittal except as shown on the attached Project Schedule of same date; and the Record drawings have been maintained and updated in accordance with the Contract Documents through the period as shown on the attached Application for Payment.</p> <p>0</p> <p>0</p> <p>0</p> <p>By. _____</p> <p>original signature required</p> <p>Date: _____</p> <p>State of: _____</p> <p>County of: _____</p> <p>Subscribed and sworn to before me this ____ day of ____</p> <p>Notary Public: _____</p> <p>My Commission expires: _____ Notary Stamp Above</p> <p>Notary stamp required for projects with Labor Compliance Program</p>
--	---

NOTE: All required original signatures must be affixed before processing of Application by the Architect.
Incomplete applications may be returned without action.

Application and Certificate for Payment

TO OWNER:

PROJECT:

APPLICATION NO.:

DISTRIBUTION TO:

FOR CONTRACTOR:

VIA ARCHITECT:

PERIOD TO:

Owner ☐

CONTRACT FOR:

Architect ☐

CONTRACT DATE:

Contractor ☐

PROJECT NOS.:

Field ☐

Other ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. Continuation Sheet is attached.

1. ORIGINAL CONTRACT SUM \$
2. NET CHANGE BY CHANGE ORDERS \$
3. CONTRACT SUM TO DATE (line 1 + 2) \$
4. TOTAL COMPLETED & STORED TO DATE (column G) \$

5. RETAINAGE:

- a. % of Completed Work
(Columns D & E) \$
- b. % of Stored Material
(Column F) \$

Total Retainage (Lines 5a + 5b)

6. TOTAL EARNED LESS RETAINAGE \$

(Line 4 minus Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENTS

(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE \$

9. BALANCE TO FINISH, INCLUDING RETAINAGE

(Line 3 minus Line 6)

\$

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$	\$
Total approved this month	\$	\$
TOTAL	\$	\$
NET CHANGES by Change Order	\$	

The undersigned Contractor certifies and declares under penalty of perjury under the laws of the state of California that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before me this _____ day of _____

Notary Public:

My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED \$

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein, issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract

ayment, or Application for Payment, Construction
taining Contractor's signed certification is attached. In
n US dollars. Use Column 1 on Contracts where variable

APPLICATION DATE:

ARCHITECT'S PROJECT NO.:

B	C	D	E	F	G		H	I
DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (Not In D or E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G/I)	BALANCE TO FINISH (C-G)	RETAINAGE (If variable rate)
		FROM PREVIOUS APPLICATION (D+E)	THIS PERIOD					
END TOTAL								

PROJECT: *(Name and address)*

CONTRACT FOR:ARCHITECT 

CONTRACTOR ☐

SURETY ☐

OTHER ☐

Contractor's Affidavit of Release of Leins

PROJECT: <i>(Name and address)</i>	ARCHITECT'S PROJECT NUMBER:	OWNER <input type="checkbox"/>
		ARCHITECT <input type="checkbox"/>
	CONTRACT FOR:	CONTRACTOR <input type="checkbox"/>
		SURETY <input type="checkbox"/>
		OTHER <input type="checkbox"/>
TO OWNER: <i>(Name and address)</i>	CONTRACT DATED:	

Consent of Surety to Final Payment

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

OWNER ☐

ARCHITECT ☐

CONTRACT FOR:

CONTRACTOR ☐

SURETY ☐

OTHER ☐

TO OWNER: *(Name and address)*

CONTRACT DATED:

SECTION 01 3200

CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Prepare cost loaded Construction schedule using the critical path method (CPM) demonstrating fulfillment of all contract requirements.
- B. Submittals and Distribution.
- C. Review.
- D. Rain days.
- E. **Schedule of Milestones.**

1.02 RELATED SECTIONS

- A. **Document 00 5200 – Contract: Contract Duration and provisions for liquidated damages.**
- B. Section 01 2900 - Applications For Payment: Schedule of values.
- C. Section 01 4000- Quality Control: Inspection and testing reports.

1.03 DEFINITIONS

- A. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations to determine when activities can be performed and the critical path of the Project.
- B. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.
- C. Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.
- D. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- E. Event: An event is the starting or ending point of an activity.
- F. Milestone: A key or critical point in time for reference or measurement.

- G. Float is the measure of leeway in activity performance.
 - 1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
 - 3. Float time shall accrue to the Owner and to the Owner's benefit.

1.04 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel or Specialist Consultant to the Contractor specializing in CPM scheduling with three 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 forty-eight (48) hours of request.
- B. Designate, in writing, an authorized representative who will be responsible for the preparation of the CPM schedule and progress of the project. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the Construction Schedule requirements.
- C. Within 5 calendar days from Notice of Award, submit demonstration of competence in use of CPM scheduling, including evidence of the use of CPM scheduling as specified above. In the event of failure to satisfy Architect of competence, the Contractor shall be required to employ a qualified CPM consultant to be approved by the Architect.
 - 1. **The cost of revision to the CPM schedule, not resulting from authorized contract changes, shall be the responsibility of the Contractor.**

1.05 SCHEDULE OF INSPECTIONS AND TESTS

- A. Provide information regarding tasks requiring special inspection and tests to District's inspection and testing laboratory, as requested.

1.06 CONSTRUCTION SCHEDULE

- A. Prepare the Construction Schedule using the network analysis diagram system known as the critical path method (CPM). Follow procedures outlined in AGC's "Construction Planning & Scheduling".
 - 1. Proceed with preparation of the network diagram immediately following Notice of Award.
 - 2. Follow the steps necessary to complete development of the network diagram in sufficient time to submit the CPM Schedule so it can be accepted for use no later than 30 days after commencement of the Work.
 - 3. Conduct educational workshops to train and inform key project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule.
 - 4. Establish procedures for monitoring and updating the CPM Schedule and for reporting progress. Use "one working day" as the unit of time.
- B. CPM Schedule Preparation: Prepare a list of all activities involved in the Project. Include a list of activities required to complete the Work. Provide the best data available for generation of the network diagram and the CPM Schedule.
 - 1. Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities.
 - 2. Indicate estimated times for the following activities to be performed:
 - a. Preparation and processing of submittals.

- b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 3. Include, in the network diagram, separate activities showing:
 - a. Preparation and submittal of shop drawings.
 - b. Architect review of shop drawings, including review and selection of colors.
 - c. Procurement and delivery of materials and equipment.
 - d. Installation and testing of major equipment.
 - e. Required delivery for all Owner supplied, Contractor installed items.
 4. Include a legend showing:
 - a. Each location or area code number and the place or location it refers to.
 - b. Each responsibility or trade code number and the trade or entity it refers to.
 5. Indicate each building or separate area as a separately scheduled element of the Work.
 6. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
 7. Where the work of several trades is combined into one activity, the Contractor shall furnish, for each such combined activity, the cost breakdown of each trade on sheets separate from the network diagram. The sum of the costs for each trade shall equal the total dollar value of each such combined activity.
- C. Submit the following supporting data with the submittal of the original CPM construction schedule. Any changes to this information shall be submitted with successive updates and revisions.
 1. The proposed number of working days per week.
 2. The holidays to be observed during the duration of the contract (by day, month, and year).
 3. The planned number of shifts per day.
 4. The number of hours per shift.
 5. The planned usage of major construction equipment on the site, on a monthly basis.
 6. The average weekly manpower usage for each trade to be employed on the project.
- D. Processing: Enter prepared data on the processing system. Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM Schedule within the limitations of Contract Time.
- E. Format: Display the full network on a single sheet of stable transparency, or other reproducible media, of sufficient width to show data clearly for the entire construction period.
 1. Mark the critical path. Locate the critical path near the center of the network; locate paths with the most float near the edges.
 2. Sub networks on separate sheets are permissible for activities clearly off the critical path.
- F. Initial Issue: Prepare the initial issue of the CPM Schedule network diagram from a listing of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports to show the following:
 1. The Contractor or subcontractor and Work or activity.
 2. Description of the activity.
 3. Principal events of that activity.
 4. Immediate preceding and succeeding activities.
 5. Early, late and actual start dates.
 6. Early, late and actual finish dates.

7. Activity duration in working days.
 8. Total float and free float time. Float time shall accrue to the Owner and to the Owner's benefit.
 9. Average size of work force.
 10. Monetary value of activity (coordinated with the Schedule of Values).
- G. Value Summaries: Prepare 2 cumulative value listings, sorted by finish dates.
1. In first listing, tabulate the following:
 - a. Activity number.
 - b. Early finish date.
 - c. Dollar value.
 - d. Cumulative dollar value.
 2. In second listing, tabulate the following:
 - a. Activity number.
 - b. Late finish date.
 - c. Dollar value.
 - d. Cumulative value.
 3. In subsequent issues of both listings, substitute actual finish dates for activities completed as of listing date.
- H. Prepare listing for ease of comparison with payment requests: coordinate timing with progress meetings.
1. In both value summary listings, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 2. Submit value summary printouts following each regularly scheduled progress meeting.
 3. Provide monthly project cash flow analysis upon District's request at no additional cost.
- I. Sequence the work to enable completion of scopes of work identified in intermediate milestones so that separate contracts can be mobilized prior to completion of this contract. Refer to Article titled MILESTONE SCHEDULE in Part 3 of this Section.

1.07 REVISIONS TO SCHEDULES

- A. Graphically indicate progress of each activity to date of submittal, and projected completion date of each activity as referenced to the baseline date for that activity as shown in the initial schedule.
- B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
- C. Insert Delay Contingency activities into the critical path at the point where they occur, incorporating the mutually agreed duration per the Article on DELAY CONTINGENCY. Shorten the initial Delay Contingency activity by this mutually agreed duration.
- C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.
- D. Revision to the CPM schedule may require reallocation of costs. Revised activity cost data shall be submitted with revised CPM schedules as necessary.

- E. After each monthly update or revision, the Contractor shall submit, to the Architect, one complete set of reproducible transparencies of the last accepted CPM schedule, each marked up in red, showing all revisions and changes in accordance with the monthly review meeting.
- F. Within five (5) working days after receipt of notice from the Architect, the Contractor shall submit a revised CPM schedule for any of the following reasons:
 - 1. When delay in completion of any activity, or group of activities, indicates an overrun of the contract time or milestone requirement by 20 working days or ten percent (10%) of the remaining duration, whichever is less.
 - 2. Delays in submittals or deliveries or work stoppage are encountered which make re-planning or rescheduling of the work necessary.
 - 3. The schedule does not represent the actual prosecution and progress of the project as being performed in the field.

1.08 SUBMITTALS

- A. Submit initial schedules within fifteen (15) calendar days after date of Owner-Contractor Agreement. After review, resubmit required revised data within five days.
- B. Submit revised Progress Schedules with each Application for Payment. Submittal of revised Progress Schedule is a condition precedent to receipt of Payment.
- C. Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Architect. In addition, submit each schedule submittal, including initial submittal, in the Scheduling software's complete and original software file format on Compact Disc – Read Only (CD-ROM). Provide one such disk with each schedule submittal. Architect will retain CD-ROM electronic versions.
- D. Submit "two-week look ahead" report in bar-chart format indicating activities scheduled to occur in the up-coming two week period. Provide and discuss these submittals at the progress meetings specified in Section 01 3900 and additionally as requested by the Architect, Owner or Inspector.

1.09 PROGRESS REPORTING, UPDATING AND REVISIONS:

- A. On a date mutually agreed upon by the Architect and the Contractor, a job site progress meeting will be held each month at which time the CPM schedule will be reviewed and updated. Attendees of this meeting shall include the Architect, the General Contractor and subcontractors, if requested by the Architect. The Contractor shall have its copy of the Payment Request form and all other data required by the Contract Documents accurately filled in and completed prior to this meeting. Job Progress and the CPM schedule will be reviewed to verify:
 - 1. Payment due to the Contractor, based on percentage complete of items in the submitted Payment Request form.
 - 2. Logic, time and cost data for change order work that is to be incorporated into the CPM schedule or Payment Request form.
 - 3. Status of as-built record drawings and as-built record specifications.
- B. The Contractor shall submit a narrative report as a part of its monthly progress review and update.

1.10 REVIEW

- A. Architect's review is limited to verification of compliance with the Contract start and end dates and inclusion of Contract Time adjustments.
- B. To the extent that the CPM schedule or any revised CPM schedule shows anything not jointly agreed upon, it shall be deemed to have not been accepted by the Architect. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase notwithstanding the Architect's acceptance of the CPM schedule.
- C. Acceptance of any revised CPM schedule and all supporting data is contingent upon compliance with all other paragraphs of this section and any other previous agreements or requirements with or by the Architect.

1.11 DELAY CONTINGENCY

- A. Each Contractor submitting a bid proposal shall make allowance in its proposal and Project Schedule for **five (5)** work days for delay to the critical path due to inclement weather or delay due to circumstances beyond the Contractor's control.
- B. Extension of time for delay due to inclement weather or circumstances beyond the Contractor's control will be allowed only in the event that the total number of critical path work days delayed exceeds the number of days allowed in paragraph A of this Article. No time extension will be allowed for delays that do not affect the critical path as set forth in the master schedule.
- C. No time extension will be allowed for inclement weather occurring on any Saturday, Sunday, National or other holiday, including holidays recognized by specific unions, crafts or trades. Exception: If any day defined above is scheduled as a work day under the provisions of the Article CONTRACTOR'S RESPONSIBILITY FOR COMPLETION and approved by the Architect and Owner, or as otherwise approved by the Owner.
- D. A rain day is defined as any day that receives .130" or greater rainfall as reported by a local weather service acceptable to the Architect and is cause for work to be stopped. For the purposes of this project, Rain Days must meet this definition and be mutually approved and agreed upon on the day that a rain day occurs by the Contractor and the Architect. Contractor will post and maintain, in a conspicuous location, a calendar of so-approved rain days at the Contractor's jobsite trailer.

1.12 CONTRACTOR'S RESPONSIBILITY FOR COMPLETION:

- A. The Contractor agrees that whenever it becomes apparent from the monthly progress review meeting or the schedule that contract completion dates will not be met, it shall take some or all of the following action at no additional cost to the Owner:
 - 1. Increase construction manpower in such quantities and crafts as will bring the progress of the work into conformance with all other requirements of this section.
 - 2. Increase the number of working hours per shift, shifts per working day, workdays per week, the amount of construction equipment or any combination of the foregoing, to bring the scheduling and progress of the work into conformance with all requirements of the Contract Documents.

3. Reschedule the work under this contract in conformance with all other contract requirements to demonstrate completion of the contract work within the contract time.
- B. Compensate owner for costs incurred to the Owner for rescheduling or additional testing, inspection, or architectural services made necessary by the Contractor's actions.

1.13 ADJUSTMENT OF THE CONTRACT TIME:

- A. The contract time will be adjusted only for causes specified in the Contract Documents. In the event the Contractor requests an adjustment of the contract time, it shall furnish such justification, CPM data and supporting evidence as the Architect may deem necessary for a determination as to whether or not the Contractor is entitled to an adjustment of time under the provisions of the contract. Submission of proof based on revised activity logic, duration and cost is obligatory with any request. Requests not conforming to these requirements are deemed to be waived.
- B. The Contract Time will be not be adjusted for any reason, including weather, until the latest accepted schedule clearly displays that the Contractor has used, in full, all the float time available for the Work. Delays in activities which, according to the latest accepted schedule, are not on the critical path in the CPM schedule will not be the basis for an adjustment to the contract time.
- C. The Contractor shall submit each request for an adjustment in the contract time to the Architect in accordance with all other requirements of the Contract Documents. The Contractor shall include, as part of each request:
 1. Justification for the delay in narrative form.
 2. A sub network showing all CPM logic revisions, duration changes and cost changes for the work in question and its relationship to other activities on the CPM schedule.
- D. The Architect's determination as to the adjustment of the contract time shall be based upon the latest schedule which has been accepted at the time of the alleged delay and all other relevant information. The Contractor shall submit with every request, an updated CPM schedule whenever the actual field progress of the work does not conform to the accepted schedule in force at the time of the alleged delay. The CPM data, if accepted by the Architect, shall be included in the next monthly updating of the schedule.
- E. The Architect shall, within a reasonable time after receipt of a request and supporting evidence for extension of the contract time, review the facts and shall advise the Contractor, in writing, of its decision.

1.14 DISTRIBUTION

- A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
- C. Architect will distribute copies to the Owner and the Inspector.

PART 2 PRODUCTS

2.01 SCHEDULING SYSTEMS

- A. Prepare schedules using professional quality scheduling software systems designed for this purpose, capable of producing results specified.
- B. Acceptable products:
 - 1. Primavera Systems
 - 2. Microsoft Project

PART 3 EXECUTION

3.01 MILESTONES

Project must be completed by start of school, August 2021

END OF SECTION

SECTION 01 3300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals required by the Contract Documents. Revise and re-submit as necessary to establish compliance with Contract Documents.
 - 1. It is reasonable that the Contractor will provide a satisfactory submittal by the second submittal. If repeated resubmittals are required, the Owner may "back charge" the Contractor for the cost of review and processing.

1.02 WORK NOT INCLUDED

- A. Submittals which are not required will not be reviewed by the Architect.
- B. The Contractor may require subcontractors to provide drawings, setting diagrams or similar information as part of the coordination of the Work. The Architect will not review this data.

1.03 RELATED WORK

- A. Section 01 3100 - Construction Schedules: Dates for submission and dates that reviewed submittals will be required shall be designated in the Construction Schedule.
- B. Section 01 7000 - Contract Closeout: Project record documents.

1.04 QUALITY ASSURANCE

- A. Submit to the Architect for review, product literature, samples and shop drawings as specified or required to fully describe every item proposed for incorporation in the work. Only approved items may be used.
- B. Prior to submittal, review and coordinate all aspects of each item. Verify that each item and its submittals conform to Contract Document requirements. Contractor assumes full responsibility for coordinating and verifying information, quantities and dimensions shown in submittals.
- C. Submittals shall include:
 - 1. Date and revision dates.
 - 2. Project title and number.
 - 3. The names of:
 - a. Architect/Engineer.
 - b. Contractor.
 - c. Subcontractor.
 - d. Supplier.
 - e. Manufacturer.
 - f. Separate detailer when pertinent.
 - 4. Identification of product or material.

5. Relation to adjacent structure or materials.
 6. Field dimensions, clearly identified as such.
 7. Specification section number.
 8. Applicable standards, such as ASTM number or Federal Specification.
 9. A blank space, 8 inches x 3 inches, for the Contractor and Architect stamps.
 10. Identification of deviations from Contract Documents.
 11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.
 12. Signature of and calculations by an engineer, licensed in California, where required by specifications.
- D. Indicate review and approval of each submittal prior to transmittal to Architect by affixing Contractor's stamp, initialed or signed, certifying:
1. Review of submittal
 2. Verification of compliance with requirements of the Contract Documents.
 3. Verification of compatibility with other submittals, shop drawings, substitutions, and work of other trades.
 4. Coordination with existing job conditions and field construction criteria.
 5. Field verification of dimensions.
- E. Architect will review Contractor's stamp language. Revise language in accordance with Architect's comments and provide new stamp if required by Architect.
- F. Architect will return unreviewed any submittal not stamped by the Contractor in accordance with the above.
- G. Direct Architect's attention to any deviations from the Contract Documents . Deviations not so noted shall be considered unreviewed.
- H. Direct Architect's attention to any changes made in submittals other than those specifically requested by Architect. Changes not so noted shall be considered unreviewed.
- I. Work shall not be fabricated, nor material shipped to project site prior to the distribution of approved submittals from the Architect.

1.05 SUBMITTALS

- A. Make submittals of shop drawings, product data, samples, substitution requests, meeting minutes and other items required by the Contract Documents in accordance with the provisions of this Section.
- B. Submittals shall include all technical and performance data necessary for the Architect to properly evaluate the submittal. Provide physical samples if requested by Architect, whether expressly specified or not.
- C. Incomplete submittals will be return to the Contractor without review. Contractor shall be responsible for delays incurred by incomplete, multiple reviews or rejected submittals.
- D. Provide only one make or brand of any product proposed.

PART 2 PRODUCTS

2.01 SHOP DRAWINGS

- A. Shop drawings are to be drawn at large scale, fully detailed and with all materials and stock or purchased components fully identified. Shop drawings are to be submitted when specified and to illustrate every custom fabricated item or assembly.
- B. Types of prints required: See 3.01 ELECTRONIC SUBMITTAL PROCEDURES.
- C. Drawings are to be identified showing the project name, the Owner's name and account number, the Architect's name and job number, the Contractor's name and the specification section number and drawing detail reference number relating to the work shown.

2.02 PRODUCT DATA

- A. Submit detailed technical literature fully describing every product or item proposed for use including manufacturers and items specified. Include manufacturer's detailed specifications, drawings, photographs, performance criteria, installation instructions, test data, samples of colors and finishes and other information required to fully describe the item.
 - 1. Modify standard product data to delete information which is not pertinent.
 - 2. Provide additional information which is specifically applicable.
- B. Mark all submittals indicating items, options, and finishes proposed, and referencing project specification section and paragraph covering the work in question. Indicate as follows:
 - 1. Performance characteristics and capacities.
 - 2. Dimensions and/or clearances required.
 - 3. Wiring, piping and control diagrams.

2.03 SAMPLES

- A. Samples shall be identical to the precise article proposed, illustrating functional characteristics with all related parts and attachments. Indicate full range of color, textures and patterns.
- B. Samples shall be identified by attaching a label on unexposed side of Samples that include the following:
 - 1. Generic Description of Sample.
 - 2. Product name and name of manufacturer.
 - 3. Number and title of applicable Specification Section.
- C. Submit number of samples as indicated above. Where samples of large complete items such as light fixtures, hardware, etc. are required, one sample will suffice and that will be returned to the Contractor after review.

2.04 COLORS AND PATTERNS

- A. Submit color and pattern selections for all products offering a choice of these attributes unless a specific color or pattern is referenced in the Contract Documents.

- B. Submit within thirty five (35) days of Notice of Award a list of all required color selections organized by product, including manufacturer and model. Include samples of manufacturer's complete color range for all products.
- C. Architect will not select colors or patterns until samples of all items requiring selections have been submitted. Architect will not make partial color selections.
- D. Failure to submit all color selections as specified above, thus requiring additional unanticipated time for the Architect to make selections will not be basis for extension of Contract Time.
- E. Architect will make color selections within 30 working days following complete submittal of samples. This time will commence with the receipt of the latest incremental submittal, as applicable.
- F. Architect will issue Color Schedule.

PART 3 EXECUTION

3.01 ELECTRONIC SUBMITTAL PROCEDURES

- A. Submittals shall be transmitted to the Architect in electronic, editable (PDF) format using the project's cloud-based file sharing and storage service ("project's website"). The cloud-based file sharing and storage service will be selected by the Architect. Contractor's failure to utilize, provide entries and processing through the Architect's cloud-based system will subject Contractor to hourly back charges associated with efforts required by others to perform work which is the contractual responsibility of the Contractor.
- B. Contractor's cost related to the use of the project's website services shall be included in the Contractor's bid.
- C. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
- D. For the shop drawings larger than 11' x 17' size and Deferred Approvals, submit (3) hardcopies to the Architect and also submit electronically on the project's website. Provide additional hardcopies, as requested by Architect.
- E. Provide hardcopy submittals if requested by Architect.
- F. The Architect's review comments will be made available on the project's website for downloading.
- G. Contractor will distribute a hardcopy of all reviewed submittals to the Inspector of Record, Owner, and Construction Manager.

3.02 ADMINISTRATION REQUIREMENTS

- A. Name electronic file using the following identifiers, separated by dashes: consecutive submittal number, specification section number, revision number (if needed), and a brief description of the submittal contents; example: 15-05 5000-0 Metal Fabrications.
- B. Write sequential page numbers at bottom of each page of submittal. On submittal cover sheet, provide brief description for product and coinciding page numbers; example: Pages 5-23 Metal Fabricated Gate Shop Drawings.
- C. Provide the following on the submittal cover sheet:
 - 1. Project title and project number.
 - 2. Date.
 - 3. Submittal number.
 - 4. The name of:
 - a. Architect/Engineer.
 - b. Contractor.
 - c. Subcontractor.
 - d. Supplier.
 - e. Manufacturer.
 - f. Separate detailer when pertinent.
 - 5. Identification of product or material and page numbers.
 - 6. Submittal number, as described in 3.03.
 - 7. A blank space, 8 inches x 3 inches, for the contractor and Architects stamps.
 - 8. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with Contract Documents.
- D. Unless otherwise indicated in technical specifications, not less than 15 days following Notice of Award, submit a complete submittal register utilizing spreadsheet provided by Architect. The architect provided submittal register is a template including most potential submittal items. Contractor shall strike through any submittal items not intended for submittal and highlight any revisions or additions to the template provided. All columns of information shall be filled out in full. Contractor shall then return edited spreadsheet to Architect for review. Spreadsheet format must not be altered to allow insertion into project data base. Once reviews are complete, the Architect will upload the submittal register into the project data base for all party's utilization.

3.03 IDENTIFICATION OF SUBMITTALS

- A. Number submittals consecutively. Each specification section requiring submittal must at a minimum have one unique submittal number. DO NOT GROUP MULTIPLE SPECIFICATION SECTION ITEMS UNDER ONE SUBMITTAL NUMBER. Refer to submittal by this number in subsequent correspondence and submittals.
 - 1. Transmit re-submittals under new cover. Use submittal number of original submittal with revision number suffix. Cite original submittal number for reference.
 - 2. Do not transmit new submittals with alphabetic suffix.

- B. Transmittal letter for each submittal shall show all information required for identification and checking.
- C. Include submittal number on first page and elsewhere as required for identification.
- D. Maintain log of submittals and status. Furnish copies to the Architect and Inspector upon request.

3.04 GROUPING OF SUBMITTALS

- A. Transmit submittals in groups containing all associated items to ensure availability of information during review. However, each specification section must bear unique submittal number.
- B. Incomplete or partial submittals may be returned for enhancement. No extension of time will be allowed for delays related to incomplete submittals.

3.05 SCHEDULING OF SUBMITTALS

- A. Transmit submittals sufficiently in advance of installation for required review, revisions, re-submittals and delivery. Include time required for transmittal by regular mail between the parties involved. No extension of time will be allowed for delays related to late submittals.
- B. Deferred approval submittals are subject to long lead times. Schedule submittals accordingly.

3.06 ARCHITECT'S REVIEW OF SUBMITTALS

- A. Submittals will be reviewed and stamped by the Architect "No exceptions taken," "Submit specified item" or "Make corrections noted" to indicate full or conditioned approval or "Revise and resubmit" or "Rejected" to indicate disapproval. Terms are defined as follows:
 - 1. No Exceptions Taken: Accepted subject to its compatibility with future submittals and additional partial submittals for portions of the work not covered in this submittal. Does not constitute approval or deletion of specified or required items not shown in the partial submittal.
 - 2. Submit specified item: Submit to the Architect the items indicated for review.
 - 3. Correct as noted: Same as 1., except that minor corrections as noted shall be made by the Contractor. No resubmittal required.
 - 4. Revise and resubmit: Rejected because of major inconsistencies or errors which shall be resolved or corrected by the Contractor prior to subsequent review by the Architect.
 - 5. Rejected: Submitted material does not conform to plans and specifications in major respect. For example, wrong size, model, capacity or material. Resubmit.
 - 6. Receipt Acknowledged. Received, recorded and distributed without further action.
- B. Submittals reviewed by the Architect which have been stamped shall be deemed to have the following language affixed and made a part thereof, regardless of the initial or subsequent readability of the actual stamp.

1. Corrections or comments made on submittals during this review do not relieve the contractor from compliance with the requirements of the drawings and specifications. This check is for review of general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selection of fabrication processes and techniques of construction, coordinating the work of the trades; and performing the work in a safe and satisfactory manner.
- C. Architect's review of submittals shall be undertaken with reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review.
- E. Architect's review of submittals has, as a primary objective, to assist in the completion of the project on time and in conformance with the Contract requirements by permitting review of material and fabricated items prior to ordering. Architect's review of submittals is based only on the data presented and extends only to conformance with general design intent and information contained in the Contract Documents.
- E. Architect's approval of submittals does not constitute final acceptance or unqualified approval of items or work proposed or put in place, nor does it constitute acceptance of responsibility for the accuracy, coordination or completeness of submittals. Architect's approval of submittals does not relieve the Contractor from the responsibility for errors, omissions, or compliance with all the requirements of the Contract Documents.
- F. Reimbursement of the Architect's costs for review:
 1. Architect will record all time and expenses incurred to review submittals requiring more than two reviews.
 2. Contractor shall reimburse the District through deduction from amounts due the Contractor upon receipt of the Architect's billing and that of the Architect's consultants at standard billing rates for all time and expenses incurred in unanticipated reviews.
- G. Architect's review of submittals does not change the Contract in any manner.

3.07 RESUBMITTAL

- A. Make all corrections or revisions required by reviewer's comments at Contractor's expense and resubmit as initially specified above. No additional costs will be authorized for corrections or revisions.
- B. Product data and shop drawings:
 1. Revise initial drawings or data and resubmit as initially specified.
 2. Indicate changes which have been made other than those requested by reviewer.
- C. Submit new samples as initially specified.

3.08 DEFERRED APPROVAL

- A. Items so designated in the Contract Documents are subject to deferred approval review by the Division of the State Architect (DSA).

- B. Not less than 15 days following Notice of Award, submit all items specified for deferred approval complete with all structural calculations, test data and information as specified or as subsequently required by the reviewing agency, including original engineering stamps and original signatures as required. Architect shall submit to DSA only following Architect/Engineer review.
 - 1. The Architect will not approve deferred approval submittals until they are approved by DSA.
- C. No work or fabrication shall begin until DSA approved submittals are distributed to the Contractor.
- D. Contractor is notified that significant lead time is required for deferred approval review by DSA and shall schedule work accordingly. No extension of Contract Time will be allowed for delays incurred by deferred approval review.
 - 1. The Architect is not responsible for DSA delays in deferred approval review.

3.09 DISTRIBUTION

- A. Distribute only submittals with Architect/Engineer (and DSA as applicable) stamps of review. Contractor is responsible for coordination of submittals and comments following review. Contractor to provide all additional reproduction costs for copies required by the Contractor at its expense. No additional costs will be authorized for Contractor costs pertaining to submittals.

END OF SECTION

SECTION 01 3546

CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT PLAN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.02 SECTION INCLUDES

- A. Description of a construction Indoor Air Quality (IAQ) Management Plan.
- B. IAQ construction requirements.

1.03 RELATED SECTIONS

- A. Section 01 6116 - VOC Restrictions.
- B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC: Additional requirements for baseline testing for IAQ.
- C. Section 23 0593- Testing, Adjusting, and Balancing for HVAC: Cleaning of HVAC system including ductwork, air intakes and returns, and changing of filters.

1.04 REFERENCES

- A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
 - 1. ASHRAE Standard 52.1-1992, Gravimetric and Dust Spot Procedures for Testing Air Cleaning Devices in General Ventilation for Removing Particulate Matter.
- B. ASTM International (ASTM):
 - 1. ASTM D5116-97, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
- C. Sheet Metal and Air Conditioning National Contractors Association (SMACNA):
 - 1. IAQ Guidelines for Occupied Buildings under Construction, 1995.

1.05 INDOOR AIR QUALITY

- A. Goals: The Owner has set the following indoor air quality goals for jobsite operations on the project, within the limits of the construction schedule, Contract Sum, and available materials, equipment, products and services. Goals include:
 - 1. Protect workers on the site from undue health risks during construction.
 - 2. Prevent residual problems with indoor air quality in the completed building.

1.06 SUBMITTALS

- A. Indoor Air Quality Plan: Within 14 days after receipt of Notice to Proceed and prior to any waste removal from the project, develop and submit for review a healthy indoor air quality plan. The plan shall include:
 - 1. List of IAQ protective measures to be instituted on the site.
 - 2. Schedule for inspection and maintenance of IAQ measures.

1.07 QUALITY ASSURANCE

- A. Perform material tests and report results in accordance with ASTM D5116.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Should the Contractor desire to use procedures, materials, equipment, or products that are not specified but meet the intent of the specifications to protect indoor air quality on the site, the Contractor shall propose these substitutions in accordance with Section 01 6000.

2.02 MATERIALS

- A. Low emitting products have been specified in appropriate sections.

PART 3 - EXECUTION

3.01 CONSTRUCTION IAQ MANAGEMENT PLAN

- A. Meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
 - 1. Protect the ventilation system components from contamination, OR provide cleaning of the ventilation components exposed to contamination during construction prior to occupancy.
 - 2. Provide a continuous ventilation rate of one (1) air change per hour minimum during construction, OR, conduct a building flush-out with new filtration media at 100 percent outside air after construction ends (following issuance of a Certificate of Occupancy) and prior to occupancy for seven (7) days. Provide a minimum of 85 percent filtration (as determined by ASHRAE Standard 52.1 on any return air systems that are operational during construction, and replace filtration media prior to occupancy.
- B. During installation of carpet, paints, furnishings, and other VOC-emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed. Preferred HVAC system operation uses supply air fans and ducts only; exhaust provided through windows. Use exhaust fans to pull exhaust air from deep interior locations. Stair towers and other paths to exterior can be useful during this process.
- C. Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection, and ventilation rate.
- D. Require VOC-safe masks for workers installing VOC-emitting products (interior and exterior) defined as products that emit 150 gpl or more UNLESS local jurisdiction's requirements are stricter, in which case the strictest requirements shall be followed for use of VOC-safe masks.

- E. Use low-toxic cleaning supplies for surfaces, equipment, and worker's personal use. Options include several soybean-based solvents and cleaning options (SOYsolv) and citrus-based cleaners.
- F. Use wet sanding for gypsum board assemblies. Exception: Dry sanding allowed subject to Architect's approval of the following measures:
 - 1. Full isolation of space undergoing finishing.
 - 2. Plastic protection sheeting is installed to provide air sealing during sanding.
 - 3. Closure of all air system devices and ductwork.
 - 4. Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust.
 - 5. Worker protection is provided.
- G. Use safety meetings, signage, and [sub] contractor agreements to communicate the goals of the construction indoor air quality plan.

END OF SECTION

SECTION 01 3900

COORDINATION AND MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Related work.
- C. Discrepancies.
- D. Examination.
- E. Pre-Contract meeting.
- F. Pre-construction meeting.
- G. Site mobilization meeting.
- H. Progress meetings.
- I. Pre-installation meetings.
- J. Project coordination meetings.

1.02 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various portions of the Contract Documents to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Coordinate hours and days of Work with local ordinances and requirements.
- C. Verify utility requirements and 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.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.

- G. 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.
- H. Contractor shall coordinate Work with work to be performed by separate contractors as listed in Section 01 1100 - Summary of Work.

1.03 RELATED WORK

- A. Referencing specification sections in "Related Work" articles is for convenience only and shall not be construed as to limit the coordination of the Contract Documents to referenced sections.
- B. Documents affecting the work of any section include, but are not limited to, General Conditions, Supplementary General Conditions, and Sections in Division 01 of these Specifications.
- C. Work in any section may relate to other work in these documents. The Contractor is responsible to coordinate all work.

1.04 DISCREPANCIES

- A. In the event of discrepancy in the Contract Documents or if uncovered conditions are not as anticipated, immediately notify the Architect and secure needed direction.
- B. Do not proceed in areas of discrepancy until such discrepancies have been fully resolved.
- C. Before starting work, verify governing dimensions at the premises, and examine adjoining work on which this work is dependent. No "Extra" or additional compensation will be allowed on account of differences between actual measurements and dimensions shown. Submit differences discovered during the work to Architect for interpretation before proceeding with the associated work.
- D. Any time extension or any increase or decrease of cost resulting from such changes will be adjusted in the manner provided in the General Conditions.

1.05 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Examine and verify specific conditions described in individual specification sections.
- C. Verify that utility services are available, of the correct characteristics, and in the correct location.

1.06 PRE CONTRACT MEETING

- A. Architect will schedule a meeting with District and apparent low bidder prior to award of Contract.
- B. Attendance Required: Owner, Architect, and Contractor.

- C. Agenda: Execution of the Notice of Award, Review of documents required for Preconstruction Meeting.

1.07 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required: Owner, Architect and Contractor.
- C. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of schedule of values.
 - 5. Designation of personnel representing the parties in Contract, and the Architect/Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Scheduling activities of DSA Inspector of Record.
- D. Architect will record minutes and distribute copies within five days after meeting to participants, and those affected by decisions made.

1.08 SITE MOBILIZATION MEETING

- A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required: Owner, Architect, Special Consultants, Contractor, Contractor's Superintendent and major Subcontractors.
- C. Agenda:
 - 1. Use of premises by Owner and Contractor.
 - 2. Owner's requirements and partial occupancy.
 - 3. Construction facilities and controls provided by Owner.
 - 4. Temporary utilities provided by Owner.
 - 5. Security and housekeeping procedures.
 - 6. Schedules.
 - 7. Application for payment procedures.
 - 8. Procedures for testing.
 - 9. Procedures for maintaining record documents.
 - 10. Requirements for start-up of equipment.
 - 11. Inspection and acceptance of equipment put into service during construction period.
- D. Architect will record minutes and distribute copies within five days after meeting to participants, and those affected by decisions made

1.09 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at bi-weekly intervals.
[Provide and discuss "two-week look ahead" schedule reports at these progress meetings.](#)
Coordinate progress payments and revised schedule, to monthly meeting attended by an officer of the construction company.
- B. Make arrangements for meetings, prepare agenda with copies for participants and preside at meetings.
- C. Attendance Required: Job Superintendent, major Subcontractors and suppliers, Owner, Inspector of Record and Architect as appropriate to agenda topics for each meeting.
- D. Architect will record minutes and distribute copies within five days after meeting to participants, including Owner, Contractor, and those affected by decisions made.

1.10 PREINSTALLATION MEETING

- A. When required in individual specification sections, convene a pre-installation 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 installation, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Architect will record minutes and distribute copies within five days after meeting to participants, with copies to Owner, Contractor and participants.

1.11 PROJECT COORDINATION MEETINGS

- A. Contractor will schedule project coordination meetings to be held weekly.
- B. Attendance Required: Contractor, job superintendent, Subcontractors, as required.
- C. Contractor will prepare agenda and preside at meeting.
- D. Contractor will record minutes and distribute copies within five days after meeting to participants, Architect and those affected by decisions made.
- E. Copies of the minutes to Architect are required as part of submission of Application for Payment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 4000

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances.
- C. References.
- D. Mockup.
- E. Inspecting and testing laboratories services.
- F. Manufacturers' field services and reports.
- G. Field engineering and staking.

1.02 RELATED SECTIONS

- A. Section 01 4200- Reference Standards.
- B. Section 01 3300 - Submittals: Submission of manufacturers' instructions and certificates.
- B. Section 01 4523 - Testing and Inspection Services.
- C. Section 09 0512 - Concrete Floor Moisture Content & pH Testing.
- E. Section 01 6000 - Material, Equipment and Substitutions: Requirements for material and product quality.
- F. Section 01 7000 - Contract Closeout.

1.03 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Correct conditions or workmanship not in conformance with specified standards or quality.
- C. Comply with manufacturers' instructions, including each step in sequence.
- D. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

- E. 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.
- F. Perform Work by persons qualified to produce required and specified quality.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.04 TOLERANCES

- A. Monitor tolerance control of installed 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/Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.05 REFERENCES

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. The contractual relationships, duties, and responsibilities of the parties in Contract or those of the Architect/Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 MOCK-UP

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups are representative of the quality required for the Work.
- D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.07 TESTING AND INSPECTION AGENCY SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent Testing and Inspection Agency to perform inspecting and testing. Inspections and Testing will be performed in accordance with Section 01 4523 - Testing and Inspection Services; and the General Conditions.

1.08 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 and to initiate instructions when necessary.

1.09 FIELD ENGINEERING AND STAKING

- A. Each Contractor awarded Work for this Project shall provide all necessary surveying, layout, lines and grades required for the proper location of the Work.
- B. Contractor agrees to provide any and all false-work, templates, batter-boards and other such structures or devices necessary to provide for the Contractor's layout, lines and grades. Work installed in an incorrect location or elevation shall be removed and re-installed at the expense of the Contractor.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

SECTION 01 4200

REFERENCE STANDARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS

- A. General: This section specifies procedural and administrative requirements for compliance with governing regulations and the codes and standards imposed upon the work. These requirements include the obtaining of permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes, and standards.
 - 1. "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.
- B. Governing Regulations: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

1.03 DEFINITIONS

- A. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to the extent they are not stated more explicitly in another element of contract documents.
- B. General Requirements: The provisions or requirements of Division 01 sections apply to entire work of Contract and, where so indicated, to other elements which are included in project.
- C. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

- D. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect/Engineer," "requested by Architect/Engineer," and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's/Engineer's responsibility into the Contractor's area of construction supervision.
- E. Approve: Where used in conjunction with Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect/Engineer be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.
- F. Project Site: The term "project site" is defined as the space available to Contractor for performance of the work. The extent of project site is shown on the drawings, and may or may not be identical with the description of land upon which the project is to be built.
- G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at 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.
- I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- J. Installer: The term "installer" is defined as the entity (person or firm) engaged by Contractor, or its subcontractor or subcontractor for 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 operations they are engaged to perform.
- K. Testing Laboratory: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.
- L. Products: The term "products" includes materials, systems and equipment.
- M. Approved Equal, Or Equal: means as approved and accepted by the Architect.
- N. Shall: The term "shall" is mandatory.
- O. As Required, As Necessary, etc.: Words of similar import mean as required by the Contract Documents or essential to the completion of the Work.
- P. Concealed: The term "concealed" means as embedded in masonry or other construction, installed within furred spaces, within double partitions or above suspended ceilings, in trenches, in crawl spaces, or in enclosures.

- Q. Exposed: The term "exposed" means not installed underground or "concealed" as defined above, including work and surfaces open in whole or in part to the exterior or weather.
- R. Work: The term "work" shall include both labor and materials.
- S. The Contract Documents:
The Contract Documents consist of the Contract, any addenda thereto, the completed Bid Form, the completed Bond and Insurance forms, the Notice Inviting Bids, the Instructions to Bidders, the General Conditions, the Supplementary General Conditions, the Labor Compliance Program, if any, the Technical Specifications, the Drawings and the Bidder's Questionnaire. All modification(s) amending or extending the work shall be as binding as if originally included in the Contract Documents. A Modification is a written amendment to the Contract signed by both parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Architect. The Contract Documents are complementary, and each obligation of the Contractor, Subcontractors, material or equipment suppliers in any one shall be binding as if specified in all.
- T. The Contract:
The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the Owner and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.
- U. The Work:
The Work shall include the initial obligation of any Contractor or Subcontractor, who performs any portion of the Work, to visit the Site of the proposed Work, a continuing obligation after the commencement of the Work to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions, and restrictions attending the Work under the Contract Documents. Each such Contractor or Subcontractor shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated bid documents. The "Site" refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.
- V. The Project:
The Project is the total construction of the Work performed in accordance with the Contract Documents in whole or in part and which may include construction by the Owner or by separate Contractors.
- W. The Drawings:
The Drawings are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect.

X. The Specifications:

The Specifications are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.

Y. The Project Manual:

The Project Manual is the volume usually assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

1.04 FORMAT AND SPECIFICATION EXPLANATIONS

A. Format Explanation: The format of principal portions of these specifications can be described as in the following paragraphs. Although some portions of these specifications may not be in complete compliance with this format, no particular significance will be attached to such compliance or non-compliance.

1. Sections and Divisions: For convenience, the basic unit of text is a "section." Each section is identified by a descriptive title (name) and the number. Individual sections are grouped together with other sections of similar or related work groupings known as "divisions." Divisions are recognized as the present industry consensus on uniform specification organization and sequence. The section title is not intended to limit meaning or content of a section, nor to be fully descriptive of the requirements specified therein, nor to be an integral part of the text.

a. Each section of specifications has been subdivided into 3 "parts" for uniformity and convenience (Part 1-General, Part 2-Products, and Part 3 - Execution); some sections may not require the use of all three parts. These parts do not limit the meaning of and are not an integral part of text which specifies requirements.

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

1. 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.
2. Paragraphs and lines of text are subordinate to sub-article titles, which are printed in upper/lower-case lettering.
3. Sub-articles are the subordinate to article titles, which are printed in uppercase lettering.
4. Subordination (if any) of certain sections (or portions of sections) to other sections is described within those sections.
5. Underscoring is used strictly to assist the reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance of text is intended where underscoring is used.
6. Imperative language is used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.
7. Section numbering is used to facilitate cross references in the contract documents. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification sections in contract documents.

8. Page Numbering: Pages are numbered independently for each section and are recorded in the listing of sections (Index or Table of Contents) in Project Manual. The section number is shown together with the page number at the bottom of each page to facilitate the location of text in the Project Manual.
 9. Project Identification: Project name (either complete or abbreviated) is recorded at top of each page of specifications to minimize possible misuse of specifications, or confusion with other project specifications.
- C. Specification Content: Because of methods by which the project specification has been produced, certain general characteristics of content and conventions in use of language are explained as follows:
1. Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive," "open generic-descriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.
 2. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or sets of requirements is 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 specifically detailed language written into the contract documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Architect/Engineer for a decision before proceeding.
 3. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified, for a particular unit of work, option is intended to be Contractor's regardless of whether or not it is specifically indicated as such.
- D. Minimum Quality/Quantity: In every instance, quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, 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 Architect/Engineer for decision before proceeding.
- E. 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 "expert" for indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of entire set of contract requirements remains with the Contractor.
- F. 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 tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

- G. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in the texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated.
1. 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.

1.05 DRAWING SYMBOLS

- A. General: Except as otherwise indicated, 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., seventh edition.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical and 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/Engineer for clarification before proceeding.

1.06 INDUSTRY STANDARDS

- A. General Applicability of Standards: 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 contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herewith. Refer to other contract documents for resolution of overlapping and conflicting requirements which result from the application of several different industry standards to the same unit of work. Refer to individual unit of work sections for indications of which specialized codes and standard the Contractor must keep at the project site, available for reference.
1. Referenced standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work. See also Chapter 35 of the CBC.
 2. Non-referenced standards are hereby defined to have no particular applicability to the work, except as general requirements of whether the work complies with standards recognized in the construction industry.
- B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.
1. Updated Standards: At the request of the Architect/Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the contract documents and before the performance of the work affected. The Architect/Engineer will decide whether to issue the change order to proceed with the updated standard.

- C. Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with recognized industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.
1. Where copies of standards are needed for proper performance of the work, the Contractor is required to obtain such copies directly from the publication source.
 2. Although certain copies of standards needed for enforcement of the requirements may be required submittals, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.
- D. Abbreviations and Names: The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA	Aluminum Association 1525 Wilson Boulevard, Suite 600, Arlington, VA 22209 www.aluminum.org
AAMA	American Architectural Manufacturers Association 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268 www.aamanet.org ; 847.303.5664
AAN	American Association of Nurserymen 1200 G St. Suite 800; Washington, DC 20005 www.anla.org ; 202 789 2900
AASHTO	American Association of State Highway & Transportation Officials 444 N. Capitol St.; Washington, DC 20001 www.transportation.org ; 202 624 5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215; Research Triangle Park, NC 27709-2215 www.aatcc.org ; 919 549 8141
ACA	American Coatings Association 1500 Rhode Island Ave., NW; Washington, DC 20005 www.paint.org ; 202-462-6272
ACI	American Concrete Institute 38800 Country Club Dr., Farmington Hills, MI 48331-3439 www.concrete.org ; 313 532-2600
ACIL	American Council of Independent Laboratories 1725 K Street, NW; Washington, DC 20006 www.acil.org ; 202 887-5872
ACPA	American Concrete Pipe Association

8445 Freeport Parkway, Suite 350, Irving TX 75063-2595
www.concrete-pipe.org 972 506 7216

AF&PA	American Forest & Paper Association 1111 19 th St. NW, Suite 800, Washington, CD 20036 www.afandpa.org
AGA	American Gas Association 400 N. Capitol St. NW, Washington DC 20001 www.aga.org 202 824 7000
AHAM	Association of Home Appliance Manufacturers 1111 19 th St. NW, Suite 402, Washington, DC 20036 www.aham.org 202 872 5955
AI	Asphalt Institute 2696 Research Park Drive, Lexington, KY 40511-8480; www.asphaltinstitute.org 859 288 4960
AIA	American Institute of Architects 1735 New York Ave. NW; Washington, DC 20006-5292 www.aia.org 800 242 3837
A.I.A.	American Insurance Association 2101 L Street NW, Suite 400, Washington DC 20037 www.aiadc.org 202 828 7100
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 700, Chicago, IL, 60601-18021 www.aisc.org 312 670 2400
ASIS	American Iron and Steel Institute 25 Massachusetts Ave NW Suite 800, Washington, DC 20001 www.steel.org 202 452 7100
AITC	American Institute of Timber Construction www.aitc-glulam.org 503 639 0651
ALSC	American Lumber Standard Committee, Inc. P.O. Box 210; Germantown, MD 20875-0210; www.alsc.org 301 972 1700
ANSI	American National Standards Institute 25 West 43 rd St. 4 th Floor, New York, NY 10036 www.ansi.org 212 642 4900
APA	American Plywood Association 7011 South 19 th , Tacoma, WA 98466; www.apawood.org 253 620 7400

ARI	Air Conditioning, Heating and Refrigeration Institute 2111 Wilson Blvd, Suite 500.; Arlington, VA 22201; www.ahrinet.org 703 524 8800
ASC	Adhesive and Sealant Council 7101 Wisconsin Ave, Ste 990, Bethesda, MD 20814; 301-986-9700 www.ascouncil.org
ASCE/SEI	American Society of Civil Engineers Structural Engineering Institute 1801 Alexander Bell Drive, Reston, VA 20191-4400 www.asce.org ; 800 548 2723
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers 1719 Tullie Circle, NE; Atlanta, GA 30329; www.ashrae.org ; 404 636 8400
ASME	American Society of Mechanical Engineers Three Park Ave, New York, NY 10016-5990 www.asme.org ; 800-843-2763
ASPE	American Society of Plumbing Engineers 2980 S. River Road; Des Plaines, IL 60018 www.aspe.org ; 847-296-0002
ASSE	American Society of Sanitary Engineers-CA Chapter 1111 W. James Wood Blvd.; Los Angeles, CA 90015 www.asse-plumbing.org ; 213-688-9090
ASTM	American Society for Testing and Materials 100 Barr Harbor Dr / PO Box C700, West Conshohocken, PA 19428 www.astm.org ; 215 299-5400
AWI	Architectural Woodwork Institute 46179 Westlake Drive,, Ste 120; Potomac Falls, VA 20165 571-323-3636
AWS	American Welding Society 8669 Doral Boulevard, Suite 130, Doral FL 33166 www.aws.org ; 800 443 9353
AWPA	American Wood Protection Association P.O. Box 361784; Birmingham AL 35236-1784 www.awpa.com
AWWA	American Water Works Association 6666 W. Quincy Ave., Denver, CO 80235 303-794-7711
BHMA	Builders' Hardware Manufacturers Association

355 Lexington Ave 17th Floor, New York, NY 10017;
www.buildershardware.com; 212-297-2122

BIFMA	Business and Institutional Furniture Manufacturer's Association 678 Front Ave NW, Ste. 150; Grand Rapids, MI 49504-5368; 616-285-3963
CBMA	Certified Ballast Manufacturers 2122 Keith Bldg.; Cleveland, OH 44115; 216 241-0711
CDA	Copper Development Association 260 Madison Ave; New York, NY 10016; 212-251-7200
CISPI	Cast Iron Soil Pipe Institute 1064 Dleaware Ave. SW, Atlanta, GA 30316 www.cispi.org; 404 622 0073
CPA	Composite Panel Association 19465 Deerfield Ave. Suite 306, Leesburg, VA 20176 www.compositepanel.org
CPSC	Consumer Product Safety Commission 4330 East West Highway; Bethesda, MD 20814-4408; 301-504-7923
CRI	Carpet and Rug Institute Box 2048/730 College Dr.; Dalton, GA 30720; 706-278-3176
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd.; Schaumburg, IL 60173; 847-517-1200
CSA	Canadian Standards Association 5060 Spectrum Way, Mississauga, Ontario, Canada L4W 5N6
CSI	Construction Specifications Institute 110 South Union St., Ste. 100; Alexandria, VA 22314; 800-689-2900 www.csinet.org
CTI	Ceramic Tile Institute 310-574-7800
DHI	Door and Hardware Institute 14150 Newbrook Drive, Ste. 200; Chantilly, VA 20151-2232 www.dhi.org; 703-222-2010
DLPA	Decorative Laminate Products Association (Formerly National Association of Plastic Fabricators) Hulman Building; 20th Floor; 120 West Second Street; Dayton, OH 45402; 513/228-1041

DOC	US Dept. of Commerce, National Institute of Standards and Technology 1401 Constitution Avenue NW, Washington DC 20230
DOJ	US Department of Justice 950 Pennsylvania Ave. NW Civil Rights Division, Disability Rights Section-NYA Washington DC 20530
DOTn	Department of Transportation 1200 New Jersey Ave, SE; Washington, DC 20402-9325 202 426 4000
EIA	Electronic Industries Association 2001 Eye St., NW; Washington, DC 20006; 202 457-4900
EPA	Environmental Protection Agency 2001 Eye St., NW; Washington DC 20006; www.epa.gov ; 202 457 4900
FEMA	Federal Emergency Management Agency, Federal Center Plaza 500 C St. S.W., Washington DC 20472 www.fema.gov
FGMA	Flat Glass Marketing Association White Lakes Professional Bldg; 3310 Harrison; Topeka, KS 66611; 913 266-7013
FM	Factory Mutual Global Research, Standards Laboratory Dept.. 1301 Attwood Ave. POB 7500, Johnson, RI 02919; www.fmglobal.com
GA	Gypsum Association 810 First St. N.E. #510, Washington, DC 20002-4268 www.gypsum.org ; 301 277 6886
HMMA	Hollow Metal Manufacturers Association See NAAMM below.
HPVA	Hardwood Plywood Veneer Association 1825 Michael Farraday Dr., Reston, VA 20190 www.hpva.org
HUD	US Dept. of Housing and Urban Development 451 7 th St. SW, Washington, DC 20410
IBC	International Building Code 500 New Jersey Ave. NW 6 th Floor, Washington, DC 20001 www.iccsafe.org

ICC	International Code Council 500 New Jersey Ave NW, 6 th Floor, Washington DC 20001 www.iccsafe.org
IEEE	Institute of Electrical and Electronic Engineers, Inc. 3 Park Ave, 17 th Floor; New York, NY 10016 212-419-7900
IES	Illuminating Engineering Society 120 Wall St., Floor 17, New York, NY 10005-4001 212-248-5000
IRI	Industrial Risk Insurers 85 Woodland St.; Hartford, CT 06102; 203/525-2601
ISO	International Organization for Standardization ISO Central Secretariat 1 ch. De la Voie-Creuse, Case Postale 56 CH-1211 Geneva 20, Switzerland www.iso.org
MCAA	Mechanical Contractors Association of America 1385 Piccard Dr.; Rockville, MD 20850; 301-869-5800
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St. NE; Vienna VA 22180-4602; 703-281-6613
NAAMM	National Association of Architectural Metal Mfrs. 800 Roosevelt Rd. Bldg C, Ste 312; Glen Ellyn, IL 60137 www.naamm.org ; 630-942-6591
NBHA	National Builders Hardware Association (No Part of HDI) 711 Old Springhouse Rd.; McLean, VA 22101; 703 556-3990
NBS	National Bureau of Standards (U.S. Dept. of Commerce) Gaithersburg, MD 20234; 301 921-1000
NCMA	National Concrete Masonry Association 13750 Sunrise Valley, Herndon, VA 22071-4662
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Ste. 1100; Bethesda, MD 20814; 301 657 3110
NEII	National Elevator Industry, Inc. 1677 Country Route 64/PO Box 838; Salem, NY 12865-0838 518-854-3100
NEMA	National Electrical Manufacturers Association

1300 North 17th Street, Ste. 1752, Rosslyn, VA 22209; 703-841-3200

NFPA	National Fire Protection Association 1 Batterymarch Park, Quincy, MA 02169-7471 www.nfpa.org ; 617 770 3000
NHLA	National Hardwood Lumber Association P.O. Box 34518; Memphis, TN 38104; 901 377-1818 www.nhla.com
NIST	National Institute of Standards and Technology (US Dept. of Commerce) 1401 Constitution Avenue NW, Washington DC 20230 www.nist.gov
NRCA	National Roofing Contractors Association 10255 W. Higgins Rd., Ste. 600, Rosemont, IL 60018-5607 www.nrca.net ; 847-299-9070
NSF	National Sanitation Foundation P.O. Box 130140/789 N. Dixboro Road, Ann Arbor, MI 48113-0140 www.nsf.org 800-673-6275
OSHA	Occupational Safety & Health Administration (U.S. Dept. of Labor) 200 Constitution Ave; Washington, DC 20210 www.osha.gov 800-321-6742
PCI	Precast Prestressed Concrete Institute 209 W. Jackson Blvd., Suite 500, Chicago, IL 60606-6938 www.pci.org
PDI	Plumbing and Drainage Institute 800 Turnpike Street, Ste. 300; North Andover, MA 01845 www.pdionline.org 978-557-0720
PTI	Post-Tensioning Institute 38800 Country Club Dr., Farmington Hills, MI 48331 www.post-tensioning.org
RFCI	Resilient Floor Covering Institute 115 Broad Street, Ste. 201; La Grange, GA 30240 www.rfci.com
RIS	Redwood Inspection Service (Grading Rules) 818 Grayson Rd., Ste. 201; Pleasant Hill, CA 94523 www.redwoodinspection.com 925-935-1499
SDI	Steel Deck Institute POB 25, Fox River Grove, IL 60021 www.sdi.org
S.D.I.	Steel Door Institute

	30200 Detroit Rd.; Westlake, OH 44145 www.steeldoor.org 440-899-0010
SFM	State of California, Dept. of Forestry and Fire Protection Office of the State Fire Marshal, POB 944246, Sacramento, CA 94246 osfm.fire.ca.gov
SGCC	Safety Glazing Certification Council 100 W. Main St. / PO Box 730; Sackets Harbor, NY 13685; 315-646-2234
SJI	Steel Joist Institute 1173B London Links Dr., Forest, VA 24551 steeljoist.org
SMACNA	Sheet Metal & Air Conditioning Contractors' National Association 4201 Lafayette Center Drive;, Chantilly, VA 20151-1219 www.smacna.org 703-803-2980
SPRI	Single-ply Roofing Institute 411 Waverly Oaks Rd., Suite 331B, Waltham, MA 02452 www.spri.org
SSPC	Steel Structure Painting Council (The Society for Protective Coatings) 40 24 th Street, 6 th Floor, Pittsburgh, PA, 15222-4656 www.sspc.org
TCNA	Tile Council of North America 100 Clemson Research Blvd., Anderson, SC 29625, www.tcnatile.com 864-646-8453
TIA	Telecommunications Industry Association 2500 Wilson Blvd., Ste 300; Arlington VA 22201 www.tiaonline.org 703-907-7700
TMS	The Masonry Society 3970 Broadway, Unit 201-D, Boulder, CO 80304-1135 www.masonrysociety.org
TPI	Truss Plate Institute 218 N. Lee St., Suite 312, Alexandria, VA 22314 www.tpinst.org
UL	Underwriters Laboratories 333 Pfingsten Rd.; Northbrook, IL 60062-2096 www.ul.com 847 272 8800
ULC	Underwriters Laboratories of Canada 7 Underwriters Rd., Toronto, Ontario, Canada M1R3B4 www.ul.com/Canada/eng/pages/aboutus/

USC	United States Code, c/o Superintendent of Documents US Government Printing Office, Washington, DC 20402-9325
WCLIB	West Coast Lumber Inspection Bureau (Grading Rules) P.O. Box 23145; Portland, OR 97281 www.wclib.org 503 639 0651
WDMA	Window and Door Manufacturers Association 1400 E. Touhy, #470, Des Plaines, IL 60018 www.wdma.com
WI (WIC)	Woodwork Institute PO Box 980247; West Sacramento, CA 95798 www.wicnet.org 916-372-9943
WRI	Wire Reinforcement Institute 942 Main Street; Hartford, CT 06103 www.wirereinforcementinstitute.org
WSC	Water Systems Council 1101 30 th Street Northwest; Washington, DC 20007-3708 www.watersystemscouncil.org 888 395 1033
WWPA	Western Wood Products Association (Grading Rules) 522 SW Fifth Ave., Ste. 500; Portland, OR 97204-2122 www.wwpa.org 503 224-3930
W.W.P.A	Woven Wire Products Association www.wovenwire.org

1.07 GOVERNING REGULATIONS/AUTHORITIES

- A. General: The procedure followed by Architect/Engineer has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the work.
- B. Trade Union Jurisdiction: It is a procedural requirement that the Contractor maintain and require prime subcontractors to maintain, complete current information on jurisdictional matters, regulations actions, and pending actions, as applicable to the work.
 - 1. Discuss new developments at appropriate project meetings at the earliest feasible dates.
 - 2. Record information of relevance along with the action agreed upon.
 - 3. The manner in which contract documents have been organized and subdivided is not intended to be an indication of jurisdictional or trade union agreements.
 - 4. Assign and subcontract the work, and employ tradesmen and laborers, in a manner which will not unduly risk jurisdictional disputes of a kind which could result in conflicts, delays, claims and losses in the performance of the work.

1.08 SUBMITTALS

- A. Permits, Licenses and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgements, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 4523

TESTING AND INSPECTION SERVICES

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Selection and payment of Testing and Inspection Agency
 - 2. Testing and Inspection Agency submittals.
 - 3. Testing and Inspection Agency responsibilities.
 - 4. Testing and Inspection Agency reports.
 - 5. Limits on Testing and Inspection authority.
 - 6. Contractor's Responsibilities.
 - 7. Architect's Responsibilities.

1.02 RELATED SECTIONS

- A. Related Sections:
 - 1. Drawings and Contract Documents, including General and Supplemental General Conditions.
 - 2. Section 01 3300 - Submittals: Manufacturer's certificates.
 - 3. Section 01 3200- Construction Progress Schedule.
 - 4. Section 01 4000 - Quality Control.
 - 5. Section 09 0512 - Concrete Floor Moisture Content & pH Testing
 - 6. Section 01 7000 - Contract Closeout: Project Record Documents.
 - 7. Section 01 7500 - Starting of Systems.
 - 8. Technical Specifications - Pertinent Sections requiring tests and inspections.

1.03 REFERENCES

- A. ASTM C802 - Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction.
- B. ASTM C1021 - Practice for Laboratories Engaged in the Testing of Building Sealants.
- C. ASTM C1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- D. ASTM C1093 - Practice for Accreditation of Testing Agencies for Unit Masonry.
- E. ASTM D290 - Recommended Practice for Bituminous Mixing Plant Inspection.
- F. ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- G. ASTM D4561 - Practice for Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.

- H. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- I. ASTM E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.
- J. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- K. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.04 SELECTION AND PAYMENT

- A. An independent testing laboratory approved by DSA shall perform inspections, tests, and other services as specified by various specification sections.
 - 1. Owner will employ and pay for testing laboratory to provide initial testing indicated under specific specification sections and specifically noted to be paid by the Owner.
 - 2. Contractor shall be back-charged for testing costs when:
 - a. Additional tests and inspections by Owner's testing agency where initial tests and inspections reveal failure to meet Contract requirements.
 - b. Excessive inspection time by Owner's testing agency is required by Contractor's failure to provide sufficient workman or to properly pursue the progress of work.
 - c. Test(s) deemed necessary by the Owner/ Architect to evaluate any substitution proposed by the Contractor.
 - d. Testing and inspection for the Contractor's convenience.
 - e. Testing and inspection overtime necessitated by the Contractor's schedule.
- B. Employment of inspection firm in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Employment of any testing laboratory by Contractor shall be subject to Owner approval; laboratory shall be under direct supervision of a registered Engineer and shall conform to ASTM 329. Laboratory of concrete producer shall not be acceptable for concrete mix designs.
- D. Owner reserves the right to test any material or work of Project at any time, whether or not tests are indicated in Contract Documents.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of the referenced standards.
- B. Laboratory: Authorized to operate in State in which Project is located.
- C. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.06 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory OR inspection firm's name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Each Contractor responsible for the construction of a main wind- or seismic-force resisting system, designated seismic or a wind- or seismic-resisting component list in the statement of special inspections shall submit a written statement of responsibility prior to commencement of work on the system or component. A copy of this written statement shall be maintained at the project site and made available upon request. The Contractor's statement of responsibility shall contain the following:
 - 1. Acknowledgment of awareness of the special requirements contained in the statement of special inspections;
 - 2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official;
 - 3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports; and
 - 4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.
- C. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.07 AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional tests required by Architect/Engineer.
- G. Attend preconstruction meetings and progress meetings.

1.08 AGENCY AND INSPECTION REPORTS

- A. After each test, observation or inspection, promptly submit copies of report to Architect, Engineer, DSA, Owner's Inspector, Owner, Contractor and as otherwise directed.
- B. Include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in the Project.

7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

C. When requested by Architect/Engineer, provide interpretation of test or inspection results.

1.09 LIMITS ON TESTING and INSPECTION AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency or laboratory may not approve or accept any portion of the Work.
- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Provide information regarding activities requiring special inspection and tests to District's inspection and testing laboratory upon request.
- B. Provide agency or laboratory representative access to any chosen location and adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- C. Cooperate with laboratory personnel, and provide access to the Work.
- D. Provide incidental labor and facilities:
 1. To provide access to Work to be tested.
 2. To obtain and handle samples at the site or at source of Products to be tested.
 3. To facilitate tests.
 4. To provide storage and curing of test samples.
- E. Notify agency or laboratory and Architect/Engineer forty-eight (48) hours prior to expected time for operations requiring testing services. Become familiar with time constraints of tests required. Schedule work to allow time for performance of required tests.
- F. Employ services of an independent qualified testing laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.11 ARCHITECT RESPONSIBILITIES

- A. Architect is not responsible for notification of the Testing Agency or scheduling its work.
- B. Architect will not be responsible for the actions of the Testing Agency.

1.12 RE-TESTING

- A. When initial tests indicate non-compliance with the Contract Documents, subsequent re-testing shall be performed by the same testing laboratory and the costs thereof shall be paid by the Owner and deducted from the Contract Sums owed to the Contractor.

1.13 SCHEDULE OF INSPECTIONS

- A. Division of State Architect Form SSS-103 SCHEDULE OF TESTS AND INSPECTIONS is attached.
- B. Individual Specification Sections: Other tests or inspections required; standards for testing.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION - NOT USED.

END OF SECTION

DIVISION OF STATE ARCHITECT FORM SSS-103 SCHEDULE OF TESTS AND INSPECTIONS FOLLOWS
THIS SECTION

SECTION 01 5000

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 SCOPE

- A. Provide all required temporary facilities and controls as shown or specified herein and such additional facilities as required for proper performance of the work.
- B. All such temporary facilities shall be located where directed and maintained in a safe and sanitary condition at all times until completion of the contract and then removed from the site for safe disposal.

1.02 TEMPORARY SANITARY FACILITIES

- A. Provide adequate temporary sanitary conveniences for the use of all employees and persons engaged on the work including subcontractors and their employees as required by law, ordinances or regulations of public authorities having jurisdiction.
- B. Toilet Facilities: Enclosed chemical toilets or water closets and urinals, types acceptable to the Architect, Owner and Authorities Having Jurisdiction.
 - 1. If fixtures are used, they shall not be incorporated into the building.
 - 2. Open pit or trench latrines will not be permitted.
- C. Permanent plumbing fixtures of the building shall not be used by construction personnel without the written consent of the Owner.
- D. Sanitary facilities locations shall be acceptable to the Architect and Owner and shall be maintained in a clean and sanitary condition during the entire course of the work. The Contractor shall keep such facilities adequately supplied with toilet paper, paper toweling, etc. as required.
- E. At completion of the work sanitary facilities shall be properly disinfected and all evidence of same removed from the site.

1.03 TEMPORARY ELECTRIC FACILITIES

- A. Provide and maintain during the progress of the work all temporary electrical power and wiring requirements to facilitate the work of all trades and services connected with the work. All payment required by the utility company for the cost of their work in providing the service installation shall be paid for by the Contractor.
- B. The Owner will permit the operation or use of portions of the permanent electrical system to provide light and power during the construction period.
- C. The Contractor shall provide adequate temporary lighting for all work.

1.04 TEMPORARY WATER

- A. The Contractor shall make arrangements for all water required for construction purposes. The Contractor shall furnish and install piping or hose to carry water to every point where needed on the project. All water used on the project shall be potable water.
- B. The Owner will permit the operation or use of portions of the permanent water system to provide water required for construction purposes during the construction period.
- C. Closest availability of water shall be determined by the Contractor.

1.05 CONSTRUCTION EQUIPMENT

- A. The Contractor shall erect, equip and maintain all construction equipment in strict accordance with all applicable statutes, laws, ordinances, rules and regulations of the Owner or other authority having jurisdiction. Provide as required for use of all trades. Hoists and scaffolding shall be installed and erected in accordance with the latest Construction Safety Orders issued by the Division of Industrial Safety, State of California and the Associated General Contractor's "Manual of Accident Prevention in Construction," latest edition.
- B. Scaffolding, staging, runways and similar equipment required for prosecution of the contract shall be provided and maintained by the Contractor.
- C. Hoists and construction elevators required for prosecution of the contract shall be provided and maintained by the Contractor complete with operators, power and signals as required.
- D. The Contractor shall provide, maintain and remove upon completion of the work all temporary rigging, scaffolding, hoisting equipment, rubbish chutes, barricades around openings and excavations, ladders between floors, fences and all other temporary work as required for all work hereunder.
- E. Temporary work shall conform to all the requirements of state, county and local authorities and underwriters which pertain to operation, safety and fire hazard. The Contractor shall furnish and install all items necessary for conformity with such requirements, whether or not called for under the separate divisions of these specifications.

1.06 FENCES AND BARRICADES

- A. Construct and maintain fences, planking, barricades, lights, shoring and warning signs as required by local authorities and state safety ordinances and as required to protect the Owner's property from injury or loss and as necessary for the protection of the public and provide walks around any obstructions made in a public place for carrying on the work covered in this contract. Leave all protection in place and maintain until removal is authorized.
- B. Security fencing shall be located such that clear and unobstructed access is maintained to all existing school facilities.
- C. Relocate fences and barricades as allowed by the progress of the work to minimize the area enclosed. Avoid unnecessary encroachment on existing facilities.

1.07 PARKING AND EXTERIOR STORAGE

- A. The Contractor shall make all arrangements and pay all costs for providing parking facilities for construction personnel, delivery vehicles and authorized visitors.
- B. Where space limitations will not permit adequate facilities within the Owner's property, arrangements for off-property facilities shall be made by the Contractor with city or county authorities or other parties having jurisdiction.
- C. The Contractor shall make similar arrangements for hardstands or other necessary provision for enclosed storage areas for materials, equipment and debris. Locations and perimeters of such facilities shall be subject to the approval of the Architect and authorities having jurisdiction.

1.08 TEMPORARY FIELD OFFICES

- A. Contractor Field Office: Contractor shall provide on the site a temporary field office with a minimum of two individual offices of suitable size for Contractor staff use and for consultations with representatives of the Architect and Owner. Field Office facility shall be:
 - 1. Weatherproof and secure,
 - 2. Provided with adequate lighting, heat, cooling and ventilation.
 - 3. Equipped with a plan rack and plan table, containing a complete set of Contract Documents at all times.
 - 4. Provide conference table and chairs to seat eight (8) persons with such additional furniture as the Contractor may require.
 - 5. Provide a temporary telephone, separate line for fax and **internet connection with wireless service** as hereinafter specified.
 - 6. Field office location shall be approved by the Architect prior to placing the building on the site.
 - 7. The Architect and Owner and their representatives shall have free access to the field office at all times.
 - 8. The field office shall remain the property of the Contractor and shall be removed from the site upon completion of the work.
 - 9. A suitable office trailer, meeting all foregoing requirements, may be provided for the job office at the Contractor's option.
- B. Inspector Field Office: The Contractor shall provide on the site a temporary job office with a minimum of two individual offices of suitable size for the Inspector of Record. Provide the following facilities:
 - 1. Weatherproof and secure;
 - 2. Provided with adequate lighting, heat, cooling and ventilation.
 - 3. Equipped with a plan rack and plan table and shall contain a complete set of Contract Documents at all times.
 - 4. Sturdy desk with file drawers and chair. The Inspector may provide additional furniture as he or she may require.
 - 5. Copy Machine as hereinafter specified.

6. Provide temporary telephone lines, separate line(s) for fax and all handsets, fax terminal equipment and **wireless internet connection with wireless service** as hereinafter specified.
7. Inspector's field office location shall be approved by the Architect and Inspector prior to placing the building on the site.
8. The Architect and Owner and their representatives shall have free access to the Inspector's field office at all times. Contractor shall not have access to the Inspector's office.
9. The Inspector's field office shall remain the property of the Contractor and shall be removed from the site upon completion of the work. The Inspector will be responsible for removing his or her files and equipment.

C. Owner will not provide office space or furniture for the Contractor's use.

D. Contractor shall relocate field offices as progress of the work may require.

1.09 TEMPORARY TELEPHONE, FAX, **INTERNET CONNECTION AND OFFICE EQUIPMENT**

- A. Provide temporary telephone, facsimile (fax) service and **internet connection** in the temporary field offices for use by the Contractor, Owner, Architect, Inspector and their representatives for purposes related to the work. The telephone, fax and **internet connection** shall be for the use of representatives mentioned above for local calls without charge to the caller.
- B. Fax equipment shall be plain paper type.
- C. Provide separate telephone lines, fax lines and **internet connection** as follows:
 1. Contractors Field Office: Two (2) Phone lines; One (1) fax line; one (1) **internet connection**.
 2. Inspector's Field Office: Two (2) Phone lines; One (1) fax line; one (1) **internet connection**.
- D. Inspector's Copy Machine: Provide copy machine service in the temporary Inspector's offices for use by the Owner, Architect, Inspector and their representatives for purposes related to the work. Contractor shall not use Inspector's copy machine.
- E. Contractor's Copy Machine: Contractor's Option, provide copy machine service in the temporary Field offices for use by the Contractor.
- F. Contractor's Responsibility for Costs: Make all arrangements and pay all costs, including service, maintenance and consumable supplies for the specified equipment, until final acceptance of the project.

1.10 TEMPORARY HEATING, COOLING, VENTILATING

- A. Provide temporary heating, cooling, dehumidification and ventilation from an approved source whenever necessary for curing, drying, cooling or warming spaces as may be required for the installation of materials or finishes in specified conditions.
- B. Maintain facilities or equipment as required for continuous operation of utilities in service. Do not allow interruption of utilities or services. Supply all fuel of types required.
- C. Continue temporary services uninterrupted until permanent building systems are completed, capable of maintaining specified conditions without supplemental equipment, and accepted by the Owner.

1.11 CONTINUITY OF SERVICES

- A. Provide temporary panels, raceway, conductors, piping, ductwork and other facilities or equipment as required for continuous operation of utilities in service. Do not allow interruption of utilities.
 - 1. All utility services, such as water, gas, sewers, electricity, data, cable television, communication, clock, bell, or fire protection system serving the project, or any part of it, shall be maintained in continuous operation at all times for the duration of the contract.
 - 2. Transfer of utilities function to new systems shall be coordinated in writing with the Owner at least two weeks in advance of the proposed date.
 - 3. Notify and obtain approval from agencies having jurisdiction over utilities prior to transfer of function.
 - 4. Coordinate provision and removal of temporary facilities with phasing of construction operations as indicated, or as necessary for continuity of service.

1.12 REMOVAL AT COMPLETION

- A. Upon completion of the work, or prior thereto when so directed by the Architect, the Contractor shall remove all temporary facilities, structures and installations from the Owner's property. Similarly, return all exterior areas utilized for temporary facilities to their original natural state or, when called for as part of the Work, complete areas as shown or noted.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 5600

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Barriers, enclosures and fencing.
- B. Dust control.
- C. Water control.
- D. Weed control.
- E. Protection of Installed Work.
- F. Exterior Protection.
- G. Tree and Plant Protection.
- H. Resource Protection.
- G. Progress Cleaning.

1.02 BARRIERS

- A. Construct and maintain any necessary fences, barricades and warning signs as required by local authorities and state safety ordinances and as required to protect the Owner's property from injury or loss. Leave all protection in place and maintain until removal is authorized.
- B. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

1.03 DUST CONTROL

- A. Control dust on the site. Maintain measures to prevent dust and debris from being transported outside the area of Work. Assume responsibility for damage caused by dust to the Work and for damage caused by dust outside the area of Work. Correct damages at Contractor's expense.
- B. Refer to Division 2 sections for additional requirements.

1.04 WATER CONTROL

- A. Grade site to drain. Provide, operate, and maintain pumping equipment as required to maintain excavations and site construction areas free of water.

- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Do not permit water to stand in locked-in areas of buildings to receive concrete slabs-on-grade, nor on such slabs following their placement. Provide pumping or dewatering facilities and monitor during storm events to prevent these conditions.

1.05 WEED CONTROL

- A. Remove weeds from site that grow over the duration of the project.
- B. Prevent incorporation of organic materials into grading or topdressing.

1.06 PROTECTION OF INSTALLED WORK

- A. Protect installed Work throughout to maintain undamaged. Provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. 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.
- D. Prohibit traffic from landscaped areas.

1.07 EXTERIOR PROTECTION

- A. Provide temporary weather-tight enclosure of exterior walls for successive areas of building as necessary to:
 - 1. Allow for progress of work;
 - 2. Provide acceptable working conditions;
 - 3. Provide weather protection for materials;
 - 4. Permit effective heating, cooling, dehumidification or ventilation as circumstances may require;
 - 5. Prevent entry of unauthorized persons.
- B. Bear all costs for replacement of damage to existing or new construction, construction materials and equipment from effects of weather, theft and unauthorized entry.

1.08 TREE AND PLANT PROTECTION

- A. Preserve and protect existing trees and plants at site which are designated to remain, and those adjacent to site.
- B. Following consultation with Architect, remove roots and branches which interfere with indicated construction.
 - 1. Employ a qualified tree surgeon to prune and treat cuts.
- C. Provide temporary barriers to a height of six feet, around each, or around each group, of trees and plants.

- D. Protect root zones of trees and plants:
 - 1. Do not allow vehicular traffic and parking.
 - 2. Do not store materials or products.
 - 3. Prevent dumping of refuse or chemically injurious materials or liquids.
 - 4. Prevent puddling or continuous running water.
- E. Carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.
- F. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations.

1.09 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Provide on-going, daily housekeeping and cleanup, including all debris boxes or method for disposal of debris. Contractor will not be permitted to leave debris, trash, leavings, dirt, garbage, rubbish, material containers, etc. on the site. No unsafe and un-workmanlike conditions will be permitted.
- B. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.10 REMOVAL OF CONTROLS

- A. Remove temporary controls prior to inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Procedures for Owner-supplied products.
- F. Spare parts and maintenance materials.

1.02 RELATED SECTIONS

- A. Document 00 1013 - Notice Inviting Bids: Products designated by Owner as "District Standards."
- B. Document 00 2113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- C. Document 00 7200 - General Conditions of the Contract: Product options and substitution procedures prior to bid date.
- D. Section 01 4000 - Quality Control: Product quality monitoring.

1.03 DEFINITIONS

- A. Request For Substitution: Requests for changes in products, materials, or equipment required by Contract Documents proposed by the Contractor prior to and after award of the Contract are considered requests for substitutions. The following are not considered substitutions;
 - 1. Revisions to Contract Documents requested by the Owner or Architect.
 - 2. Specified options of products, materials, and equipment included in Contract Documents.

1.04 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 Agreement.
 - 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.
- 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 colors, textures, and patterns.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances

PART 2 PRODUCTS

2.01 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacture for components being replaced.
- C. Products or equipment referenced with a manufacturer's name and/or model number shall be provided with all standard materials, components, compliance requirements and features normally furnished for that model or product. These items and requirements are inherent in the specification whether or not individually itemized.
- D. Manufacturer's Requirements: Any deviation from design requirements shown or specified, resulting either from Contractor's or supplier's change of model, or manufacturer's recommendation, or from submitted alternates or accepted substitutions, shall be clearly indicated on the Contractor's submittals. Contractor shall provide all such manufacturer or supplier supplemental requirements at no additional cost.
- E. Owner's Requirements:
 - 1. Pursuant to the requirements of California Public Contract Code 3400, the Owner may designate certain products as "District Standards" in order that a field test or experiment may be made to determine the product's suitability for future use, or in order to match other products in use on a particular public improvement, either completed or in the course of construction.
 - 2. A list of these designated products as may be applicable to the project is contained in the Notice Inviting Bids, as required by PCC 3400. These products shall be provided as specified and are not subject to substitution. All bids shall be deemed to include these listed items as specified without additional costs.
 - 3. In the event of a conflict between the Notice Inviting Bids and the technical specifications for a product's provision for substitutions, the Notice Inviting Bids shall govern.

2.02 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 a Single Manufacturer with a Provision for Substitutions: Submit a request for substitution in accordance with specified procedures for products meeting specifications from any manufacturer not named. For such specifications, the Architect is aware of only one manufacturer providing products meeting the specification, pursuant to PCC 3400.
- C. Products Specified by Naming Multiple Manufacturers with a Provision for Substitutions: Submit a request for substitution in accordance with specified procedures for products meeting specifications from any manufacturer not named.
- D. Products Specified by Naming A Single Manufacturer or Multiple Manufacturers without Provision for Substitution: Use only a product of one of the manufacturers named and meeting specifications. No options or substitutions allowed.
- E. Products Specified by Naming A Single Manufacturer or Multiple Manufacturers as listed in the Notice Inviting Bids: Use only a product of one of the manufacturers named and meeting specifications. No options or substitutions allowed

2.03 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
- B. Deliver to Project site, prior to final payment.
 - 1. Provide materials list for all items turned over to the Owner including quantities.
 - 2. Deliver items in presence of Owner designated representative to the location identified by the Owner.
 - 3. Obtain Owner designated representative sign-off of materials list attesting to receipt of items in triplicate. Retain one copy, provide one copy to Owner representative receiving items, and submit one copy to Architect.

PART 3 EXECUTION

3.01 LIMITATIONS ON SUBSTITUTIONS SUBMITTED PRIOR TO THE RECEIPT OF BIDS

- A. The Bid shall be based upon the standards of quality established by those items of equipment and/or materials which are indicated in the Contract Documents, including those products designated as "District Standards".
- B. Architect may consider requests for substitutions of specified equipment and/or materials only when requests are received by Architect within **twenty-one (21)** days prior to the date of bid, in conformance with Public Contract Code Section 3400. Do not request substitutions for products designated as "District Standards".
- C. Architect will consider a substitution request only if request is made in strict conformance with provisions of this Section. Request shall be fully responsive to all product requirements of the specified product, including those requirements noted in this section in the article titled PRODUCTS.

- D. Burden of proof of merit of requested substitution is the responsibility of the proposer requesting the substitution.
- E. It is the sole responsibility of the proposer requesting the substitution to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.
- F. When substitution is not accepted, provide specified product.
- G. Substitute products shall not be included within the bid without written acceptance by Addendum.

3.02 LIMITATIONS ON SUBSTITUTIONS SUBMITTED AFTER THE AWARD OF THE CONTRACT

- A. The Contract is based upon the standards of quality established by those items of equipment and/or materials which are indicated in the Contract Documents, including those products designated as "District Standards".
- B. Architect will consider substitution requests received after the established date of the receipt of bids or contract award only when one or more of the following conditions are met and documented:
 - 1. Specified item fails to comply with regulatory requirement.
 - 2. Specified item is no longer manufactured.
 - 3. Specified item, through no fault of the Contractor, unavailable in the time frame required to meet project schedule.
 - 4. Specified item, through subsequent information disclosure, will not perform properly or fit in designated space.
 - 5. Manufacturer declares specified product to be unsuitable for use intended or refuses to warrant installation of product,
 - 6. Substitution would be, in the sole judgment of the Architect, a substantial benefit to the Owner in terms of cost, time, energy conservation, or other consideration of merit.
- C. Notwithstanding other provisions of this section and the above, the Architect may consider a request for substitution after the date of the receipt of bids or contract award, if in the sole discretion of the Architect, there appears to be just cause for such a request. The acceptance of such a late request does not waive any other specified requirement.
- D. Architect will consider a request for substitution after the date of the receipt of bids or contract award only if request is made in strict conformance with provisions of this section. Request shall be fully responsive to all product requirements of the specified product, including those requirements noted in this section in the article titled PRODUCTS.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
 - 1. Review of shop drawings does not constitute acceptance of substitutions indicated or implied on shop drawings.
 - 2. Substitutions will not be considered when requested or submitted directly by subcontractor or supplier.

- F. Contractor's failure or inability to pursue the work promptly or coordinate activities properly shall not establish a cause for consideration of Substitutions.
- G. Burden of proof of merit of requested substitution is the responsibility of the Contractor.
- H. It is the sole responsibility of the Contractor to establish proper content of submittal for requests for substitutions. Incomplete submittals will be rejected.
- I. When substitution is not accepted, provide specified product.
- J. Substitute products shall not be provided without written acceptance by Change Order.

3.03 SUBSTITUTION PROCEDURES

- A. Document each request on Architect's Request For Substitution (RFS) form with complete data substantiating compliance of proposed substitution with Contract Documents. All requests for substitution must be submitted on the specified form which may be obtained from the Architect. Requests received without the Request Form will be rejected.
- B. A request for substitution constitutes a representation that the proposer:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty or bonds for the substitution as for the specified product.
 - 3. Will coordinate installation of an accepted substitution and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives all claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse the Owner for services provided by Owner and Architect for review or redesign services associated with re-approval by authorities.
- C. Regulatory Requirements: Proposer requesting the substitution shall be responsible for obtaining all regulatory approvals required for proposed substitutions.
 - 1. All regulatory approval shall be obtained for proposed substitutions prior to submittal of substitution request to Architect, unless Architect participation is required by the regulating agency.
 - 2. All substitutions that affect structural safety, fire and life safety, access compliance or energy (as applicable) shall be submitted to Division of State Architect for review and approval.
 - 3. All costs incurred by the Owner in obtaining regulatory approvals for proposed substitutions, including the costs of the Architect and any authority having jurisdiction over the project shall be reimbursed to the Owner. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.
- D. Substitution Submittal Procedure:
 - 1. Submit one original signature copy of only the Request For Substitution Form included in this Project Manual for consideration. Forms provided by proposer or other agencies or organizations are not acceptable. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence, including:
 - a. Statement of cause for substitution request.
 - b. Identify product by specification section and article number.

- c. manufacturer's name, address, and phone number.
- d. List of fabricators, suppliers, and installers as appropriate.
- e. List of similar Projects where proposed products have been used, date of installation and names of Architect and Owner.
- f. Confirmation of regulatory approvals
- g. Product data, including drawings and product samples.
- h. Fabrication and installation procedures.
- i. Comparison of the qualities of the proposed substitution with that specified.
- j. Cost data comparing the proposed substitution with the product specified.
- k. Any required license fees or royalties.
- l. Availability of maintenance service and source of replacement materials.
- m. Coordination information, including a list of changes or modifications needed to other items of work that will be required to accommodate Proposed substitution.
- n. Statement on the Substitution's effect on the Construction Schedule.
- o. Written certification by the proposer that the Substitution is equal or better in every respect to that required by the contract Documents and that substitution will perform adequately in the application intended.
- p. Written certification that the proposer will pay for all permits, fees, and costs required to implement the substitution, and including waiver of all claims for additional costs or time extension which may subsequently become apparent, and reimbursement of Owner and Architect for review or redesign services associated with re-approval by authorities.

3.04 ARCHITECT'S REVIEW OF SUBSTITUTIONS

- A. The Architect will accept or reject proposed substitutions within fourteen (14) days of receipt of request.
- B. If a decision on a substitution cannot be made within the time allocated, the product specified shall be used.
- C. No extension of bid period or contract time will be made for substitution review.
- D. Final acceptance of a substitution submitted prior to the date established for the receipt of bids will be in the form of a Bid Clarification or Addendum.
- E. Final acceptance of a substitution submitted after the award of the contract will be in the form of an Architect Supplemental Instruction and/or Construction Change Direction.
- F. Architect/Engineer shall be the judge of the acceptability of the proposed substitution. Architect's decision on substitution requests is final and does not require documentation or justification.
- G. Rejection Of Substitution Request: Any of the following reasons shall be cause for rejection, all as determined by the Architect;
 - 1. Vagueness or incompleteness of Substitution submittal,
 - 2. Insufficient data, failure to meet specified requirements, (including warranty).
 - 3. Qualification of the requirements of the Substitution Form, including modification of any of the requirements.

- H. The Architect/Engineer will notify Contractor in writing of decision to accept, accept as noted, or not accept the request for substitution.
- I. Substitute products shall not be ordered or installed without written acceptance.
- J. Owner shall receive full benefit of any cost reduction as a result of any request for substitution.
- K. Provide submittals for accepted substitutions in accordance with specified requirements of the respective section and provisions of Section 01 2500.
 - 1. An accepted substitution is not acceptable as a submittal under Section 01 2500. Provide separate submittals for each review.

3.05 OWNER-SUPPLIED PRODUCTS

- A. See Section 01 1100- Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange and pay for product delivery to site.
 - 2. On delivery, inspect products jointly with Contractor.
 - 3. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 4. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 2. Handle, store, install and finish products.
 - 3. Repair or replace items damaged after receipt.
 - 4. Coordinate installation with other trades.

3.06 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

3.07 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- I. Provide bonded off-site storage and protection only when site does not permit on-site storage or protection. Obtain Owner's permission prior to initiating such off-site storage.

END OF SECTION

(REQUEST FOR SUBSTITUTION FORM FOLLOWS)

Request for Substitution

{Projects.Name}

Project Number: {Projects.Number}

DSA Application: {LegalDocInfo.NotaryStateOf}

DSA File: {LegalDocInfo.NotaryName}

Specification Title: _____

Product Description: _____

Specification Section: _____

Article/Paragraph: _____

Architect will consider substitution requests received after the date established as deadline for substitution request only when one or more of the following conditions are met and documented; indicate one or more conditions which apply:

- ☐ Specified item fails to comply with regulatory requirement.
- ☐ Specified item is no longer manufactured.
- ☐ Specified item, through no fault of the Contractor, unavailable in the time frame required to meet project schedule.
- ☐ Specified item, through subsequent information disclosure, will not perform properly or fit in designated space.
- ☐ Manufacturer declares specified product to be unsuitable for use intended or refuses to warrant installation of product.
- ☐ Substitution would be a substantial benefit to the Owner in terms of cost, time, energy conservation, or other consideration of merit.

Explain benefit (required): _____

Proposed Product Name (include specific model number): _____

Manufacturer: _____ Phone: _____

Address: _____

Installer: _____

Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 years old ☐ More than 10 years old

Difference between proposed substitution and specified product: _____

☐ Attached comparative table. Include point-by-point comparison of each article number. **REQUIRED**

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

Date Installed: _____

Proposed substitution affects other parts of Work? ☐ No ☐ Yes; Explain: _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time? ☐ No ☐ Yes; [Add] or [Deduct] _____ days.

Substitution Request

(Continued)

As outlined in Specification Section 01 6000, a request for substitution constitutes a representation that the proposer:

- ☐ Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
- ☐ Will provide the same warranty or bonds for the substitution as for the specified product.
- ☐ Will coordinate installation of an accepted substitution and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
- ☐ Waives all claims for additional costs or time extension which may subsequently become apparent.
- ☐ Will reimburse Owner for services provided by Owner and Architect associated with re-approval by authorities.

{Company.Name} Representative Printed Name: _____

{Company.Name} Representative Signature: _____

Date Submitted from {Company.Name} to Architect: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports

Additional comments: _____

Architect's review and action:

- ☐ Substitution approved - Make submittals in accordance with Specification Section 01 3300.
- ☐ Substitution approved as noted - Make submittals in accordance with Specification Section
- ☐ 01 3300. Substitution rejected - Use specified materials.
- ☐ Substitution Request received too late - Use specified materials.

Reviewed by: _____ Date: _____

SECTION 01 6116

VOLATILE ORGANIC COMPOUND (VOC) RESTRICTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. VOC restrictions for product categories listed below under "DEFINITIONS."
 - 1. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".
- B. All products of each category that are installed in the project must comply; applicable laws and ordinances do not allow for partial compliance.
- C. Listing of a product in these specifications shall not be construed as a solicitation or requirement to use any product or combination of products in violation of the requirements of South Coast Air Quality Management District Rule No.1168, as described in Rule 1168(g).
 - 1. If a listed product does not meet the requirements of this rule, request approval for use of an alternate product by the same or another manufacturer meeting the requirements of this rule.
 - 2. Do not use products which do not meet the requirements of this rule.

1.02 RELATED REQUIREMENTS

- A. Divisions 01 through 33 contain related requirements specific to the work of each of these Sections. Requirements may or may not include reference to this section.
- B. Section 01 8113 "Sustainable Design Requirements".

1.03 DEFINITIONS

- A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site:
 - 1. Adhesives, sealants, and sealer coatings, regardless of specification section or division.
 - 2. Paints and coatings.
 - 3. Carpet and resilient flooring.
 - 4. Composite wood products; plywood, particleboard, wood fiberboard.
- 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.

1.04 REFERENCE STANDARDS

- A. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".
- B. Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net.
- C. CRI (GLCC) - Green Label Testing Program - Approved Product Categories for Carpet Cushion; Carpet and Rug Institute; Current Edition.

- D. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.
- E. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.
- F. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.
- G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.
- H. SCS (CPD) - SCS Certified Products; Scientific Certification Systems; current listings at www.scs-certified.com.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittals Procedures.
- B. Evidence of Compliance: Submit for each different product in each applicable category.
 - 1. Identify evidence submittals with the words "CAL-Green VOC Compliance Report".
- C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.
- D. Installer Certifications for Accessory Materials: Require each installer of any type of product, (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.
 - 1. Use the form following this section for installer certifications.

1.06 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168 and less where required by code.
 - 1. These products may be specified in multiple sections throughout these specifications.
- B. Adhesives, including carpet: Comply with Title 24, Part 11, Table 5.504.4.1.
 - 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.
- C. Joint Sealants: Comply with Title 24, Part 11, Table 5.504.4.2.
 - 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.

- D. Aerosol Adhesives: Comply with Title 24, Part 11, Table 5.504.4.1. and California Code of Regulations Title 17, Section 94507.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current GreenSeal Certification.
 - b. Report of laboratory testing performed in accordance with GreenSeal GS-36 requirements.
 - c. Published product data showing compliance with requirements.
- E. Paints and Coatings: Comply with Title 24, Part 11, Table 5.504.4.3; California Air Resources Board, Architectural Coatings Suggested Control Measure, February 1, 2008.
 - 1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
 - a. Evidence of Compliance: Acceptable types of evidence are:
 - 1) Report of laboratory testing performed in accordance with requirements.
 - 2) Published product data showing compliance with requirements.
 - 3) Certification by manufacturer that product complies with requirements.
 - b. Provide coatings that comply with the most stringent requirements specified in the following:
 - 1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2) South Coast Air Quality Management District Rule No.1168.
- F. Carpet: Comply with Title 24, Part 11, 5.504.4.4; meet testing and product requirements of one of the following:
 - 1. Carpet & Rug Institute "Green Label Plus".
 - 2. California Department of Public Health Standard Practice for testing of VOC's (Specification 01350).
 - 3. NSF/ANSI 140 at Gold Level.
 - 4. Scientific Certification Systems Sustainable Choice.
 - 5. All carpet cushion installed shall meet requirements of Carpet & Rug Institute "Green Label Program".
 - 6. All carpet cushion installed shall meet requirements of Title 24, Part 11, Table 5.504.4.1.
- G. Resilient Flooring Products: Comply with Title 24, Part 11, 5.504.4.6. Fifty percent of floor area receiving resilient flooring shall have flooring complying with VOC emission limits in CHPS 2009 criteria and listed on the Low Emitting Materials List or Product Registry or certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
 - 1. Provide documentation verifying that finish materials are certified to meet pollutant limits. Acceptable types of evidence are:
 - a. Published product data showing compliance with requirements.
 - b. Inclusion on one of the following lists:
 - 1) www.chps.net/dev/drupal/node/381
 - 2) www.rfci.com/int_FS-ProdCert.htm
 - 3) www.greenguard.org/default.aspx?tabid=135
 - 4) Other method acceptable to enforcing agency.
- H. Composite Wood Products: Comply with Title 24, Part 11, Table 5.504.4.5 formaldehyde limits for hardwood plywood, particleboard, and medium density fiberboard composite wood products.
 - 1. Title 24, Part 11, Table 5.504.4.5 Composite Wood Products Maximum Formaldehyde Emissions in Parts per Million.

PRODUCT	CURRENT LIMIT (Effective July 1, 2012)
Hardwood Plywood veneer core	0.05
Hardwood Plywood composite core	0.05
Particleboard	0.09
Medium Density Fiberboard	0.11
Thin Medium Density Fiberboard	0.13

2. Evidence of Compliance: Acceptable types of evidence are:
 - a. Chain of custody certifications
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.
 - d. Other method acceptable to enforcing agency.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. All additional costs to restore indoor air quality, including fines by authorities, due to installation of non-compliant products will be borne by Contractor.

3.02 RESTRICTED COMPONENTS

- A. Restricted Components:
 1. Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.

- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

- B. The following tables are taken from South Coast Air Quality Management District Rule No.1168 and are believed accurate at the time of publication. All products used shall comply with the limits of Rule No. 1168. In the event of discrepancy between these values and those of Rule No. 1168, those of Rule No. 1168 shall prevail.

C. **Table 5.504.4.1 ADHESIVE VOC LIMIT**

Architectural Applications	Current VOC Limit
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Outdoor Carpet Adhesives	150
Wood Flooring Adhesives	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50
Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250

D. **Table 5.504.4.1 Continued**

	VOC Limits and Effective Dates **	** The specified limits remain in effect unless revised limits are listed in subsequent columns.		
Specialty Applications	Current VOC Limit	1-1-05	7-1-05	1-1-07
PVC Welding	510			
CPVC Welding	490			
ABS Welding	400		325	
Plastic Cement Welding	350	250		
Adhesive Primer for Plastic	650		550	
Computer Diskette Manufacturing	350			

Contact Adhesive	80			
Special Purpose Contact Adhesive	250			
Tire Retread	100			
Adhesive Primer for Traffic Marking Tape	150			
Structural Wood Member Adhesive	140			
Sheet Applied Rubber Lining Operations	850			
Top and Trim Adhesive	540			250

E. Table 5.504.4.1 Continued

For adhesives, adhesive bonding primers, or any other primer not regulated by the above two tables and applied to the following substrates, the following limits shall apply	
Substrate Specific Applications	Current VOC Limit
Metal to Metal	30
Plastic Foams	50
Porous Material (Except Wood)	50
Wood	30
Fiberglass	80

F. Table 5.504.4.2 SEALANT VOC LIMIT

If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.	
Sealant	Current VOC Limit
Architectural	250
Marine Deck	760
Nonmembrane Roof	300
Roadway	250
Single Ply Roof Membrane	450
Other	420

Sealant Primers	Current VOC Limit
-----------------	-------------------

Architectural	
Porous	250
Non-Porous	775
Modified Bituminous	500
Marine Deck	760
Other	750
For low-solid adhesives or sealants the VOC limit is expressed in grams per liter of material as determined in paragraph (b)(32); for all other adhesives and sealants, VOC limits are expressed as grams of VOC per liter of adhesive or sealant less water and less exempt compounds as determined in paragraph (b)(31).	

- G. Paints and Coatings: Architectural Paints and Coatings shall comply with VOC limits in Table 1 of ARB Architectural Coatings Suggested Control Measure, California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green" Table 5.504.4.3. All products used in this category shall comply with these limits, unless more stringent local and regional rules apply.

H. **Table 5.504.4.3 VOC CONTENT LIMITS FOR ARCHITECTURAL COATINGS (See Notes 2 & 3 below)**

Grams of VOC per Liter of Coating, less water and less exempt compounds.	
COATING CATEGORY	Current VOC Limit 1/1/2012
Flat Coatings	50
Nonflat Coatings	100
Nonflat High Gloss Coatings	150
Specialty Coatings	
Aluminum Roof Coatings	400
Basement Specialty Coatings	400
Bituminous Roof Coatings	50
Bituminous Roof Primers	350
Bond Breakers	350
Concrete Curing Compounds	350
Concrete / Masonry Sealers	100
Driveway Sealers	50
Dry Fog Coatings	150
Faux Finishing Coatings	350
Fire Resistive Coatings	350
Floor Coatings	100
Form-Release Compounds	250
Graphic Arts Coatings (Sign Paints)	500
High-Temperature Coatings	420
Industrial Maintenance Coatings	250
Low Solids Coatings (See Note 1 above)	120
Magnesite Cement Coatings	450

Mastic Texture Coatings	100
Metallic Pigmented Coatings	500
Multicolor Coatings	250
Pretreatment Wash Primers	420
Primers, Sealers and Undercoaters	100
Reactive Penetrating Sealers	350
Recycled Coatings	250
Roof Coatings	50
Rust Preventative Coatings	250
Shellacs:	
Clear	730
Opaque	550
Specialty Primers, Sealers and Undercoaters	100
Stains	250

Stone Consolidants	450
Swimming Pool Coatings	340
Traffic Marking Coatings	100
Waterproofing Membranes	250
Wood Coatings	275
Wood Preservatives	350
Zinc Rich Primers	340

1. Note 1: Grams of VOC per liter of coating including water and including exempt compounds
2. Note 2: Not Applicable
3. Note 3: Values in this table are derived from those specified by the California Air Resources Board, Architectural Coatings Suggested Control Measure, February 1, 2008. More information is available from the Air Resources Board.

END OF SECTION

SECTION 01 6116.01

ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

1.01 FORM

- A. Identification:
 - 1. Project Name: _____
 - 2. Project No.: _____
 - 3. Architect: _____
- B. Use of This Form:
 - 1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.
 - 2. Contractor is required to obtain and submit this form from each installer of work on this project.
 - 3. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
 - 4. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product.
- C. VOC content restrictions are specified in Section 01 6116.

2.01 PRODUCT CERTIFICATION

- A. I certify that the installation work of my firm on this project:
 - 1. [HAS] [HAS NOT] required the use of any ADHESIVES.
 - 2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
 - 3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
 - 4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.
- B. Product data and MSDS sheets are attached.

3.01 CERTIFIED BY: (Installer/Manufacturer/Supplier Firm)

- A. Firm Name: _____
- B. Print Name: _____
- C. Signature: _____
- D. Title: _____ (officer of company)
- E. Date: _____

END OF SECTION

SECTION 01 7000

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Spare parts and maintenance Products.
- G. Warranties and bonds.
- H. Maintenance service.

1.02 RELATED SECTIONS

- A. Section 01 5600 - Temporary Controls.
- B. Section 01 7500 - Starting of Systems
- C. Section 01 2900 - Applications for Payment

1.03 CLOSEOUT PROCEDURES

- A. Submit written certification including:
 - 1. The Work, or a designated portion thereof, is substantially complete in accordance with Contract Documents and ready for Architect/Engineer's review.
 - 2. A comprehensive list of work which is incomplete or in need of correction.
 - 3. Draft closeout submittals for the Work, or designated portions thereof.
- B. Within a reasonable time after receipt of this certification, the Architect will perform initial review. Incremental review will not be performed.
- C. If the Architect determines that the Work is not substantially complete:
 - 1. The Architect will promptly notify the Contractor and Owner in writing, setting forth reasons for the determination.
 - 2. The Contractor shall correct or complete deficiencies in the Work and send a second written certification as above.
 - 3. The Architect will perform a subsequent review as above.

- D. Coordinate corrective work under provisions of Section 01 3900 - Coordination and Meetings.
- B. Upon the Architect's determination that the Work is substantially complete, the Architect will provide to the Contractor a document co-signed by the Owner's Representative indicating remainder of work to be accomplished prior to completion of the project, or contract recognized portion thereof.

1.04 FINAL INSPECTION

- A. Submit written certification that:
 - 1. Contract Documents have been reviewed,
 - 2. Work has been inspected, and that
 - 3. Work, or a designated portion thereof, is complete in accordance with Contract Documents and
 - 4. Systems and equipment have been tested in the presence of the Owner.
 - 5. Work is ready for Architect review.
- B. Within a reasonable time after receipt of this certification, the Architect will perform a review to verify the status of the Work.
- C. If the Architect determines that the Work is not substantially complete, defective or otherwise in need of correction:
 - 1. The Architect will promptly notify the Contractor and Owner in writing, setting forth reasons for the determination and listing the deficient work.
 - 2. The Contractor shall immediately correct or complete deficiencies in the Work and send a second written certification that the Work is complete.
 - 3. The Architect will perform a subsequent review as above.
 - 4. Additional review time by the Architect due to incomplete corrections may be "backcharged" to the Contractor by the Owner.
- D. When the Architect determines that the Work is complete in accordance with the Contract Documents, the Architect will request the Contractor to make closeout submittals.

1.05 CLOSEOUT SUBMITTALS

- A. Submit under provisions of Section 01 3300 - Submittals.
- B. Submittals for review shall be subdivided according to design consultant review.
- C. Submittals required by governing or other authorities.
- D. Evidence of payment and release of liens under the provisions of Section 01 2900 - Applications for Payment.
- E. Certificates of insurance for products and completed operations.
- F. Record Drawings
- G. Warranties and Bonds.
- H. Operations and Maintenance information and manuals.

- I. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and sum remaining due. Adjustments include:
 1. Approved Change Orders.
 2. Unit price calculations.
 3. Allowances.
 4. Liquidated Damages.
 5. Deductions for reinspection.
 6. Deductions for deficient work uncorrected.
 7. Other adjustments.
 8. Approved payments.
 9. Contract Sum as adjusted.
 10. Amount remaining due.

1.06 FINAL CLEANING

- A. Execute final cleaning prior to Architect's initial review.
- B. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned. Remove excess lubrication and other substances.
- C. All marks, stains, fingerprints, dust, dirt, splattered paint and blemishes resulting from the various operations shall be removed throughout the Project. Stair treads and risers shall be wet-mopped. Glass shall be left clean and polished both inside and outside. Clean and buff all metalwork. Plumbing fixtures and light fixtures shall be washed clean. Vacuum carpeted and soft surfaces. Exposed concrete, ceramic tile and resilient flooring shall be swept, mopped and waxed (where appropriate) in full compliance with specific requirements of finish manufacturer's specifications. Hardware and other unpainted metals shall be cleaned and all building papers and other temporary protections and labels shall be removed throughout the building, or portion of the building where Contractor was involved, all to the satisfaction of the Architect and District.
- D. Contractor shall replace filters and clean heating and ventilating equipment used for temporary heating, cooling and ventilation.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste, surplus materials and rubbish from the site.

1.07 PROJECT RECORD DOCUMENTS

- A. 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. Measured depths of foundations in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
- G. Submit reproducible documents to Architect prior to final Application for Payment, including indexed PDF(s) of all required documents. Provide one PDF file each for:
 - 1. Complete Record Specifications
 - 2. Complete Record Drawings
 - 3. Complete Record Shop Drawings
- H. Receipt and acceptance of Record Documents by the Owner is a precondition for filing Notice of Completion.

1.08 OPERATION AND MAINTENANCE DATA

- A. Submit data on 8-1/2 x 11 inch (A4) text pages, bound in three-ring "slant D" binders with durable plastic covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.

- d. Operating instructions.
- e. Maintenance instructions for equipment and systems.
- f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
- g. Receipts for spare parts, maintenance products and keys, attested by the Owner.
- 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Originals of warranties and bonds
- E. Submit draft copy of completed volumes as an indexed PDF of all required documents. This copy will be reviewed and returned with Architect comments. Revise content of all document sets as required prior to final submission.
- F. Submit two sets of revised final volumes, within 10 days after final inspection, including indexed PDF(s) of all required documents.
- G. Receipt and acceptance of Operations and Maintenance Documents by the Owner is a precondition for filing Notice of Completion.

1.09 WARRANTIES AND BONDS

- A. Submit guarantees as specified in the General Conditions.
- B. Provide duplicate copies.
- C. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- D. Provide Table of Contents and assemble in a three ring binder with durable plastic cover. Also provide indexed PDF of scan of all warranties and bonds.
- E. Submit prior to final Application for Payment.
- F. Substantial Completion addressing warranties will only be recognized in relation to the following portions of work:
 - 1. None
- G. In the case that any portion of the work is eligible for a warranty start period prior to Notice of Completion as designated by above article 1.09.F, Contractor shall conform to procedures defined by articles 1.03 through 1.09, applicable to portion of work. Upon the Architect's determination that the Work is substantially complete, the Architect will:
 - 1. Prepare the Certificate of Substantial Completion upon AIA Form G704 with the Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
 - 2. Submit the completed Certificate of Substantial Completion to the Contractor and the Owner for written acceptance of their respective duties set forth therein.
- H. For items of Work delayed beyond date of Notice of completion or Substantial Completion where applicable, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections during the warranty period.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of each prime Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY:

- A. Contractor shall implement procedures to divert **65%** of construction waste. As many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
- B. The Contractor shall develop a Waste Management Plan as defined in this Section and submit for review by the Owner, Construction Manager, and Architect.

1.03 DEFINITIONS

- A. Waste Materials: construction materials that are excess to the contract requirements and which can not be effectively used in the Work.
- B. Salvage Materials: waste materials or materials that exist on the site that can be reused, either on site or by another entity.
- C. Recyclable Waste: waste materials that exist on site or are generated during the construction process that can be recycled/remanufactured into another material.
- D. Categories of salvageable or recyclable waste include the following:
 - 1. Concrete, Masonry, and Other Inert Fill Material: concrete, brick, rock, broken up asphalt pavement, clay, and other inert (non-organic) materials.
 - 2. Metals: metal scrap including iron, steel, copper, brass, and aluminum; includes beverage containers, packaging materials (such as metal banding), fencing, reinforcing bar, wiring, plumbing, etc.
 - 3. Untreated Wood: unpainted, untreated dimensional lumber, wood edging, wood shipping pallets, etc. Does not include pressure treated or creosote treated wood.
 - 4. Engineered Wood Products: plywood, oriented strand board, "Masonite", particleboard, manufactured trusses and beams, and glue-laminated timbers.
 - 5. Gypsum Wallboard: excess drywall construction materials including cuttings, other scrap, and excess materials.
 - 6. Cardboard: clean, corrugated cardboard such as used for packaging, etc.
 - 7. Paper Goods:
 - 8. Office paper: includes any paper, such as manufacturer instruction, specification sheets, files, correspondence, packaging, stiffeners, etc.
 - 9. Newsprint: shredded or whole newspaper goods.

10. Plastic: beverage containers, packaging materials (such as polystyrene “peanuts” and expanded polystyrene), containers (other than those used for hazardous materials), vinyl products, etc.
 11. Glass: includes glass beverage containers, and recyclable glass building materials.
 12. Insulation: rigid foam, batt, and loose fill insulation materials.
 13. Carpet: face fiber, backing, padding, and carpet cushion scrap.
 14. Paints: unused portions of paints and coatings applied on-site.
 15. Fabric: uncontaminated fabric scraps.
 16. Rubber: uncontaminated rubber scraps, including but not limited to recycled-content rubber flooring, rubber edging, tires that are no longer serviceable, etc.
 17. Other: any additional materials identified on-site to be valued for salvage, reuse, or recycling by the Contractor, Owner, Construction Manager, or Architect.
- E. Non-Recyclable Waste: All waste materials that are not able to be recycled, due to contamination, lack of recycling facilities or salvage options, or high cost.
- F. Source Separated: Materials that are separated on-site by category.
- G. Co-Mingled: Several types of construction waste that are combined in a single container. Co-mingling of recycling waste must be approved by the identified recycling facility.
- H. Hazardous Waste: Any substance whose handling and/or disposal is regulated as hazardous waste by local, state, or federal authorities.
- I. Alternative Daily Cover (ADC): Material placed over a waste collection location or container in order to prevent vector dispersal, fires, odors, or blowing debris, which is then disposed of as waste itself. ADC is not permitted on projects seeking LEED certification.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with all applicable federal, state, and local ordinance and regulation requirements for recycling and waste management.
- B. Disposal Sites, Recyclers, and Waste Materials Processors: Use only facilities properly permitted by state and local authorities.
- C. Preconstruction Waste Management Conference: Prior to beginning work at the site, schedule and conduct a conference to review the Construction Waste Management Plan and discuss procedures, schedules and specific requirements for waste materials recycling and disposal. Discuss coordination and interface between the Contractor and other construction activities. Identify and resolve problems with compliance with requirements. Record minutes of the meeting, identifying all conclusions reached and matters requiring further resolution.
1. Plan Revision: Make any revisions to the Construction Waste Management Plan agreed upon during the meeting and incorporate resolutions agreed to be made subsequent to the meeting. Submit the revised plan to the Contracting Officer's Representative for approval.
- D. Implementation:

1. Designate an on-site party responsible for instructing workers and implementing the Construction Waste Management Plan.
2. Distribute copies of the Construction Waste Management Plan to the job site foreman and each subcontractor.
3. Include waste management and recycling in worker orientation.
4. Provide on-site instruction on appropriate separation, handling, recycling, and salvaging methods to be used by all parties at the appropriate stages of the work at the site.
5. Prominently display Waste Management Plan and clearly mark all containers and areas on site dedicated to source separation.
6. Include waste management and recycling discussion in pre-fabrication meetings with subcontractors and fabricators.
7. Also include discussion of waste management and recycling in regular job meetings and job safety meetings conducted during the course of work at the site.

1.05 STORAGE AND HANDLING

- A. Salvage Materials: Provide protective handling and storage as required for all items identified for salvage and reuse by the Owner, Construction Manager, or Architect.
- B. Recyclable Waste: Remove all recyclable materials, as identified in the Waste Management Plan, from the work location to approved containers daily. Failure to remove waste materials will be considered cause for withholding payment and/or termination of Contract.
 1. Provide separate collection containers as required by recycling haulers and to prevent contamination of materials, including protection from rain as applicable.
 2. Replace loaded containers with empty ones as demand requires but not less than weekly.
 - 3.If waste will be collected co-mingled in a single container for off-site sorting, facility delivery receipts must show recycling rates for each material stream.
 - 4.Personal waste (lunch wrappers, etc) must be collected separately from construction waste.
- E. Handling: Deposit all indicated recyclable materials in the containers in a clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers until such time as such materials have been cleaned.
 1. If contamination chemically combines with the material so that it cannot be cleaned, do not deposit into the recycle containers.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Transport recyclable waste materials from the Work Area to the recycle containers and carefully deposit in the containers in a manner to minimize noise and dust. Close container covers immediately after materials are deposited. Do not place recyclable waste materials on the ground adjacent to a container.
- B. Existing Conditions: Coordinate with "Instructions to Bidders" and "Supplementary Conditions".

1.07 SUBMITTALS

- A. Construction Waste Management Plan: Contractor must submit complete Construction Waste Management Plan for review within 30 days from the Notice to Proceed.
- B. Updated Construction Waste Management Plan with delivery receipts.

PART 2 PRODUCTS

2.01 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. Construction Waste Management Plan: Contractor shall develop a construction waste management plan indicating proposed methods for collection, segregation, and removal of all construction wastes and debris produced by the work of this Contract, including all costs associated with this plan. Those waste materials produced during the course of this Contract that can be recycled cost-effectively, shall be. The Waste Management Plan shall include, at a minimum, the following:
 - 1. Provide an analysis of jobsite waste to be generated, including types and quantities.
 - 2. Provide strategies for salvage, reuse, or recycling for a minimum of all materials listed below. Include additional waste materials that are deemed cost-effective to salvage, reuse, or recycle. See "Definitions" above for material categories.
 - 3. Provide documentation to justify decision not to recycle any items listed below.
 - 4. Show compliance with applicable state and local ordinances and regulations.
 - 5. Include a list of recycling facilities to which indicated recyclable materials will be distributed for disposal.
 - 6. Identify materials that are not recyclable or otherwise conservable that must be disposed of in a landfill or other means acceptable under governing State and local regulations.
 - 7. List permitted landfills and/or other disposal means to be employed.
 - 8. Indicate any instances where compliance with requirements of this Section does not appear to be possible and request resolution from the Architect.
- B. Waste Materials: The following materials shall be salvaged or recycled according to this specification. Strategies for salvage and recycling shall be identified in the Waste Management Plan as required above.
 - 1. Salvage Materials: Identify materials existing on site that are candidates for salvage and reuse, either on this Project or through sale or donation to local organizations.
 - 2. Recyclable Materials: The following materials, at a minimum, shall be salvaged or recycled. Applies to all such listed waste materials produced during the course of this Contract.
 - a. Concrete, Masonry, and Other Inert Fill Material
 - b. Metals
 - c. Untreated Wood
 - d. Gypsum Wallboard Scrap
 - e. Cardboard
 - f. Paper Goods
 - g. Beverage Containers
 - h. Plastic
 - i. Glass
 - j. Carpet

- C. Delivery Receipts: Maintain copies of delivery receipts for waste materials salvaged and sent to permitted waste materials processors or recyclers that indicate the location and name of firm accepting recyclable waste materials, types of materials, net weights of each type, date of delivery and value of materials.
- D. Maintain working copy of Construction Waste Management Plan at site for review by Owner, Construction Manager, Architect, and all Trades involved in Project.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT

- A. General: Implement waste management procedures in accordance with approved construction waste management plan. Maintain procedure throughout the life of this Contract.
- B. Source Separation: Separate, store, protect, and handle at the project site all identified recyclable and salvageable waste products to prevent contamination of materials and maximize recyclability and salvageability of materials.
- C. Collection: Arrange for timely pickups from the site or deliveries to approved recycling facilities of designated waste materials to keep construction site clear and prevent contamination of recyclable materials. Maintain records accessible to the Contracting Officer's Representative for verification of construction waste materials recycling.
- D. Delivery Receipts: Keep and maintain records of all deliveries to recycling facilities and all pickups of waste materials at the site by others as specified above.
- E. Salvage and Reuse: Identify salvage and reuse options for all materials that are deemed to be reusable, but will not be reused on this Project.
- F. Non-Recyclable Waste: Collect and segregate non-recyclable waste for delivery to a permitted landfill site.
- G. Hazardous Waste: Control and dispose of hazardous waste in accordance with local, state, and federal regulations.

END OF SECTION

SECTION 01 7500

STARTING OF SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Starting of Systems:
 - 1. New systems in this Contract.
 - 2. Existing systems relocated or disturbed by the Work of this Contract.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

1.02 RELATED SECTIONS

- A. Section 01 4000 - Quality Control: Manufacturers field reports.
- B. Section 01 7000 - Contract Closeout: System operation and maintenance data and extra materials.

1.03 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractors' personnel in accordance with manufacturers' instructions.
- G. Submit a written report in accordance with Section 01 3300 - Submittals that equipment or system has been properly installed and is functioning correctly.

1.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion, including existing telephone, intercom and fire alarm.

- B. Demonstrate Project equipment by a qualified manufacturers' representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within four months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at designated location.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 7513

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Execution and installation requirements.
- B. Products and installation for patching and extending work.
- C. Transition and adjustments.
- D. Repair of damaged surfaces, finishes, and cleaning.
- E. Existing Systems: Relocation and restoration of function, testing.

1.02 RELATED SECTIONS

- A. Section 01 2500 - Submittals: Submittals procedures.
- B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- C. Section 01 5000 - Temporary Facilities and Section 015600 - Temporary Controls: Exterior enclosures, temporary heating/cooling/ventilating facilities.
- D. Section 01 7000 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.03 SUBMITTALS

- A. 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 as for the project record.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration which 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.

1.04 QUALIFICATIONS

- A. For survey work employ a land surveyor registered in California and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. 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.
- E. Erosion and Sediment Control: Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
- F. Noise Control: Provide methods, means, and facilities to minimize noise from demolition, earthwork and noise produced by construction operations.
- G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. 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.

1.06 COORDINATION

- A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate occupancy 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. Verify utility requirements and 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.

- D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. 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

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- 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 6000.

2.02 FABRICATION

- A. Machine-roll components or elements required to be curved or radiused. Do not field bend or "walk-down". Provide true curves minimizing joints, segmented fabrication not allowed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Beginning new work means acceptance of existing conditions.
- B. Verify that demolition is complete in alterations areas and areas are ready for installation of new work.
- C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- D. Examine and verify specific conditions described in individual specification sections.

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

3.02 PREPARATION

- A. Cut, move, or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.
- C. Remove debris and abandoned items from area and from concealed spaces.
- D. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate ducts and piping to prevent condensation in exposed areas.
- E. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.
- F. Clean substrate surfaces prior to applying next material or substance.
- G. Seal cracks or openings of substrate prior to applying next material or substance.
- H. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 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 indicated on Drawings.
- 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 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.
 - 4. All other work as indicated or necessary.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

- A. Install Products as specified in individual sections.
- B. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new Work abuts or aligns with existing, perform a smooth and even transition.
- C. 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.
- D. Grind or bush split-faced or textured masonry to achieve hairline fit to adjacent trim, flashings, inserts, escutcheons or other penetrating elements.
- E. 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.
- F. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
- G. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
- H. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.
- I. Re-cover and refinish work that exposes mechanical and electrical work exposed accidentally during the work.

3.05 CUTTING AND PATCHING

- A. Execute cutting and patching including excavation and fill to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.

- B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- I. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.06 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 rubbish from site periodically and dispose off-site.

3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

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

3.08 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Division 23 and Sections 01 4000 and 01 7500.

3.09 EXISTING SYSTEMS

- A. Examine and test existing building systems and utilities with components requiring relocation during performance of this work. Examples may include but are not limited to:
 - 1. Mechanical Systems
 - 2. Plumbing Systems
 - 3. Electrical Systems, line voltage, low voltage, signal alarm, or data.
 - 4. Fiber-optic data or communication cabling systems.
- B. Remove or relocate these components while work is performed.
 - 1. Fiber-optic data cabling systems are extremely fragile and subject to mechanical damage. Relocate these systems with great care. Do not disconnect or remove these systems, which must remain in place and in operation during the Work.
- C. Restore these components to the former location upon completion of the Work.
- D. Test systems under provisions of Section 01 7500 to confirm proper operation. Conduct tests in the presence of the Architect and Owner's Representative.
- E. Perform remedial work as necessary to establish proper operation. Assume responsibility for proper operation of systems following completion of Work.

END OF SECTION

SECTION 01 8113

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes general requirements and procedures for compliance with California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".
 - 1. Chapter 5- Non-Residential Mandatory Measures.

1.02 RELATED REQUIREMENTS

- A. Pertinent sections specifying erosion control.
- B. Section 01 6116 - Volatile Organic Compound (VOC) Restrictions.
- C. Section 01 7419 - Construction Waste Management and Disposal.
- D. Section 01 7000 - Contract Closeout .
- E. Pertinent sections specifying landscape irrigation.

1.03 DEFINITIONS

- A. CAL-Green Definitions: Certain terms are defined by CAL-Green in Chapter 5 of the Code. Words and terms used in this section shall have the meanings shown therein.

1.04 INFORMATIONAL SUBMITTALS

- A. General: Submit CAL-GREEN submittals required by code and in other Specification Sections.
- B. CAL-GREEN submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CAL-GREEN requirements.
- C. Acceptable verification submittals are specified in the related sections.

PART 2 PRODUCTS

2.01 REQUIREMENTS - GENERAL

- A. Provide products and procedures necessary to confirm CAL-GREEN compliance required in this Section. Although other Sections may specify some CAL-GREEN requirements, the Contractor shall determine additional materials, techniques, means, methods and procedures necessary to comply with CAL-GREEN requirements.

2.02 STORM WATER POLLUTION PREVENTION PLAN

- A. Section 5.106.1: Comply with requirements of this code section, local ordinances, General Conditions, Special Provisions, and related sections specifying erosion control.

2.03 OUTDOOR WATER USE

- A. Section 5.304.3.1: Irrigation Controllers: Comply with requirements of this code section, local ordinances and Section 32 8000.

2.04 CONSTRUCTION WASTE REDUCTION

- A. Section 5.408 Construction Waste Management, Diversion and Recycling: Comply with requirements of this code section, local ordinances and Section 01 7419.

2.05 BUILDING MAINTENANCE AND OPERATION

- A. Section 5.410.2.3, 4. Commissioning and Functional Performance Testing: Participate in Commissioning and provide functional performance testing as required by these code sections and as specified in Section 01 7500.
- B. Section 5.410.2.5. Documentation and Training: Provide Operations Training as required by these code sections and as specified in Section 01 7500 and Systems Manual as specified in Section 01 7500.

2.06 POLLUTANT CONTROL

- A. Section 5.504.3 Indoor Air Quality: Comply with requirements of this code section, local ordinances.
 - 1. During storage, rough installation and until final start-up of HVAC equipment, securely cover all ducts and air distribution component openings with plastic, tape, sheet metal or other methods acceptable to enforcing agency to reduce dust or debris collected in the system.
- B. Section 5.504.4 Finish Material Pollutant Control: All Finish materials shall comply with requirements of this code section, local ordinances and Section 01 6116.

PART 3 EXECUTION

3.01 GENERAL

- A. Comply with Section 01 7419 - Construction Waste Management and Disposal.
- B. Comply with execution requirements of related sections and applicable local codes and ordinances.

END OF SECTION

SECTION 02 4119
MINOR DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Remove existing work as indicated and as necessary to permit new work.
 - 1. Removal of designated building equipment and fixtures.
 - 2. Removal of designated construction.
- B. Disposal of materials.
- C. Identification of utilities.
- D. Salvaging, storing, and protecting existing work to remain or to be removed and re-installed.

1.02 RELATED SECTIONS

- A. Section 01 1100 - Summary: Work sequence and continued occupancy of the building.
- B. Section 01 5000 - Temporary Facilities and Controls: Temporary enclosures, dust control barricades, security at occupied areas, and cleanup during construction.
- C. Section 01 7513 - Execution Requirements: Re-installation of removed components.

1.03 SUBMITTALS

- A. See Section 01 2500 - Submittals, for submittal procedures.
- B. Project Record Documents: Accurately record actual locations of capped utilities.

1.04 REGULATORY REQUIREMENTS

- A. Conform to TITLE 24 CBC code for demolition work, dust control, products requiring electrical disconnection and re-connection .
- B. Do not close or obstruct egress from any building exit or site exit.
- C. Do not disable or disrupt building fire or life safety systems without 10 (ten) days prior written notice to Owner.
- D. Conform to applicable regulatory procedures when hazardous or contaminated materials are discovered.

1.05 SEQUENCING

- A. Sequence work under the provisions of Section 01 3100.

1.06 SCHEDULING

- A. Schedule work under the provisions of Section 01 3100.
- B. Schedule work to coincide with new construction.
- C. Coordinate demolition with other trades to assure the proper sequence, limits, methods and time of performance. Schedule work so as to impose a minimum of hardship on the present operation of facilities and the performance of the work of other trades or contracts.
- D. Perform noisy, malodorous, or dusty work. Conform to more stringent requirements of local authorities having jurisdiction, when applicable:
 - 1. Between the hours of 7:00 am and 5:00 pm.

1.07 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Use all means necessary to protect existing objects, construction and plantings designated to remain. In the event of damage, make all repairs and replacements necessary for approval of Architect at no additional cost to the Owner.
- C. Protective measures: Provide all necessary safeguards, including warning signs and lights, barricades, and the like, for protection of the public, Contractor's employees and existing improvements during demolition. Prevent access of unauthorized persons to area of work
- D. Provide at least one person who shall be present at all times during execution of this portion of the work, be thoroughly familiar with the type of work being performed and the best methods for its execution and who shall direct all work performed under this Section.
- E. Control the use of water to prevent damage to the existing facilities to remain. Provide wet vacuum equipment where water, such as waste cooling water from concrete sawing or water used as dust emollient, is used adjacent to and in existing buildings.
- F. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION

3.01 PREPARATION

- A. Provide, erect, and maintain temporary barriers at locations indicated.
- B. Inspect the area of work and verify locations of all items designated to be removed or preserved.
- C. Do not begin demolition work until temporary barricades, warning signs and other forms of protection are installed.
- D. Erect and maintain weatherproof closures for exterior openings.
- E. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued occupancy of adjacent buildings.
- F. Protect existing materials and features that are not to be demolished.
- G. Prevent movement of structure; provide bracing and shoring.
 - 1. Be responsible for the adequacy and design of all temporary shoring and bracing systems.
- H. Notify affected utility companies before starting work and comply with their requirements.
- I. Mark location and termination of utilities.
- J. Provide appropriate temporary signage including signage for exit or building egress.

3.02 DEMOLITION

- A. Disconnect, remove, and identify designated utilities within demolition areas.
- B. Demolish in an orderly and careful manner. Protect existing supporting structural members and features indicated to remain.

1. Cut openings in existing walls or roofs at locations necessary to accommodate new doors, windows, ductwork, piping, conduits, raceways or other building services or elements.
 2. Demolish concrete curbs at locations of walls to be removed.
 3. Remove dry-rotted wood materials and other unsuitable materials as indicated and as required to provide sound substrates for other work.
 4. Use of explosives will not be permitted.
- C. Remove existing glazing, sealants, stops, and other elements at existing hollow metal frames indicated to receive new operable sash.
- D. Remove existing glazing, sealants, stops, trim and other elements of existing windows indicated to be replaced with new windows. Coordinate full extent of demolition with Section 08 5113 and Section 06 2000.
- E. Remove existing flooring, wall coverings, trim or other finishes in areas designated to receive new work.
- F. Remove existing construction only to the extent necessary for the proper installation of new construction and junction with existing work. Cut back finished surfaces to straight, plumb or level lines as required.
- G. Mechanical, Plumbing and Electrical systems : Demolish existing improvements as required to permit installation of new systems indicated. Refer to pertinent sections of Divisions 22, 23 and 26 for additional specific demolition required for mechanical, plumbing and electrical systems.
- H. Securely seal exposed ends of existing ductwork systems left open by demolition operations. Prevent entry of foreign matter. Protect these seals from damage until connected to new work.
- I. Remove all fasteners, anchors, supports and similar appurtenances from substrates indicated to remain. Leave substrates in good condition to receive new work.
1. Pull nails from wood framing. Unthread screws, do not pull out. Do not drive existing nails or screws flush.
 2. Remove suspended ceiling support wires.
 3. Remove staples, screws, and miscellaneous anchors from all gypsum board, wood paneling, masonry wall surfaces indicated to remain.
- J. Demolish as follows:
1. Portland cement concrete, asphalt concrete paving: Saw cut or core drill; jack-hammering of central areas away from saw-cut joint is acceptable for removing large areas of concrete. Cut back concrete or paving to clean, straight saw-cut lines. Provide wet vacuum equipment as required for control of waste cooling water.
 2. Modular materials such as ceiling, resilient and ceramic tile: Remove to a natural point of division in whole units to a joint line with no damaged or defective unit remaining to adjoin new construction.
 3. Gypsum wallboard: Remove to a joint line on a support.
 4. Wood trim: Remove to a natural existing joint line.
- K. Examine substrates and surfaces exposed by demolition for water damage, dryrot, decay, termite infestation or other structural failure. Request direction from the Architect if these conditions are discovered. Additional demolition beyond scope originally indicated may be required to fully remove damaged or unsuitable materials.

- L. Work not mentioned to be removed that interferes with new construction shall be cut to clean cut lines to provide for proper interface with new construction, or patching and repair, as required.
- M. All holes or trenches created by removal of underground piping or other facilities demolished shall be filled with clean soil and compacted to the density for fills specified. Do not backfill if subsequent excavation will occur at the same location. Do not backfill hole or trenches until inspected by the Soils Engineer or IOR.
- N. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- O. Remove materials as demolition progresses. Upon completion of demolition, leave areas in clean condition.
- P. Remove temporary facilities.

3.03 SALVAGE

- A. Items indicated to be salvaged shall be removed carefully, cleaned and stored in a protected location on or off the site until re installed; salvaged items to be delivered to the Owner shall also be removed carefully and presented to the Owner's designated representative.
- B. Owner may take possession of any items of salvage for his use if he desires. Provide incidental labor to relocate designated salvage for Owner's storage.
- C. Salvage existing wood trim of unique or unusual profile. Stockpile and re-install in new locations. Minimize provision of new materials.
- D. Salvage existing acoustic ceiling tile of unique or unusual patterns. Stockpile and re-install in new locations where patching is necessary to install new work of other sections. Minimize provision of new materials.

3.04 PATCHING

- A. Patch materials to remain when damaged by this work. Finish materials and appearance of the patch or repair work shall match the existing contiguous materials and finishes in all respects and shall be approved by Architect.
- B. Where openings are cut oversize or in improper location, replace the excess removed material as instructed by Architect at no additional cost to the Owner.

3.05 CLEAN-UP AND DISPOSAL

- A. Debris, waste, and removed materials, other than items to be salvaged, are Contractor's property for legal disposal off the site, as required by applicable Federal and State regulations. Continuously clean up and remove these items. Do not allow demolished items to accumulate. All materials to be disposed, shall meet the requirements of the Construction Waste Management program.
- B. Leave the site in a neat and orderly condition prepared for the work of other trades.

3.06 SCHEDULES

- A. Remove, store and protect the following materials and equipment:
 - 1. Existing wood casing and trim of special or unusual profile.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials and equipment and all operations required to complete all formwork as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
 - 1. Forms, shores, bracing, removal and other operations as necessary for all cast-in-place concrete placed.
 - 2. Setting and securing anchor bolts and other metal items embedded in concrete into formwork, using materials and layouts furnished and delivered to jobsite as specified under other sections.
- B. Related Sections:
 - 1. Pertinent Sections of Division 03 specifying concrete construction.
 - 2. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete foundations and formwork.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 19A Concrete.
- B. American Concrete Institute (ACI) 347 "Recommended Practice for Concrete Formwork".
- C. American Plywood Association (APA) "Concrete Forming Guide".
- D. West Coast Lumberman Inspection Bureau (WCLIB) "Standard Grading Rules for West Coast Lumber".
- E. ACI SP-066 "ACI Detailing Manual".
- F. ACI 301 "Specifications for Structural Concrete".
- G. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

1.03 DESIGN REQUIREMENTS

- A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements, resist imposed loads; resultant concrete to conform to required shape, line and dimension.

1.04 SUBMITTALS

- A. Limitation of review: Structural Engineer's review will be required only where specifically requested for general architectural applications and features only. Contractor is responsible for structural stability, load-resisting characteristics and sufficiency of form work design.

1.05 QUALITY ASSURANCE

- A. General: All form materials shall be new at start of work. Produce high quality concrete construction. Minimize defects due to joints, deflection of forms, roughness of forms, nonconforming materials, concrete or workmanship.
- B. Reuse of Forms: Plywood forms may be reused, if thoroughly cleaned of all dirt, mortar, and foreign materials, and undamaged at edges and contact face. Reuse shall be subject to permission from the Architect without exception, and issued in writing. Reuse of any panel which will produce a blemish on exposed concrete, will not be permitted.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Form Materials:
 - 1. Non-Exposed Surface Formwork Facing: Forms for concrete which is not exposed to view, may be of plywood as specified for exposed surfaces, or square edge 1x nominal Douglas Fir, Construction Grade, S4S.
 - 2. Exposed Surface Formwork Facing:
 - a. Forms for all exterior and interior concrete flat surfaces unless otherwise specified as board formed shall be new Douglas Fir Plywood (APA) ply, 5/8-inch, B-B Plyform, Class 1, Exterior Type, oiled and edged and edge-sealed conforming to U.S. Product Standard PS 1 in large sheet sizes to achieve joint patterns shown.
 - b. All exposed concrete edges shall be chamfered 3/4" minimum or as noted on the drawings.
 - 3. Exposed Surface Formwork - Special Pattern Form Liner:
 - a. Forms for all exterior and interior concrete flat surfaces indicated shall be as designated by Architect.
- B. Earth Forms: Allowed, subject to soil standing in excavations without ravel or caving.
- C. Form Release Agent: Spray-on compound, not affecting color, bond or subsequent treatment of concrete surfaces. Maximum VOC content shall comply with local requirements and California Green Building Code.
- D. Accessories: Types recommended by manufacturers or referenced standards to suit conditions indicated;
 - 1. Anchors, spacers, void in-fill materials: sized to resist imposed loads.
 - 2. Form Ties: Prefabricated rod, flat band, or wire snap ties with 1" break-back or threaded internal disconnecting type with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than 1" to surface.
- E. Corner Chamfers and Rustications: Filleted, wood strip or foam type; sizes and shapes as detailed, or 3/4 x 3/4 inch size minimum if not detailed; maximum possible lengths.

- F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Inspect the substrate and the conditions under which concrete formwork is to be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected. Commencement of work indicates acceptance of substrates and conditions.
- B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

- A. If natural soil or compacted fill can be accurately cut and maintained, foundations and grade beams may be poured against earth without forming. Provide positive protection of trench top corners.
- B. Maintain earth forms free of water and foreign materials.

3.03 ERECTION – FORMWORK

- A. General: Construct formwork in accordance with calculations, and recommendations of Section 401 of ACI 347. Construct forms to the sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in finished structure. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Use selected materials to obtain required finishes.
 - 1. Construct cambers specified in concrete members and slabs in the formwork.
 - 2. Schedule the work and notify other trades in ample time so that provisions for their work in the formwork can be made without delaying progress of the project. Install all sleeves, pipes, etc. for building services systems, or other work. Secure information about and provide for all openings, offsets, recessed nailing blocks, channel chases, anchors, ties, inserts, etc. in the formwork before concrete placement.
 - 3. Deflection: Formwork and concrete with excessive deflection after concrete placement will be rejected. Excessive deflection is that which will produce visible and noticeable waves in the finished concrete.
 - 4. Measure formwork for elevated structural slabs, columns, wall elevations points of maximum camber and submit in writing to the Architect/Engineer prior to placing concrete.
- B. Formwork Construction: Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Uniform, substantial and sufficiently tight to prevent leakage of concrete paste, readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials. Tie, brace, shore, and support to insure stability against pressures from any source, without failure of any component part and without

excessive deflection. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

- C. Provide all openings, offsets, inserts, anchorages, blocking, and other features of the work as shown or required. See INSERTS, EMBEDDED PARTS, AND OPENINGS for detailed requirements.
- D. Warped, checked, or scuffed forms will be rejected.
- E. Maintain membranes, reinforcing and other work free of damage; protect with plywood runway boards or other positive, durable means.
- F. Align joints and make watertight. Keep form joints to a minimum.
- G. Provide fillet and chamfer strips on external corners of exposed locations and as indicated to form patterns in finished work. Extend patterns around corners and into alcoves, on backs of columns and similar locations not otherwise shown.
 - 1. Produce beveled, smooth, solid, unbroken lines, except as otherwise indicated to conform to patterns.
 - 2. Form corners and chamfers with 3/4 inch x 3/4 inch strips, unless otherwise indicated, accurately formed and surfaced to produce uniformly straight lines and tight edge joints. Extend terminal edges to required limit and miter chamfer at changes in direction.
- H. Unexposed corners may be formed either square or chamfered.
- I. Ties and Spreaders: Arrange in a pattern acceptable to the Architect when exposed. Snap-ties may be used except at joints between pours where threaded internal disconnecting type shall be used.
- J. Coordinate this section with other sections of work that require attachment of components to formwork.
- K. Reglets and Rebates: Accurately locate, size, and form all reglets and rebates required to receive work of other trades, including flashing, frames, and equipment.

3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not allow excess form coating material to accumulate in the forms or to come into contact with reinforcement or surfaces which will be bonded to fresh concrete.
- D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork will be rejected.
- E. Leave no residue or stain on the face of the concrete, nor affect bonding of subsequent finishes or work specified in other sections.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
 - 1. Provide openings in concrete formwork to accommodate work of other sections including those under separate contracts (if any). Size and location of openings, recesses and chases shall be in accordance with the section requiring such items. Accurately place and securely support items to be built into forms.
- B. Construction Joints: Construct and locate generally as indicated on Drawings and only at locations approved by Structural Engineer, so as not to impair the strength of the structure. Form keys in all cold joints shown or required.
- C. Locate and set in place items that will be cast directly into concrete.
- D. Rough Hardware and Miscellaneous Metal: Set inserts, sleeves, bolts, anchors, angles, and other items to be embedded in concrete. Set embedded bolts and sleeves for equipment to template and approved shop drawings prepared by trades supplying equipment.
- E. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- F. Wood Inserts and Nailers: Provide approved preservative-treated lumber. Set all required nailing blocks, grounds, and other inserts as required to produce results shown. Wood plugs shall not be used.
- G. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- H. Piping: Do not embed piping in structural concrete unless locations specifically approved by Structural Engineer.
- I. Conduit: Location shall be subject to Engineer's written approval and shall not impair the strength of the structure.
- J. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
 - 1. Provide openings for the introduction of vibrators at intervals necessary for proper placement.
 - 2. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- K. Install Form Liner inserts in accordance with manufacturer's recommendations, to produce patterns and textures indicated.
- L. Install waterstops in accordance with manufacturer's recommendations to provide continuous waterproof barrier.

3.06 FORM CLEANING

- A. Clean forms as erection proceeds, remove foreign matter within forms.

- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Remove all dirt, chips, sawdust, rubbish, water and foreign materials detrimental to concrete.
 - 2. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

3.07 EQUIPMENT BASES

- A. Form concrete bases for all mechanical and electrical equipment in accordance with approved shop details furnished by other sections.
- B. Sizes and locations as indicated and as required to produce results shown.
- C. Provide coved base for all equipment bases placed on concrete slabs.

3.08 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

3.09 FIELD QUALITY CONTROL

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.
- C. Clean and repair surfaces to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.
- D. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

3.10 FORM REMOVAL

- A. Do not loosen or remove forms before minimum curing period has elapsed without employment of appropriate alternate curing methods, approved by the Architect in writing.
- B. Remove forms without damage to the concrete using means to insure complete safety of the structure and without damage to exposed beams, columns, wall edges, chamfers and inserts. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Do not remove forms until the concrete has hardened sufficiently to permit safe removal and the concrete has attained sufficient strength to safely support imposed loads. The minimum elapsed time for removal of forms after concrete has been placed shall be as follows:
 - 1. Slabs: 7 days minimum.

- D. Duration listed above are minimums and are subject to extension at the sole judgment of the Architect/Engineer.
- E. Reshoring: Reshore members where and if required by Formwork Design Engineer.
- F. Do not subject concrete to superimposed loads (structure or construction) until it has attained full specified design strength, nor for a period of at least 14 days after placing.
- G. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

3.11 CLEANING

- A. Remove excess material and debris associated with this work from the job site.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Reinforcing steel work for all concrete and masonry work as indicated on the drawings and specified herein.
2. Coordinate this work with other work affected by these operations, such as forms, electrical work, mechanical work, structural steel, and concrete.

B. Related Sections:

1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
2. Pertinent Sections of Divisions 03 specifying concrete construction.
3. Pertinent Sections of Divisions 04 specifying masonry construction.
4. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete work.

1.02 REFERENCE STANDARDS

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19A Concrete.
- B. American Concrete Institute (ACI) 301 "Specifications for Structural Concrete for Buildings".
- C. ACI 318 "Building Code Requirements for Reinforced Concrete and Commentary".
- D. ACI SP-066 "ACI Detailing Manual".
- E. American Society for Testing and Materials (ASTM) A1064 "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete".
- F. ASTM A615 "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement".
- G. ASTM A706 "Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement".
- H. American Welding Society (AWS) D1.4 - "Structural Welding Code for Reinforcing Steel".
- I. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication.

- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer.
- C. Shop Drawings: Show complete fabrication and placing details of all reinforcing steel. Comply with requirements of ACI SP-66. Include:
 - 1. Bar sizes and schedules;
 - 2. Shapes of bent bars, layout and spacing of bars, location of splices.
 - 3. References to Contract Document detail numbers and designations.
- D. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- E. Certificates: Submit all certifications of physical and chemical properties of steel for each heat number as manufactured, including location of material in structure as specified below in Article titled QUALITY ASSURANCE. All materials supplied shall be tagged with heat numbers matching submitted Mill Test Report analyses.
- F. Samples: Provide to the Owner's Testing laboratory as specified in Article SOURCE QUALITY CONTROL.

1.04 QUALITY ASSURANCE

- A. Perform work of this Section in accordance with CRSI DA4, CRSI P1, ACI 301, and ACI 318.
- B. Requirements of Regulatory Agencies, refer to pertinent Sections of Division 01 and CBC.
- C. Certification and Identification of Materials and Uses: Provide Owner's Testing Agency with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.
 - 1. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.
 - 2. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each grade of reinforcing and/or heat number in the project (i.e. slabs, etc.).
 - 3. Unidentified Material Tests: Where identification of materials by heat number to mill tests cannot be made, Owner's Testing Agency shall test unidentified materials as described below.
- D. Testing and Inspection: Tests and Inspections required by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent Sections of Division 01.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent requirements of Division 01.
- B. Deliver reinforcement to project site in bundles marked with durable tags indicating heat number, mill, bar size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.
- C. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Reinforcing Steel: Deformed billet steel bars, ASTM A706 Grade 60 or ASTM A615 Grade 60.
 - 1. All reinforcement to be unfinished.
- B. Tie Wire: No. 16 AWG or heavier, black annealed.
- C. Concrete Blocks: On-grade conditions only, as required to support reinforcing bars in position.
- D. Reinforcing Supports: Plastic or galvanized steel chairs, bolsters, bar supports, or spacers sized and shaped for adequate support of reinforcement and construction loads imposed during concrete placement, meeting ACI and CRSI standards.
 - 1. For use over formwork: Galvanized wire bar type supports complying with CRSI recommendations. Provide plastic tips where exposed to view or weather after removal of formwork. Do not use wood, brick, or other unacceptable materials.
- E. Reinforcement Splice Couplers: For use only where specified on drawings. Submit other locations proposed for use to Engineer for review. "L-Series Bar Lock" Coupler Systems for Splicing Reinforcement Bars, UES ER-0319, by Dayton-Superior Corporation.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4), unless specifically shown otherwise. Details not specifically shown or indicated shall conform to SP-066 and specified codes and standards.
 - 1. Accurately shop-fabricate to shapes, bends, sizes, gauges and lengths indicated or otherwise required.
 - 2. Bend bars once only. Discard bars improperly bent due to fabricating or other errors and provide new material; do not re-bend or straighten unless specifically indicated. Rebending of reinforcement in the field is not allowed.
 - 3. Do not bend reinforcement in a manner that will injure or weaken the material or the embedding concrete.
 - 4. Do not heat reinforcement for bending. Heat-bent materials will be rejected.
- B. Unacceptable materials: Reinforcement with any of the following defects will not be permitted in the work.

1. Bar lengths, depths and bends exceeding specified fabrication tolerances.
 2. Bends or kinks not indicated on Drawings or final shop drawings.
 3. Bars with reduced cross-section due to rusting or other cause.
- C. Tag reinforcement with durable identification to facilitate sorting and placing.

2.03 SOURCE QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following:
1. Sampling and Tests of Reinforcing Bars per CBC 1910A.2.
 2. Material Testing:
 - a. Identified Steel: When samples are taken from bundled steel identified by heat number, matched with accompanying mill analyses as delivered from the mill, Owner's Testing Agency will perform one tensile test and one bend test per each ten tons or fraction thereof for each required size of reinforcing steel.
 - b. Unidentified Steel: When identification of materials by heat number matched to accompanying mill analyses cannot be made, perform one tensile test and one bend test per each two and one-half tons or fraction thereof for each required size of reinforcing steel. Tests of unidentified steel shall be performed by the Owner's Testing Agency and costs for these tests shall be paid by the Contractor by deductive change order.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect the conditions under which concrete reinforcement is to be placed. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Coordinate with work of other sections to avoid conflicts or interference. Bring conflicts between reinforcement and other elements to Architect's attention. Resolve conflicts before concrete is placed.
- C. Notify Architect, Structural Engineer, and Authority Having Jurisdiction for review of steel placement not less than 48 hours before placing concrete.

3.02 PLACEMENT

- A. General: Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
- B. Clean bars free of substances which are detrimental to bonding. Maintain reinforcement clean until embedded in concrete.
- C. Place reinforcement to obtain the minimum coverages for concrete protection. Do not deviate from required position. Maintain required distance, spacing and clearance between bars, forms, and ground.

- D. Location and Support: Provide metal chairs, runners, bolsters, spacers and hangers, as required.
- E. Provide additional steel reinforcement as necessary or as directed, to act as spreaders or separators to maintain proper positioning.
- F. Tying and Attachment: Securely tie at all intersections and supports with wire. Prevent dislocation or movement during placement of concrete. Direct twisted ends of wire ties away from exposed concrete surfaces.
- G. Separate reinforcing from pipes or conduits with approved non-metallic separators. Do not use wood or steel form stakes or reinforcement used as stakes as support for reinforcement.
- H. Accommodate placement of formed openings required by other sections.
- I. Obstructions:
 - 1. Where obstructions, block-outs, or penetrations (conduits, raceways, ductwork) prevent continuous placement of reinforcement as indicated, provide additional reinforcing as detailed and as directed by the Structural Engineer to supplement the indicated reinforcement around the obstruction.
 - 2. Place additional trim bars, ties, stirrups, or other elements as detailed and as directed at all opening, sleeves, pipes or other penetrations through structural elements.

3.03 REINFORCING SPACING AND COVERAGE

- A. Spacing: Do not space bars closer than four (4) diameters of the largest of two adjacent bars, except at bar laps, which shall be placed such that a minimum of 2 bar diameters is clear between bars.
- B. Where reinforcing in members is placed in two layers, the distance between layers shall not be less than four bar diameters of the largest bar and the bars in the upper layers shall be placed directly above those in the bottom layer, unless otherwise detailed or dimensioned.
- C. Coverage of bars (including stirrups and columns ties) shall be as follows, unless otherwise shown:
 - 1. Slabs (on grade): 2 inches to grade face, 1-1/2 inches to top face.

3.04 DOWELS, SPLICES, OFFSETS AND BENDS

- A. Provide standard reinforcement splices at splices, corners, and intersections by lapping ends, placing bars in contact, and tightly tying with wire at each end. Comply with details shown on structural drawings and requirements of ACI 318.
- B. Provide minimum 1-1/2 inch clearance between sets of splices. Stagger splices in horizontal bars so that adjacent splices will be 4 feet apart.
- C. Splices of reinforcement shall not be made at points of maximum stress. Provide splice lengths as noted on the structural drawings, with sufficient lap to transfer the stress between bars by bond and shear.

D. Spacing:

1. Space bars minimum distance specified and all lapped bars 2 bar diameters (minimum) clear of the next bar.
2. Stagger splices of adjacent bars where possible and where required to maintain bar clearance.
3. Request Architect/Engineer review prior to placement for all splices not shown on the drawings.

- E. Reinforcement Couplers: Install at all locations indicated. Install couplers in accordance with manufacturer's recommendations.

3.05 WELDING

- A. No reinforcing shall be welded unless specifically indicated. No reinforcing shall be welded without prior approval of the Structural Engineer and the Authority Having Jurisdiction.
- B. Only when so approved for use as noted above, all welding shall conform to AWS D1.4, ACI 318 Section 26.6.4, and CBC 1903A.8 and the following;
1. All welding performed by certified welders.
 2. All reinforcement requires preheat prior to welding. All preheat and welding shall be continuously inspected by the Testing Agency.

3.06 MISPLACED REINFORCEMENT

- A. Notify Architect/Engineer immediately if reinforcing bars are known to be misplaced after concrete has been placed.
- B. Perform no correction or cutting without specific direction. Do not bend or kink misplaced bars.
- C. Correct misplaced reinforcing only as directed in writing by the Architect/Engineer. Bear all costs of redesign, new, or additional reinforcing required because of misplaced bars at Contractor's expense.

3.07 FIELD QUALITY CONTROL

- A. The Testing Agency as specified in the Article QUALITY ASSURANCE, will inspect the work for conformance to contract documents before concrete placement.
1. Inspection: Provide inspection and verification of installed reinforcement. Confirm that the surface of the rebar is free of form release oil or other coatings.
 2. Inspect all preheat and welding activities for steel reinforcement, when these occur.
 3. Exception: Non-structural patios, driveways, and sidewalks do not require special inspection.

3.08 CLEANING

- A. Remove excess material and debris associated with this work from the job site.

END OF SECTION

SECTION 03 3000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Provide all labor, materials, equipment and services to complete all concrete work required, including, but not limited to, the following:
 - 1. Slabs-on-grade.
 - 2. Installation of all bolts, inserts, sleeves, connections, etc. in the concrete.
 - 3. Joint devices associated with concrete work.
 - 4. Miscellaneous concrete elements, including, but not limited to: equipment pads and fence bases.
 - 5. Concrete curing.
 - 6. Coordination with other sections:
 - a. Make all preparations and do all work necessary to receive or adjoin other work. Install all bolts and anchors, including those furnished by other sections, into formwork and provide all required blocking.
 - b. Install all accessories embedded in the concrete and provide all holes, blockouts and similar provisions necessary for the work of other sections. Provide all patching or cutting made necessary by failure or delay in complying with this requirement at the Contractor's expense.
 - c. Coordinate with other sections for the accurate location of embedded accessories.
- B. Related Sections:
 - 1. Pertinent Sections of Division 01 specifying Quality Control and Testing Laboratory services.
 - 2. Pertinent Sections of Division 03 specifying concrete construction.
 - 3. Pertinent Sections of other Divisions specifying work to be embedded in concrete or work penetrating concrete.
 - 4. Pertinent sections of other Divisions specifying floor finishes and sealants applied to concrete substrates.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC) Chapter 19A Concrete.
- B. American Concrete Institute (ACI) 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete"; ACI 211.2 "Standard Practice for Selecting Proportions for Lightweight Concrete".
- C. ACI 301 "Specifications for Structural Concrete".
- D. ACI 302.1R "Guide for Concrete Floor and Slab Construction".
- E. ACI 304R "Guide for Measuring, Mixing, Transporting, and Placing Concrete".

- F. ACI 305R "Hot Weather Concreting".
- G. ACI 306R "Cold Weather Concreting".
- H. ACI 308 "Standard Practice for Curing Concrete".
- I. ACI 318 "Building Code Requirements for Reinforced Concrete and Commentary".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review. Submit for review prior to fabrication.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.
- C. Product Data: Submit manufacturers' data on manufactured products and other concrete related materials such as bond breakers, cure/sealer, admixtures, etc. Demonstrate compliance with specified characteristics. Provide samples of items upon request. Submit material certificates for concrete aggregates and cementitious materials. Certificates shall show compliance to applicable ASTM's, the CBC, and additional requirements stated herein.
- D. Mix Designs: Submit Mix Designs for each structural concrete type required for work per requirements of articles CONCRETE MIXES and QUALITY ASSURANCE. Resubmit revised designs for review if original designs are adjusted or changed for any reason. Non-Structural mixes need not be submitted for review by Structural Engineer.
- E. Shop Drawings: Proposed location of construction and cold joints. Proposed location of all slab construction/dowel joints, control joints, and blockouts.
- F. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.
- G. Batch Plant Certificates: Include with delivery of each load of concrete. Provide Certificates to the Testing Agency and the Architect/Engineer as separate submittals. Concrete delivered to the site without such certificate shall be rejected and returned to the plant. Each certificate shall include all information specified in Article SOURCE QUALITY CONTROL below.
- H. Engineering Analysis: Prepared by a California-licensed Civil or Structural Engineer, justifying construction-imposed loads on slabs, beams, and walls which exceed those allowed by CBC for the specified use.
 - 1. 2000 lbs maximum allowable construction load without analysis.
 - 2. 10,000 lbs maximum allowable construction load with analysis.
- I. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.04 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Concrete construction verification and inspection to conform to CBC 1705A.3.
- C. Common Sourcing: Provide each of the following materials from consistent sources for entire project.
 - 1. Cement.
 - 2. Fly ash.
 - 3. Aggregate.
 - 4. Ground Granulated Blast Furnace Slag.
- D. Follow recommendations of ACI 305R when concreting during hot weather. Follow recommendations of ACI 306R when concreting during cold weather.
- E. Services by the Independent Testing Agency (includes "Special" Inspections) as specified in this Section and as follows:
 - 1. Perform tests and inspections specified below in articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and reports to be in conformance with pertinent Sections of Division 01.
- F. Contractor shall bear the entire cost of remediation, removal, and/or replacement of concrete determined defective or non-conforming, including Architect/Engineer fees for redesign.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Materials specified by brand name shall be delivered in unbroken packages bearing manufacturer's label and shall be brand specified or an approved equal.
- B. Delivery, Handling and Storage of other materials shall conform to the applicable sections of the current editions of the various reference standards listed in this Section.
- C. Protect materials from weather or other damage. Sort to prevent inclusion of foreign materials.
- D. Specific Requirements:
 - 1. Cement: Protect against dampness, contamination, and warehouse set. Store in weather tight enclosures.
 - 2. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stock pile.
 - 3. Admixtures:
 - a. Store to prevent contamination, evaporation, or damage.
 - b. Protect liquid admixtures from freezing and extreme temperature ranges.
 - c. Agitate emulsions prior to use.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather (Freezing or near-freezing temperatures) per ACI 306R:

1. Heat concrete materials before mixing, as necessary to deposit concrete at a temperature of at least 50°F but not more than 90°F.
2. Do not place concrete during freezing, near-freezing weather, snow, rain or sleet unless protection from moisture and/or cold is provided.
3. Protect from freezing and maintain at a temperature of at least 50°F for not less than seven days after placing. Take special precautions to protect transit-mixed concrete.
4. No salts, chemical protection or admixture are permitted without written approval of Architect/Engineer.
5. Contractor shall maintain an air temperature log for the first 7 days after placement with entry intervals not to exceed 8 hours.

B. Hot Weather per ACI 305R:

1. Cool concrete materials before mixing, or add ice in lieu of mix water as necessary to deposit concrete at a temperature below 85°F.
2. Do not place concrete in hot/windy weather without Architect/ Engineer review of procedures.
3. Provide sunshades and/or wind breakers to protect concrete during finishing and immediate curing operations. Do not place concrete at air temperature exceeding 90°F.
4. Provide modified mix designs, adding retarders to improve initial set times and applying evaporation reducers during hot/windy weather for review by Independent Testing Agency prior to use.

1.07 MOCK-UP

- A. Construct and erect mock-up panel for architectural concrete surfaces indicated to receive special treatment or finish, as result of formwork.
 1. Panel Size: Sufficient to illustrate full range of treatment.
 2. Number of Panels: 2.
 3. Locate as indicated on drawings.
- B. If requested by Architect / Engineer, cast concrete against mock-up panel. Obtain acceptance of resulting surface finish prior to erecting formwork.
- C. Accepted mock-up panel is considered basis of quality for the finished work. Keep mock-up exposed to view for duration of concrete work.
- D. Mock-up may remain as part of the Work.

1.08 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.
- B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 1000.

2.02 REINFORCEMENT

- A. Comply with requirements of Section 03 2000.

2.03 MATERIALS

- A. General Requirements: All materials shall be new and best of their class or kind. All materials found defective, unsuitable, or not as specified, will be condemned and promptly removed from the premises.
- B. Cementitious Materials:
 - 1. Portland Cement: ASTM C150, Type II, low alkali.
 - 2. Fly Ash (Pozzolan): ASTM C618, Class F.
 - 3. Ground Granulated Blast Furnace Slag: ASTM C989, Grade 100 or 120.
- C. Concrete Aggregates:
 - 1. Coarse and Fine Aggregates: ASTM C33; Stone aggregate and sand. Specific source aggregate and/or sand or shrinkage characteristics as required for class of concrete specified.
 - 2. Source shall remain constant throughout the duration of the job. The exact portions of the fine aggregates and coarse aggregates to be used in the mix shall be determined by the mix design.
 - 3. Aggregates shall be tested for alkali reactivity per CBC section 1903A.5. Where test results exceed allowable limits, additional testing of mitigation procedures shall be provided, as outlined per CBC section 1903A.5.
- D. Water: Potable, clean, from domestic source.
- E. Admixtures: All admixtures shall be used in strict accordance with the manufacturer's recommendations. Admixtures containing calcium chlorides or other accelerators shall not be used without the approval of the Architect/Engineer and the Owner's Testing Laboratory.
 - 1. Mid Range Water Reducing Admixtures: ASTM C494 Type A, "MasterPolyHeed" (formerly "PolyHeed") series by Master Builders Solutions, "WRDA" series by W.R. Grace, or equal.
 - 2. High Range Water-Reducing Admixtures: ASTM C494 Type F, "MasterRheoBuild 1000" (formerly "RheoBuild 1000") or "MasterGlenium" (formerly "Glenium") series by Master Builders Solutions or equal.
 - 3. Water Reducing Admixture and Retarder: ASTM C494 Type B or D, "MasterPozzolith" (formerly "Pozzolith") series or "MasterSet DELVO" (formerly "DELVO") series by Master Builders Solutions, "Plastiflow-R" by Nox-crete, or equal.
 - 4. Air Entraining Admixtures: ASTM C260, product suit condition by Master Builders Solutions or equal.
 - 5. Viscosity Modifiers: ASTM C494 Type S.

- F. Slurry: Same proportion of cement to fine aggregates used in the regular concrete mix (i.e. only coarse aggregate omitted); well mixed with water to produce a thick consistency.
- G. Dry Pack: Dry pack (used only for cosmetic concrete repairs) shall consist of:
 - 1. One part cement to 2-1/2 parts fine aggregate (screen out all materials retained on No.4 sieve), mixed with a minimum amount of water, added in small amounts.
 - 2. Mix to consistency such that a ball of the mixture compressed in the hand will retain its shape, showing finger marks, but without showing any surface water.

2.04 ACCESSORIES

- A. Bonding Agent: ASTM C881, Type II Grade 2 Class B or C. Do not allow epoxy to set before placing fresh concrete.
 - 1. "MasterEmaco ADH 326" (formerly "Concresive Liquid LPL") by Master Builders Solutions;
 - 2. "Rezi-Weld 1000" by W.R. Meadows.
- B. Chemical Hardener: Fluorosilicate solution designed for densification of cured concrete slabs. "MasterKure HD 300 WB" (formerly "Lapidolith") by Master Builders Solutions, "LIQUI-HARD" W.R. Meadows Co, or equal.
- C. Moisture-Retaining Cover: ASTM C171, type 1, one of the following;
 - 1. Regular Curing Paper, Type I, reinforced waterproof: Fortifiber Corporation "Orange Label Sisalkraft", "Pabcotite" paper, or equal.
 - 2. Polyethylene Film: ASTM D 2103, 4 mil thick, clear or white color.
 - 3. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd.
- D. Liquid Curing Compound: ASTM C 309, Type 1, Class B, clear or translucent, 25% minimum solids, water base acrylic cure/sealer which will not discolor concrete and compatible with bonding of finishes specified in related sections. W.R. Meadows Co. "Vocomp 25" or equal. Maximum VOC content shall comply with local requirements and California Green Building Code.
- E. Underslab Water Vapor Retarder: See Section 07 2500 "Weather Barriers".
- F. Evaporation Reducer: "MasterKure ER 50" (formerly Confilm), by Master Builders Solutions.
- G. Permeability Reducer: Use only where specifically referred to.
 - 1. Admixture Type: Xypex Chemical Corporation "XYPEX Admix C-500". Dosage: 2-3% of cement content by weight; 15 lb/cu. yd. max. or Master Builders Solutions "MasterLife 300D" (formerly "Rheomac 300D"). Dosage: 2% of cement content by mass.
 - 2. Surface-Applied Type: Xypex Chemical Corporation "XYPEX Concentrate. Brush application: 1.25-1.50lb/sq. yd., 5 parts powder to 2 parts water. Master Builders Solutions "MasterSeal 500" (formerly "Tegraproof"). Slurry coat: one part water to 2.25-2.5 parts powder by volume.
 - 3. Approved equal.

2.05 JOINT DEVICES AND MATERIALS

- A. Waterstops: Resilient type, meeting Corps of Engineers CRD-C 572. Consult manufacturer for appropriate product for specific use. Submit for review. Install per manufacturers recommendation. Provide W. R. Meadows "Seal Tight" PVC waterstop, Sika "Greenstreak" PVC waterstop, or approved equal.
- B. Expansion Joint Filler: ASTM D1751, Nonextruding, resilient asphalt impregnated fiberboard or felt, 3/8 inch thick and 4 inches deep; tongue and groove profile.
 - 1. Products: "Servicised Products", W.R. Meadows, Inc., "National Expansion Joint Company", "Celotex Corporation", or equal.
- C. Joint Filler: ASTM D944, Compressible asphalt mastic with felt facers, 1/4 inch thick and 4 inches deep.
- D. Sealant and Primer: As specified in Section 07 9200.
- E. Slab Joint Sealant: Compatible with floor finishes specified in related sections.

2.06 CONCRETE MIXES

- A. General requirements for mix design and submittal of structural class concrete:
 - 1. Provide Contractor submittals to Architect/Engineer not less than 15 days before placing concrete.
 - 2. Contractor shall review mix designs and proposed placing requirements prior to submittal for compatibility to ensure that the concrete as designed can be placed in accordance with the drawings and specifications.
 - 3. Changes or revisions require re-submittal: All variations to approved mix designs, including changing type and/or quantity of admixtures shall be resubmitted to the Architect/Engineer for review prior to use.
 - 4. Mix design(s) for all structural classes of concrete to be prepared by qualified person experienced in mix design. Allow for time necessary to do trial batch testing when required.
 - 5. Preparer to provide backup data and certify in writing that mix design meets:
 - a. Requirements of the specifications for concrete durability and quality;
 - b. Requirements of the California Building Code and ACI 318 Section 26.4, including break histories, trial batching test results, and/or a mix designed by a California Registered Civil Engineer per ACI 318 Section 26.4.3.1(b) and bearing the Engineer's seal & signature.
 - 6. Clearly note on mix designs with specified maximum WCR if design permits addition of water on site, or clearly identify in the mix design that no water is to be added on site.
 - 7. Deviations: Clearly indicate proposed deviations, and provide written explanation explaining how the deviating mix design(s) will provide equivalent or better concrete product(s) than those specified.
 - 8. Include adjustments to reviewed mix designs to account for weather conditions and similar factors.
- B. Proportioning - General: The following provisions apply to all mix designs:

1. Proportion concrete mixes to produce concrete of required average strength (as defined by ACI 318 Section 19.2.1). Select slump, aggregate sizes, shrinkage, and consistency that will allow thorough compaction without excessive puddling, spading, or vibration, and without permitting the materials to segregate, or allow free water to collect on the surface.
 2. Select aggregate size and type to produce dense, uniform concrete with low to moderate shrinkage, free from rock pockets, honeycomb and other irregularities.
 3. Mix designs may include water reducing and retarding admixtures to meet or exceed minimum set times (time required to place and finish) and to minimize Water Cement Ratios (WCR). Minimum and maximum criteria presented in this section are guidelines and do not represent a specific mix design.
 4. Cement Content: Minimum cement content indicates minimum sacks of cementitious material. Increasing cement content to increase early strengths or to achieve specified WCR while maintaining water content is discouraged in order to minimize effects of shrinkage.
 - a. Substitution of fly ash for Portland cement on an equivalent weight basis up to 25% replacement is permitted, except at high early strength concrete. Replacement in excess of 25% is not permitted unless part of a specified mix design that has been submitted for review.
 - b. Substitution of slag for Portland cement on an equivalent weight basis up to 45% replacement is permitted, except at high early strength concrete. Replacement in excess of 45% is not permitted unless part of a specified mix design that has been submitted for review.
 - c. Such substitution requests may be denied by the Engineer.
 5. Water Content: Mix designs with a specified maximum Water Cement Ratio (WCR) may be designed with a lower WCR than specified in order to allow addition of water at the site.
 6. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301 and this section.
 - a. For trial mixtures method, employ independent testing agency acceptable to Architect/Engineer for preparing and reporting proposed mix designs.
 7. Placement Options: Mix designs may, at the Contractor's option, be designed for either pump or conventional placement with aggregate size, slumps, etc. to be maintained as specified in this section.
- C. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations and this section.

D. Mix Design Minimum Requirements:

Concrete Class	Coarse Aggregate Size (Inches) & Fine Aggregate ³	Maximum WCR or Maximum Nominal Slump & Tolerance (Inches) ^{1,2}	Minimum 28-Day Design Strength	Minimum Cement Sacks/per yd ⁴
NON-STRUCTURAL				
1) Lean Concrete (use only where specified)	---	---	---	3.0
2) Slab on Grade Exterior	1" x #4	WCR = .55	2,500	4.5

1. The tolerance is the maximum deviation allowable without rejection. The mix design shall be based on the nominal value specified and is without water reducing mixtures. Slump to be measured at the end of the hose.
2. The maximum water cement ratio (WCR) is limited at time of placement as noted. No water is to be added on site such that the specified WCR or maximum slump is exceeded without approval of the testing laboratory and the Architect/Engineer. Workability is to be achieved utilizing an acceptable mid range to high range water reducing admixture.
3. Gradation of aggregate is per ACI 318 section 26.4.1.2 and ASTM C33.
4. Minimum cement content includes all cementitious materials.

2.07 MIXING CONCRETE

- A. Batch final proportions in accordance with approved mix designs. All adjustments to approved proportions, for whatever reason, shall be reviewed by the Architect/Engineer prior to use.
- B. Batch and mix concrete in accordance with ASTM C94, at an established plant. Site mixed concrete will be rejected.
- C. Provide batch and transit equipment adequate for the work. Operate as necessary to provide concrete complying with specified requirements.
- D. Place mixed concrete in forms within 1-1/2 hours from the time of introduction of cement and water into mixer or 300 revolutions of the drum whichever comes first. Use of, re-mixing, and/or tempering mixed concrete older than 1 hour will not be permitted.
- E. Do not add water at the site to concrete mixes with a maximum specified WCR unless the water content at batch time provides for a WCR less than specified and this provision, including the quantity of water which may be added at the site, is specifically noted on the mix design and certification by the mix preparer. See ASTM C94 for additional requirements.

2.08 SOURCE QUALITY CONTROL

- A. Services by independent Testing Agency:
 1. Where aggregate alkali reactivity testing (and, when applicable, mitigation testing) per the MATERIALS section is not available, the Testing Agency shall perform this testing to verify materials conformance to CBC section 1903A.5.

2. Batch Plant inspection at automated plants to occur at commencement of concrete work each day (first truck). Batch Plant inspection at non-automated plants and when accuracy is questionable shall be continuous. Additionally, water cement ratio (WCR) is to be verified where a WCR is specified herein. The computed WCR is to be written on the Batch Plant Certificate to be taken to the job site prior to the truck leaving the plant. See requirements of CBC 1705A.3.3.
3. Batch Plant Certificates: Obtain the weighmaster's Batch Plant Certificate at arrival of truck at the site. If no batch plant certificate is provided, recommend to the General Contractor that the truckload of concrete be rejected. So note in daily log, along with the location of the load of concrete in the structure if the load is not rejected. See requirements of CBC 1705A.3.3.
 - a. Laboratory's inspector shall obtain for each transit mixer Batch Plant Certificates to verify mix design quantities and condition upon delivery to the site.
 - b. Certificates to include: Date, time, ingredient quantities, water added at plant and on job, total mixer revolutions at time of placement, and time of departure.
 - c. Concrete with specified water cement ratio: Add no water on site unless mix design and batch records each show additional water may be added. See ASTM C94 for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.
- B. Verify work of other sections is complete and tested as required before proceeding.

3.02 PREPARATION

- A. Observation, Inspection and Testing:
 1. Architect/Engineer: Notify not less than 2 working days before each concrete placement, for observation and review of reinforcing, forms, and other work prior to placement of concrete.
 2. Testing Agency: Notify not less than 24 hours before each placement for inspection and testing.
- B. Placement Records: Contractor shall maintain records of time, temperature and date of concrete placement including mix design and location in the structure. Retain records until completion of the contract. Make available for review by Testing Agency and Architect/Engineer.
- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
- D. Verify location, position and inclusion of all embedded and concealed items.
- E. Cleaning and Preparation:
 1. Remove loose dirt, mud, standing water, and foreign matter from excavations and cavities.
 2. Close cleanout and inspection ports securely.

3. Thoroughly clean reinforcement and other embedded items free from loose rust and foreign matter. Maintain reinforcing securely in place. Do not place concrete on hot reinforcing.
 4. Dampen form materials and substrates on which concrete is to be placed at least 1 hour in advance of placing concrete; repeat wetting as necessary to keep surfaces damp. Do not saturate. Do not place concrete on saturated material.
 - a. Thoroughly wet wood forms (except coated plywood), bottom and sides of trenches, adjacent concrete or masonry and reinforcement.
 - b. Concrete slabs on base rock, dampen rock.
 - c. Concrete slabs on vapor retarder, do not wet vapor retarder.
 5. Verify that metal forms are clean and free of rust before applying release agent.
 6. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- F. Drill holes in existing concrete at locations where new concrete is doweled to existing work. Insert steel dowels and prepare connections as detailed.
- G. Do not overcut at existing concrete work to remain. Contractor is responsible for repair/replacement of overcut concrete to the Owner's satisfaction.

3.03 PIPES AND CONDUITS IN CONCRETE

- A. Slabs-on-Grade:
1. No pipe or conduit exceeding 1 inch outside diameter shall be embedded within the specified slab thickness except as specifically detailed.
 2. Do not stack or abut pipes, maintain 3 inches minimum clearance.
- B. Sleeving and Wrapping:
1. Slabs or Curbs: Sleeve or wrap all individual pipe penetrations, minimum 1-1/2 inches clear to reinforcing all around.
 - a. Sleeves: PVC. Provide 1 inch minimum clear all around O.D. pipe to I.D sleeve, UNO at ends, fill void space with mastic or plastic bituminous cement.
 - b. Wrapped Vertical Pipes: Provide 1/8 inch nominal sheet foam with three wraps minimum, UNO.
 - c. Wrapped Horizontal Pipes: Provide 1/8 inch nominal sheet foam with eight wraps minimum, UNO.
 - d. Underground Fire Lines 4" and Larger: At sleeves provide 2 inch minimum clear all around O.D. pipe to I.D sleeve. At wrapped pipes, provide 1/8 inch nominal sheet foam with sixteen wraps minimum.
- C. Space groups of pipes/conduits at least 3 sleeve diameters apart, do not interrupt specified concrete and reinforcement.
1. Center pipe/conduit penetrations in the depth and/or thickness of slab.
 2. Maximum size of pipe/conduit penetrations shall not exceed the least dimension of concrete divided by 3.

3.04 CONCRETE PLACEMENT

- A. Transporting:

1. Provide clean, well-maintained equipment of sufficient quantity and capacity to execute the work and produce concrete of quality specified.
 2. Handle and transport concrete from mixer to final deposit location as rapidly as practicable. Prevent separation or loss of ingredients.
- B. Perform concrete placement by methods which will not puncture, damage or disturb vapor retarder membrane. Repair all damage to vapor retarder membrane before covering.
- C. Placement - General: Placement, once started, shall be carried on as a continuous operation until section of approved size and shape is completed. Engineer's written approval required for all deviations.
1. Deposition:
 - a. Deposit concrete to maintain an approximately horizontal plastic surface until the completion of the unit placement.
 - b. Deposit as neatly as practicable in final position, minimize re-handling or flow.
 - c. Do not drop concrete freely where reinforcing bars, embeds, or obstructions occur that may cause segregation. Provide spouts, elephant trunks, or other means to prevent segregation during placement.
 2. Depth: Layered placement in columns and walls shall not exceed ten feet vertical depth.
 - a. Place concrete in minimum 32 inch horizontal lifts.
 - b. Schedule placement to ensure that concrete will not take initial set before placement of next lift.
 3. Progress Cleaning: Remove all concrete spilled on forms or reinforcing steel in portions of structure not immediately concreted. Remove completely before concrete sets.
 4. Interruptions: Shut down placement operations and dispose of all remaining mixed concrete and concrete in hoppers or mixers following all interruption in placement longer than 60 minutes.
 - a. If such interruption occurs, provide new or relocate existing construction joints as directed by Engineer.
 - b. Cut concrete back to the designated line, cleaning forms and reinforcing as herein specified.
 - c. Prepare for resumption of placement as for new unit when reason for interruption is resolved.
- D. Consolidation:
1. Consolidate all concrete thoroughly during placement with high-speed mechanical vibrators and other suitable tools. Perform manual spading and tamping to work around reinforcement, embedded fixtures, and into corners of formwork as required to obtain thorough compaction.
 - a. Provide vibrators with sufficient amplitude for adequate consolidation.
 - b. Use mechanical vibrators at each point of concrete placement.
 - c. Keep additional spare vibrators, in addition to those required for use, at the site for standby service in case of equipment failure.
 2. Consolidate each layer of concrete as placed.
 - a. Insert vibrators vertically at points 18 to 30 inches apart; work into top area of previously placed layer to reconsolidate, slowly withdraw vibrator to surface.
 - b. Avoid contact of vibrator heads with formwork surfaces.

- c. Systematically double back and reconsolidate wherever possible. Consolidate as required to provide concrete of maximum density with minimized honeycomb.
- E. Unacceptable Materials:
 - 1. Do not place concrete that has started to set or stiffen. Dispose of these materials.
 - 2. Do not add water on site to concrete except as specified in the approved mix design, see PART 2 above.
- F. Protection of installed work:
 - 1. Do not introduce any foreign material into any specified drainage, piping or duct systems.
 - 2. Contractor shall bear all costs of work required to repair or clean affected work as a result of failure to comply with this requirement.

3.05 CONCRETE JOINTS

- A. Structural Joints (Construction/Cold Joints):
 - 1. Locate joints only where shown, or as approved.
 - 2. Review Required: Joints not indicated on the plans shall be located to meet the minimum requirements below, shall not impair the strength of the structure and shall be submitted to Architect/Engineer for review prior to placement of concrete.
 - a. Indicate proposed location(s) of construction/cold/expansion joints on shop drawing submittals for review prior to placing concrete.
 - 3. Clean and roughen all surfaces of previously placed concrete at construction joints by washing and sandblasting to expose aggregate to 1/4 inch amplitude.
 - 4. Slabs-On-Grade: Maximum Length of continuous placement shall not exceed 60 feet without special review by the Architect/Engineer. Alternate or stagger placement sections.
 - 5. Horizontal Construction Joints: Place 2 inch slurry (specified concrete mix less coarse aggregate) at beginning of pour at the bottom of walls unless a prior review of a mock-up section demonstrates that segregation of aggregate will not occur.
- B. Expansion/Construction Joints (Dowel Joints and Control Joints):
 - 1. Exterior Slabs-on-Grade:
 - a. Expansion/Construction Joints: Provide dowel joints or control joints at a maximum dimension (in feet) of three times the slab thickness (in inches) in each direction unless noted otherwise (15'-0" maximum). Install joints to match slab level and in straight lines. Locate joints at all reentrant corners including blockouts.
 - b. Proportions: Install joints to divide slab into rectangular areas with long dimensions less than 1.5 times short dimension.
- C. Joint Types:
 - 1. Dowel Joint: A keyed joint with smooth dowels passing through to allow unrestricted movement due to contraction and expansion. Joints are as specified on the drawings.

2. Control Joint(s): Shrinkage crack control joints may be of the following types when shown on the drawings. Install joints in a straight line between end points with edges finished appropriate to type. Depth shall be 25% of the slab thickness, unless noted otherwise. Fill joints with sealant as shown on the drawings or as required by related sections.
 - a. 1/4 inch wide troweled joint.
 - b. Keyed joint: Only at locations where concealed by other finishes.
 - c. Masonite Strip, 1/8 inch: Only at locations where concealed by other finishes.
 - d. Saw Cut, 1/8 inch: Must be performed within eight hours of completion of finishing. Do not make saw cuts if aggregate separates from cement paste during cutting operation. Prevent marring of surface finish. Fill with flexible sealant.

3.06 VAPOR RETARDER

- A. Vapor Retarder Installation: Install as specified in Section 07 2500 "Weather Barriers", ASTM E1643, and per manufacturer's recommendations including taping and lapping of seams, sealing of penetrations, and repair of damage. Do not extend vapor retarder below footings.

3.07 FLATWORK

- A. General Requirements for All Concrete Formed & Finished Flat:
 1. Edge Forms and Screeds: Set accurately to produce indicated design elevations and contours in the finished surface, edge forms sufficiently strong to support screed type proposed.
 2. Jointing: Located and detailed as indicated.
 3. Consolidation: Concrete in slabs shall be thoroughly consolidated.
- B. Flatwork Schedule:
 1. Exterior Slabs-On-Grade: Place concrete directly over sub-base as indicated.
 - a. Sub-Base: Clean free-draining, crushed base rock, 4 inch minimum thickness, thoroughly compacted.

3.08 FORMED SURFACES

- A. Form all concrete members level and plumb, except as specifically indicated. Comply with tolerances specified in ACI 318 Section 26.11, ACI 301 Section 2, and this specification, except that maximum permissible deviation is 1/4 inch end-to-end for any single member.

3.09 CONCRETE FINISHES

- A. Flatwork Finishing:
 1. All exposed concrete flatwork surfaces shall be non-slip. See Architectural, Civil, and Landscape drawings.
 2. Perform with experienced operators.
 3. Finish surfaces monolithically. Establish uniform slopes or level grades as indicated. Maintain full design thickness.
 4. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains as indicated on drawings.
 5. Flatwork Finish Types:

- a. Wood Float Finish: Surfaces to receive quarry tile, ceramic tile, or cementitious terrazzo with full bed setting system, or wood frame for raised finished floors.
 - b. Steel Trowel Finish: Surfaces to receive carpeting, resilient flooring, seamless flooring, thin set terrazzo, thin set tile or similar finishes specified in related sections. Trowel twice, minimum.
 - c. Broom Texture Finish: Exterior surfaces as indicated or for which no other finish is indicated. Finish as for steel trowel finish, except immediately following first troweling, (depending on conditions of concrete and nature of finish required) provide uniform surfaces texture using a medium or coarse fiber broom.
- B. Other Concrete: Provide as required to achieve appearance indicated on structural and architectural drawings and related sections.
1. Repair surface defects, including tie holes, immediately after removing formwork.
 2. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
 3. Exposed Form Finish: Finish concrete to match forms. Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - a. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
 - b. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
 - c. Cork Floated Finish: Immediately after form removal, apply grout with trowel or firm rubber float; compress grout with low-speed grinder, and apply final texture with cork float.
 4. Intermediate joint and score marks and edges: Tool smooth and flush unless otherwise indicated or as directed by the Architect.
 5. Use steel tools of standard patterns and as required to achieve details shown or specified. All exposed corners not specified to be chamfered shall have radiused edges.

3.10 TOLERANCES

- A. Minimum Flatwork Tolerances: Measure flatness of slabs within 48 hours after slab installation in accordance with ACI 302.1R and ASTM E1155 and to achieve the following FF and FL tolerances:
1. Exterior surfaces: 1/8 inch minimum per foot where sloped to drain. Level otherwise. FF20 and FL15.
- B. Formed Surface Tolerances:
1. Permanently Exposed Joints and Surfaces: Provide maximum differential height within two feet of, and across construction joints of 1/16 inch.
 2. Vertical Elevations: Elevation of surfaces shall be as shown or approved.

3.11 CONCRETE CURING

- A. Curing - General: Cure in accordance with ACI 308. Maintain concrete water content for proper hydration and minimize temperature variations. Begin curing immediately following finishing.

- B. Protection During Curing: Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. The General Contractor is responsible for the protection of the finished slab from damage.
 - 1. Avoid foot traffic on concrete for minimum of 24-hours after placement.
 - 2. Protect concrete from sun and rain.
 - 3. Maintain concrete temperature at or above 50 degrees F. during the first 7 days after placement. See Article ENVIRONMENTAL REQUIREMENTS.
 - 4. Do not subject concrete to design loads until concrete is completely cured, and until concrete has attained its full specified 28-day compressive strength or until 21 days after placement, whichever is longer.
 - 5. Protect concrete during and after curing from damage during subsequent building construction operations. See Article PROTECTION.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.
 - 2. High early strength concrete: Not less than 4 days.
- D. Begin curing immediately following finishing.
- E. Surfaces Not in Contact with Forms:
 - 1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 3 days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - 2. Begin final curing after initial curing but before surface is dry.
 - a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
 - b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
 - 3. In addition, see specific conditions noted below.
- F. Slabs on Grade: Cure by one of the following methods:
 - 1. Water Cure (Ponding): Maintain 100 percent coverage of water over floor slab areas, continuously for minimum 7 calendar days.
 - 2. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
 - 3. Moisture-Retaining Film or Paper: Lap strips not less than 6 inches and seal with waterproof tape or adhesive; extend beyond slab or paving perimeters minimum 6 inches and secure at edges; maintain in place for minimum 7 days.
 - 4. Absorptive Moisture-Retaining Covering: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides and extend beyond slab or paving perimeters 6 inches minimum; maintain in place for minimum 7 days.
 - 5. Liquid Membrane-forming Curing Compound: Provide only when subsequent concrete treatments or finish flooring specified in related sections will not be affected by cure/sealer. Apply curing compound in accordance with manufacturer's instructions at the maximum recommended application rate in two coats, with second coat applied at right angles to first.

3.12 GROUTING AND DRY PACK

- A. Set steel plates on concrete with high strength grout bed, completely fill all voids; thoroughly compact in place.
- B. Bolts or inserts dry packed or grouted in place shall cure for minimum 7 days before tensioning.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspections by Independent Testing Agency: Provided verification and inspection of concrete per CBC Table 1705A.3. Provide written reports for to Engineer, Architect, Contractor and Building Official for the following tests and inspections:
- B. Testing & Inspection: Provide periodic inspection of reinforcing steel. Provide continuous inspection during placement of structural class concrete, 3000 psi or more. Non-structural class concrete with a design strength of 2500 psi or less to have periodic inspection on a 150 cubic yard basis as required to assure conformance.
 - 1. Provide periodic inspection of bolts in concrete prior to and during placement where so noted on the construction documents.
 - 2. Structural Concrete Cylinder Tests: Perform in accordance with ASTM C31.
 - a. Take four standard 6 inch x 12 inch (or five 4 inch x 8 inch) cylinder specimens on the site, of each class of concrete as specified in PART 2, not less than once a day or for each 50 cubic yards or 2000 sq ft or fraction thereof placed each day.
 - b. Record the location of each concrete batch in the building in a log and also note on each specimen.
 - c. Perform standard compression test of cylinders in accordance with ASTM C39, one at 7 days and two (three for 4x8 cylinders) at 28 days.
 - d. Hold fourth (fifth) cylinder untested until specified concrete strengths are attained.
 - 3. Structural Concrete Slump Test and Air Tests: Perform in accordance with ASTM D143 and C231 or C173 at the time of taking test cylinders, and/or at one-hour intervals during concrete placing.
 - 4. Measure and record concrete temperature upon arrival of transit mixers and when taking specimens. Note weather conditions and temperature.
 - 5. Propose adjustments to reviewed mix designs for Architect / Engineer review to account for variations in site or weather conditions, or other factors as appropriate.
 - 6. Water Vapor Transmission Tests: Floors receiving floor finishes specified in related sections will be tested prior to installation of flooring systems. Refer to sections specifying floor finishes for related requirements.
- C. Services by Contractor:
 - 1. Rejection of Concrete Materials: Do not use the following without prior written approval of the Architect/Engineer;
 - a. Materials without batch plant certificates.
 - b. Materials not conforming to the requirements of these specifications.

3.14 ADJUSTING

- A. Inspect all concrete surfaces immediately upon formwork removal. Notify Architect/Engineer of identified minor defects. Repair all minor defects as directed.

- B. Surface and Finish Defects: Repair as directed by the Architect/Engineer, at no added expense to the Owner. Repairs include all necessary materials; reinforcement grouts, dry pack, admixtures, epoxy and aggregates to perform required repair.
 - 1. Repair minor defective surface defects by use of drypack and surface grinding. Specific written approval of Architect/Engineer is required. Submit proposed patching mixture and methods for approval prior to commencing work.
 - 2. Slabs-on-Grade: Review for "curled" slab edges and shrinkage cracks prior to installation of other floor finishes. Grind curled edges flush, fill cracks of 1/16 inch and greater with cementitious grout.
 - 3. Grind high spots, fins or protrusions caused by formwork; Fill-in pour joints, voids, rock pockets, tie holes and other void not impairing structural strength. Provide surfaces flush with surrounding concrete.

3.15 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required compressive strength, lines, details, dimensions, tolerances, finishes or specified requirements; as determined by the Architect/Engineer.
- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer who may order additional testing and inspection at his option. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Specific Defects:
 - 1. "Low-Strength"; Concrete Not Meeting Specified Compressive Strength after 28 days:
 - a. Concrete with less than 25% Fly Ash or 35% Slag as cementitious material: Test remaining cylinder(s) at 56 days. If strength requirements are met, concrete strength is acceptable.
 - b. Concrete with 25% or more Fly Ash or 35% or more Slag as cementitious material: Test remaining cylinder(s) at 70 days. If strength requirements are met, concrete strength is acceptable.
 - 2. Excessive Shrinkage, Cracking, Crazeing or Curling; Defective Finish: Remove and replace if repair to acceptable condition is not feasible.
 - 3. Lines, Details, Dimensions, Tolerances: Remove and replace if repair to acceptable condition is not feasible.
 - 4. Slab sections not meeting specified tolerances for trueness/flatness or lines/levels: Remove and replace unless otherwise directed by the Architect/Engineer. Minimum area for removal: Fifteen square feet area unless directed otherwise by the Architect/Engineer.
 - 5. Defective work affecting the strength of the structure or the appearance: Complete removal and replacement of defective concrete, as directed by the Architect/Engineer.

3.16 CLEANING

- A. Maintain site free of debris and rubbish. Remove all materials and apparatus from the premises and streets at completion of work. Remove all drippings; leave the entire work clean and free of debris.

3.17 PROTECTION

- A. Protect completed work from damage until project is complete and accepted by Owner.
- B. Construction Loads: Submit engineering analysis for equipment loads (including all carried loads) specified in article submittals.
- C. Keep finished areas free from all equipment traffic for a minimum of 4 additional days following attainment of design strength and completion of curing.
- D. Protection of Drainage Systems:
 - 1. Care shall be taken not to introduce any foreign material into any specified drainage, piping or duct system.
 - 2. Cost of work to repair or clean drainage system as a result of failure to comply with this requirement will be back charged to the contractor.
- E. Cover traffic areas with plywood sheets or other protective devices; maintain protection in place and in good repair for as long as necessary to protect against damage by subsequent construction operations.

END OF SECTION

SECTION 05 1100

STRUCTURAL AND MISCELLANEOUS STEEL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials, equipment and operations required to complete structural and miscellaneous metals in shapes and configurations indicated; including:
 - 1. Structural steel beams, bracing, base plates, bolts, and joist hangers.
 - 2. Miscellaneous structural steel and connections; fabricated connectors and hangers installed by related sections.
 - 3. Anchor bolts and steel inserts embedded in concrete or masonry, installed by related sections.
 - 4. Fabricated steel items embedded in concrete installed by related sections.
 - 5. Shop priming and field touch-up, galvanizing.
 - 6. Bracing, Shoring, Fabrication and Erection.
- B. Related Sections:
 - 1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services.
 - 2. Pertinent Sections of other Divisions specifying concrete reinforcement, formwork, concrete, structural and miscellaneous metal fabrications, steel joists, metal decking, cold-formed metal framing, rough carpentry.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 22A Steel.
- B. American Institute of Steel Construction (AISC) 303 "Code of Standard Practice for Steel Buildings and Bridges".
- C. AISC 360 "Specification for Structural Steel Buildings".
- D. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel".
- E. Underwriters Laboratories (UL) FRD "Fire Resistance Directory".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer. Submittals that do not meet these requirements will be returned for correction without review.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents.

- C. Product Data: Submit manufacturer's product data, specifications, location and installation instructions for proprietary materials and reinforcement accessories. Provide samples of these items upon request.
- D. Shop drawings: Submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;
 - 1. Profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Fabrication tolerances for all steel.
 - 3. Connections: All, including type and location of shop and field connections.
 - 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths, type, size, and sequence. Designate demand critical welds.
 - 5. Cross-reference all shop drawing detail references to contract document detail references.
 - 6. Secure all field measurements as necessary to complete this work prior to submitting shop drawings for review.
 - 7. Provide holes, welded studs, etc. as necessary to secure work of other sections.
 - 8. Provide the following as separate submittals for each building or unit of work:
 - a. Bolt and anchor setting plans.
 - b. Layout, fabrication and erection drawings.
- E. Certifications:
 - 1. Steel Materials: Submit the following for identified materials.
 - a. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
 - b. Mill Test Reports: Indicate structural strength, destructive test analysis, and non-destructive test analysis.
 - c. Contractor's affidavit certifying that all identified steel materials provided are of the grades specified and match the certificates supplied.
 - 2. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification per AWS D1.1.
- F. Samples: Provide samples to the Testing Agency as specified in Article SOURCE QUALITY CONTROL, at no additional costs.

1.04 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies, refer to pertinent sections of Division 01 and CBC Chapter 17A.
- B. All tests shall be performed by a recognized testing agency as specified in pertinent sections of Division 01.
- C. Certification and Identification of Materials and Uses: Provide Testing Agency with access to fabrication plant to facilitate inspection of steel. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection and all material identification/test information listed below.
 - 1. Test all steel as required by ASTM A6.

2. Provide manufacturer's Mill Test Reports for all materials. Include chemical and physical properties of the material for each heat number manufactured. Tag all fabricated materials with heat number.
 3. Provide letter certifying all materials supplied are from heat numbers covered by supplied mill certificates. Include in letter the physical location of each material type and/or heat number in the project (i.e. walls, braced frames etc.).
 4. Unidentified Material Tests: Where identification of materials by heat number or mill tests cannot be made, Owner's Testing Agency shall test unidentified materials.
 5. Provide all certification, verifications, and other test data required to substantiate specified material properties at no additional cost to the Owner.
- D. Testing and Inspection: Tests and Inspections performed by Independent Testing Agency are specified below in Articles SOURCE QUALITY CONTROL and FIELD QUALITY CONTROL. Duties and limitations of Independent Testing Agency, test costs and test reports in conformance with pertinent sections of Division 01.
- E. The following standards are the minimum level of quality required. Provide higher quality work as specifically indicated in the Contract Documents.
1. Workmanship and details of structural steel work shall conform to the CBC and AISC 360.
 2. The quality of materials and the fabrication of all welded connections shall conform to AWS D1.1.
 3. Comply with Section 10 of AISC 303 for architecturally exposed structural steel.
- F. The Testing Agency will review all submittals and testing of materials.
- G. All re-inspections made necessary by non-conforming work shall be at the Contractor's expense.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in bundles marked with durable tags indicating heat number, mill, member size and length, proposed location in the structure and other information corresponding with markings shown on placement diagrams.
- B. Handle and store materials above ground to prevent damage, contamination or accumulation of dirt or rust.

1.06 SCHEDULING AND SEQUENCING

- A. Organize the work and employ shop and field crew(s) of sufficient size to minimize inspections by the Testing Agency.
- B. Provide schedule and sequence information to Testing Agency in writing upon request. Update information as work progresses.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Plates: ASTM A36 or ASTM A572 Gr. 50 or ASTM A529 Gr. 50

- B. Structural Steel Channels, Angles: ASTM A36 or ASTM A572 Gr. 50.
- C. Bolts, Nuts, and Washers: ASTM A307 Grade A machine bolts with ASTM A563 Grade A nuts and ASTM F844 washers to match. See FINISHES section for galvanization, where required.
- D. Anchor Bolts/Rods, Nuts, and Washers: ASTM F1554 Gr. 36 or 55 with ASTM A563 Grade A nuts, and ASTM F436 Type 1 washers. Grade DH nuts where Grade 105 rod is specified. No upset thread allowed.
- E. Arc-Welding Electrodes: AWS Standards E70 or equivalent, except no E70T-4 allowed.
- F. Other Welding Materials: AWS D1.1; type required for materials being welded.

2.02 ACCESSORIES

- A. High Strength Grout: ASTM C1107, non-shrink, premixed compound consisting of aggregate, cement, and water reducing plasticizing agents. Minimum compressive strength $f'c = 7000$ psi at 28 days. Non-metallic where exposed to view. BASF "MasterFlow 928" or equivalent.
- B. Building Structural Steel Primers: Comply with local VOC limitations of authorities having jurisdiction and the California Green Building Code. Verify compatibility with finish coats specified in other sections. Follow manufacturers printed instructions. Apply one coat unless otherwise directed.
 - 1. Type A: Self-Crosslinking Hydrophobic Acrylic passing 2000 hours ASTM D4585 & 7000 hours ASTM D5894. "Series 115 Uni-Bond DF" by Tnemec (2.0 to 4.0 mils DFT).
 - 2. Type B: Organic Zinc-Rich Urethane passing 50,000 hours ASTM B117 and 15000 hours ASTM G855. "Series 90-97 Tneme-Zinc" by Tnemec (2.5 to 3.5 mils DFT) or "Series 94-H20 Hydro-Zinc" by Tnemec (2.5 to 3.5 mils DFT).
 - 3. Type C: MIO-Zinc Filled Urethane passing 10,000 hours ASTM B117 and 5000 hours ASTM D4585. "Series 394 PerimePrime" by Tnemec (2.5 to 3.5 mils DFT).
- C. Galvanizing: ASTM A153 and A123.
- D. Touch-Up Primer for Galvanized Surfaces: Type B primer.

2.03 FABRICATION

- A. Shop fabricate to greatest extent possible.
- B. Continuously seal built up members by continuous welds where exposed to weather.
- C. Fabricate connections for bolt, nut, and washer connectors.
- D. Protect all materials, before and after fabrication, from rust, corrosion, dirt, grease, and other foreign matter.
- E. Fabricate framing members free from twists or bends. Form holes, cut and sheared edges neatly without kinks, burrs, or warped edges.
- F. Exposed Steel: Straight, smooth, free of nicks, scars or dents.

- G. Gas Cutting: Gas cutting of holes in a member shall not be permitted.
- H. Splicing of members: Members requiring splicing due to length requirements may be spliced using full penetration butt welds when such welds and procedures are inspected and certified by the Testing Agency, in conformance with AWS and AISC standards. The location of splices shall be approved by the Architect/Engineer in writing prior to fabrication.
- I. Welding: Welding of structural steel connections shall be performed by qualified welders in accordance with AWS Standards. All weld sizes shall match those shown on the drawings.
 - 1. Preparation: Clean all surfaces free of rust, paint and all foreign matter. Remove paint or scale by brushing, chipping or hammering as required. Chip clean and wire brush burned or flame cut edges before welding. Space and alternate welds, clamping as necessary to prevent warp or misalignment.
 - 2. Sequence Welding: When welds enclose, or partially enclose, the perimeter or portion of the surface of a member, make weld bead in sequence, or staggered. Minimize internal stresses. Weld groups of members occurring in a single line in staggered sequence to minimize distortion of the structural frame.
 - 3. Faulty and Defective Welding: Welds failing to meet AWS standards and the Contract Documents shall be rejected and remade at Contractor expense. All welds showing cracks, slag inclusion, lack of fusion, bad undercut or other defects, ascertained by visual or other means of inspection shall be removed and replaced with conforming work.
 - 4. Minimum Weld Strengths: All welds shall match the minimum weld sizes recommended by AISC. Details of fabrication not specifically shown shall match similar details which are specifically shown. All bevel and groove welds shall be full penetration unless size is noted otherwise.
 - 5. Threaded studs, headed studs, and deformed bar anchors shall be full-fusion welded conforming to ASW D1.1.
- J. Camber: Fabricate all beams cambered as indicated on the drawings.
 - 1. Fabricate beams without camber for installation with any "natural" crown up.
 - 2. Exception: Fabricate cantilever beams with "crown" down.
- K. Grinding: Grind smooth the following structural steel and connections;
 - 1. Exposed cut ends of structural and fabricated shapes.
 - 2. All welds exposed to view.
 - 3. Mitered and fit-up corners and intersections.
- L. Bolt Holes: Edge, end distances and spacing shall conform to dimensions shown on the drawings, and as follows;
 - 1. Round: Size indicated and 1/16 inch maximum oversize, except 1 inch and larger bolts may have 1/8 inch maximum oversize.
 - 2. Slotted: At locations specifically noted on the drawings, provide size indicated and 1/16 inch by 1/4 inch oversize slotted in direction perpendicular to applied loads.
 - 3. Holes in base plates for anchor bolts may be 1/8 inch oversize.
- M. Comply with Section 10 of AISC 303 for architecturally exposed structural steel (AESS). See

architectural & structural drawings for locations of AESS.

2.04 FINISHES

- A. Steel exposed to inclement atmospheric conditions or weather (such as coastal moisture or seasonal rain) shall be sufficiently primed or otherwise protected against corrosion. If condition of steel is suspect due to weathering/corrosion, Contractor shall bear cost of inspection to determine if excessive corrosion is present and if steel member(s) requires repair or replacement. Contractor shall bear cost of repair or replacement.
- B. Prepare and finish structural and miscellaneous steel component surfaces as follows, unless a higher standard-of-care is determined necessary per item A:
 - 1. Unpainted, interior, dry exposure surfaces need not be primed.
 - 2. Finished painted, interior, dry exposure surfaces:
 - a. Surface Preparation: SSPC-SP2 Hand-Tool and/or SP3 Power-Tool Cleaning. Apply Primer Type A. Field touchup with same primer.
 - b. Where jobsite exposure is expected to exceed 6 months, SSPC-SP6 / NACE No. 3 Commercial Blast-Cleaning is required. Apply Primer Type B or C. Field touchup with same primer.
 - 3. Finish painted surfaces with exterior exposure, interior exposure subject to wet conditions or fumes, or surfaces to receive high performance finish coatings (for example epoxy or urethane coatings).
 - a. Surface Preparation: SSPC-SP6 / NACE No. 3 Commercial Blast-Cleaning to create a dense, uniform angular surface profile of 2.0 mils minimum. For severe (immersion) exposure, SSPC-SP10 / NACE No. 2 Near-White Blast-Cleaning is required.
 - b. Apply Primer Type B. Field touchup with same primer.
 - 4. Surfaces to be fire proofed need not be primed unless required by the fireproofing manufacturer or if jobsite exposure is expected to be inclement per item A. Where unprimed steel is to receive fireproofing, prepare steel surface as required by fireproofing manufacturer. If fireproofed surfaces are to be primed, provide primer as follows:
 - a. Surface Preparation: SSPC-SP3 Power-Tool Cleaning.
 - b. Apply Primer Type C. Field touchup with same primer.
 - 5. Exterior exposed (unpainted) surfaces and as otherwise indicated to receive galvanizing:
 - a. Galvanize per ASTM A123 Class 55 minimum. Passivation agents are not permitted on galvanized metal that is to be painted. Provide vent holes per ASTM A385 at closed sections (such as HSS). Submit proposed location of vent holes for review by Engineer.
 - b. Connection hardware shall be hot-dip galvanized per ASTM A153 or F2329. Mating bolts and nuts shall receive the same zinc-coating process.
 - c. Repair all uncoated, damaged, or altered galvanized surfaces per ASTM A780.
- C. Do not prime the following surfaces unless otherwise indicated:
 - 1. Connections to be field welded.
 - 2. Steel in contact with concrete.
 - 3. Surfaces to receive welded metal decking.
- D. Do not cover up work with finish materials until inspection is complete and work is approved by the Testing Agency.

2.05 SOURCE QUALITY CONTROL

- A. An independent Testing Agency will perform source quality control tests and submit reports, as specified in pertinent sections of Division 01.
- B. Steel Materials Testing:
 - 1. No testing is required for materials identified in accordance with CBC 2202A.1 (heat number, grade stencil, etc.).
 - 2. Unidentified steel- General: Test all structural shapes. In addition, test to verify F_y and F_u values when engineering requirements exceed $F_y = 25$ ksi for design.
- C. Shop Welding Inspection:
 - 1. Testing Agency shall inspect and certify all structural welds.
 - 2. Welder Qualifications: Welding inspector shall verify that all the welders are properly qualified prior to steel fabrication and state the qualifications of each welder in the welding inspection report.
 - 3. Welding Inspection: Continuous inspection required unless otherwise noted below. Comply with requirements of AWS D1.1.
 - a. Welding Inspector shall check all welds, materials, equipment and procedures.
 - b. Welding Inspector shall provide reports certifying the welding is as required and has been done in conformity with the plans, specifications and codes.
 - c. Welding Inspector shall use radiographic, ultrasonic, magnetic particle, or any other necessary aid to visual inspection to assure adequacy of welds.
 - 4. Periodic Inspection Acceptable:
 - a. Single pass fillet welds not exceeding 5/16 inch.
- D. Bolts, Nuts, and Washers: Provide samples to Testing Agency for required testing, at no additional cost.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Framing:
 - 1. Erect all structural steel true and plumb.
 - 2. Verify proper final alignment prior to making final connections.
- C. Field Connections:

1. Workmanship of field bolted and welded connections shall conform in all respects to methods and tolerances specified for fabrication.
 2. Field weld components indicated on shop drawings. Sequence field welds to minimize built-up stress and distortion of the structural frame. Verify sequence with Engineer. Coordinate field welding schedule with Testing Laboratory.
- D. Templates: Provide bolt setting templates for all anchor bolts. Provide instructions for the setting of anchors and bearing plates, verify these items are set correctly as work progresses.
- E. Bolting:
1. Inspect mating surfaces to insure that bolt head and nut will have full bearing and that metal plies will mate flush between bolts.
 2. Install bolts in matching holes. Do not distort metal or enlarge holes by drifting during assembly. Remake mismatched components to achieve tolerances indicated.
 3. Holes mismatched in excess of 1/8 inch will be rejected.
 4. Holes mismatched less than 1/8 inch may be reamed to the next larger size bolt.
 5. Do not enlarge holes by flame cutting or air/arc ("plasma") cutting.
 6. Provide flat washer(s) at over-size holes.
 7. Provide washer at bolt head and nut where connected part is less than 1/4 inch thick.
 8. Provide ASTM F436 beveled washers when the slope of the surfaces of parts in contact with the bolt head or nut is greater than 1:20.
 9. Do not install bolts with damaged threads.
 10. Threads shall commence outside of the shear plane.
 11. Machine Bolts (MB): Install and tighten to a snug condition (ST) such that laminated surfaces bear fully on one another, using an impact wrench or "full effort" of an installer using a standard spud wrench.
- F. Supports, Shoring and Bracing: Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing. Conform to requirements of all applicable laws and governing safety regulations. Resist imposed loads, including those of stored materials and equipment.
1. Provide all temporary supports, shoring and bracing necessary to achieve work of tolerances indicated.
 2. Provide all necessary temporary flooring, planking and scaffolding required for erection of steel, and support of erection machinery.
 3. Construction Loading: Do not overload the structure or temporary supports with stored materials, equipment or other loads.
 4. Maintain temporary bracing and shoring until work is complete, and longer as required to ensure stability and safety of structure.
- G. Do not make final connections until structure is aligned to meet specified tolerances.

3.03 ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

- A. The independent Testing Agency will perform field quality control tests, as specified in pertinent sections of Division 01.
- B. Field Welding Inspection: Conform to all requirements of section SOURCE QUALITY CONTROL.
 - 1. Inspect mating surfaces.
 - 2. Test all materials prior to use. Use only materials meeting specified requirements.

3.05 ADJUSTING

- A. Touch-up damaged finishes with compatible specified primer.
- B. Replace defective or damaged work with conforming work. Replace all defective work at Contractor's expense.
- C. Straighten materials by means that will not injure the materials.
- D. Replace defective or damaged work which cannot be corrected in the field with new work, or return defective items to the shop for repair.
- E. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.
- F. Pay expenses incurred by Owner for Architect/Engineer's costs for (re-)design and obtaining approvals of Authorities Having Jurisdiction (AHJ) necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.
- G. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work, as specified in pertinent sections of Division 01.

3.06 CLEANING AND PROTECTION

- A. Clean all surfaces upon completion of erection; leave free of grime and dirt. Remove unused materials, tools, equipment and debris from the premises and leave surfaces broomed clean.
- B. Protect work from damage by subsequent operations.

END OF SECTION

**SECTION 05 5000
METAL FABRICATIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All miscellaneous metal fabrications not classified as structural steel.
- B. Iron and steel fabrications for wood or metal framing, including bracing.
- C. Inserts and anchorages: Furnish only, inserts and anchoring devices for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work.
- D. Miscellaneous nonferrous metal items not specified under other sections.
- E. Fabrication and installation of metal work, including shop and field welding, drilling, cutting, connecting and shop painting.
- F. Miscellaneous shapes, plates, angles, clip angles, supports, bolts, and specialty iron and steel items indicated and as necessary to complete the work, including, but not limited to, the following:
 - 1. Expanded metal Fences and gates.

1.02 RELATED REQUIREMENTS

- A. Pertinent Sections specifying Volatile Organic Compound (VOC) Content Restrictions.
- B. Division 06 Sections: Installation of anchorage and support items. Framing connectors for wood framing.
- C. Refer to pertinent sections of Division 09 for interior and exterior painting
- D. Other sections requiring metal fabrications or referencing this section for fabrication and installation.
- E. Pertinent Division 22, 23 and 26 sections: Sleeves and inserts for mechanical piping and ducts, and electrical conduit, bracing and support of mechanical and electrical equipment.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- H. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

- I. SSPC (PM2) - Painting Manual, Vol. 2, Systems and Specifications; Steel Structures Painting Council; 1995.
- J. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- K. California Code of Regulations, Title 24, Part 2, California Building Code (CBC), International Building Code.
- L. California Code of Regulations, Title 24, Part 11, California Green Building Standards Code, "CAL-Green".

1.04 SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Include details of cuts, connections, camber, holes, and other pertinent data.
 - 2. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths, sizes and types.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
 - 1. Catalog cuts for all manufactured items demonstrating compliance with specified requirements.
- D. CAL-GREEN Submittals: Product Data – VOC Limits: For adhesives sealants, fillers, primers and coatings, documentation including printed statement of VOC contents, comply with limits specified in related section.
- E. Manufacturer's data: Submit certified copies of the following prior to any fabrication. Include laboratory test reports and other data as required to show compliance with these specifications, including specified standards.

1.05 SUBMITTALS FOR RECORD

- A. Section 01 3300 - Submittals: Procedures for submittals. Architect will not review these submittals.

1.06 QUALITY ASSURANCE

- A. Design criteria: Design, fabricate and erect miscellaneous metal items complete, in accord with AISC's Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Coordinate the Work under provisions of pertinent sections of Division 01.
- C. Welders:
 - 1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
 - 2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months, and are qualified in the State of California.
- D. Welding Inspection: All structural welding shall be specially inspected according to CBC 1704A and DSA IR-17-3 except as otherwise provided below.

1. Special inspection shall not be required if welding is done in an approved fabricator's shop licensed in accordance with CBC 1704A.

1.07 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01 6000.
- B. Deliver anchor bolts, anchorage devices, sleeves and inserts, which are to be incorporated into other work in ample time to avoid delay.
- C. Store materials to permit easy access for inspection and identification. Store steel materials off the ground, using pallets, platforms or other supports. Protect steel members, package materials and identifications from deterioration.
- D. Store material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- E. Prevent contact with materials which may cause discoloration or staining. Clean materials which are discolored or stained.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers, primers and coatings . Comply with limits specified in related section.

2.02 MATERIALS

- A. General: Furnish new tested stock complying with reference specifications.
- B. Steel Tubing: Hot formed, welded or seamless, ASTM A 501, or cold-formed, ASTM A500, Grade B cold-formed.
- C. Bars and bar-size shapes: ASTM A 663, Grade 65, or ASTM A 36.
- D. HVAC security fencing/cages : Expanded Metal Fencing and Gate Materials: .Cageitup.com
 1. Fencing sections 3/4" #9 expanded metal welded to tube frame
 2. Fence Frame , including top frame: 2" x 14 ga. square tube
 3. 5" x 11ga square tube, 1 1/2" x 1/4" flat iron
- E. When anchoring to concrete slab, posts will have 6" x 6" x 1/4" mounting plate with (4) 7/16" holes to accept 3/8" wedge anchors.
- F. Brackets, flanges and anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- G. Concrete inserts: wedge type, galvanized ferrous castings, either malleable iron ASTM A 47 or cast steel ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
- H. Welding Materials: AWS D1.1; type required for materials being welded. Comply with AWS D1.1, D1.3 and CBC Title 24 Part 2.
- I. Shop and Touch-Up Primer and paint: as recommended by manufacturer, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of the work. Allow for trimming and

fitting where field conditions preclude accurate measurements or where final dimensions cannot be established prior to fabrication.

- B. Fit and shop assemble items in largest practical sections, for delivery to site.
 - 1. Minimize field splicing and site assembly. Disassemble only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
 - 2. Complete assembly, including welding, before start of finishing operations. Provide finish surfaces of members exposed in the final structure free of markings, burrs, and other defects.
 - 3. Use materials and items necessary to complete the work, using the best materials and methods ordinarily used for this type of work whether explicitly specified, indicated and detailed or not.
- C. Fabricate items with joints tightly fitted and secured.
- D. Continuously seal joined members by continuous welds.
 - 1. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 - 2. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
 - 3. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- E. Use only materials smooth and free of blemishes including pitting, seam marks, roller marks, trade names and roughness.
- F. Fabricate steel members in accordance with drawings and as recommended by A.I.S.C. Verify all dimensions with field conditions prior to fabrication.
 - 1. Clean, prepare and shop-prime steel members. Do not prime surfaces to be field welded or in direct contact with concrete.
 - 2. Galvanizing: ASTM A153, ASTM A123; all steel exposed to weather.
 - 3. Cutting and drilling: Provide holes for fabrication and for attachment of work specified elsewhere. Countersink holes for bolts and screws.
- G. Welding: Comply with the AWS Structural Welding Code, and with the following:
 - 1. Welds shall be free from excessive oxides, nonmetallic inclusions, and gas pockets.
 - 2. Welds shall be uniform in section, smooth in weld metal, feather edged, without overlaps.
 - 3. Surfaces to be welded shall be free from loose scale, rust, paint, or other foreign matter.
 - 4. Tack welds located in way of design welds shall be melted out when encountered in final welding, or shall be thoroughly fused in with final weld.
 - 5. Use proper care and procedures to minimize locked-in stress and distortion.
 - 6. Welder qualification requirements, welding procedure and welding electrodes shall conform to CBC 2204A and most recent editions of AWS D1.1, D1.3; CBC IR-17-3.

2.04 METAL FENCES:

- A. Expanded Metal fences; Fabricate to dimensions and details shown, with welded joints ground smooth and flush. Hot-dipped galvanized at exterior locations.
 - 1. Fabricate and install to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.
 - 2. Materials: .
 - a. Fencing sections 3/4" #9 expanded metal welded to tube frame

- b. Fence Frame , including top frame: 2" x 14 ga. square tube
- c. 5" x 11ga square tube, 1 1/2" x 1/4" flat iron
- 3. When anchoring to concrete slabe, posts will have 6" x 6" x 1/4" mounting plate with (4) 7/16" holes to accept 3/8" wedge anchors.
- 4. Provide galvanized inserts for concrete paving.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work. Correct conditions detrimental to the proper and timely performance of this work before proceeding with installation. Commencement of work indicates acceptance of substrates.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, measured from established lines and levels, accurately fitted, free from distortion or defects.
- B. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.
- C. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction; including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- D. Cutting and fitting:
 - 1. Perform cutting, drilling and fitting required for installation of miscellaneous metal items. Fit exposed connections accurately together to form tight hairline joints.
 - 2. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.
 - 3. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field weld components ____as required to assemble shop-fabricated work on site. If field-welding is not specifically indicated on drawings, option is the Contractor's for efficient assembly.
- F. Perform field welding in accordance with AWS D1.1/D1.1M.

- G. Immediately after erection, clean and prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete with the same materials used for shop finishing.
- H. Expanded Metal Fencing Installation:
 - 1. Install components in accordance with manufacturer's instructions and referenced standards.
 - 2. Place frames in correct position, plumb and level.
 - 3. Mechanically cut galvanized finish surfaces. Do not flame cut.
 - 4. Anchor by bolting through saddle clips.
 - 5. Set perimeter closure flush with top of grating and surrounding construction.
 - 6. Secure to prevent movement.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.05 PROTECTION

- A. Protect finished work from damage until acceptance by Owner.
- B. Repair and replacement: In the event of damage, immediately make repairs and replacements necessary to satisfaction of Architect without change in contract sum or time.

3.06 CLEAN-UP

- A. When work of this section has been completed, and at such other times as may be directed, remove all trash, debris, surplus materials, tools and equipment from site.
- B. Comply with pertinent requirements of Division 01 section specifying Contract Closeout.

END OF SECTION

SECTION 06 1000

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: All labor, materials and equipment and all operations required to complete all rough carpentry and structural framing as indicated on the drawings; to produce shapes and configurations as shown, as required; and as specified herein, including:
1. Structural floor, wall, and roof framing.
 2. Floor, wall, and roof sheathing.
 3. Rough hardware, framing connectors and fasteners.
 4. Treatment of wood.
 5. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and other work requiring supporting blocking.
 6. Miscellaneous wood nailers and furring strips, including roof applications, other wood framing, furring, shims or blocking as required to complete the work.
- B. Related Sections:
1. Pertinent sections of Division 01 specifying Quality Control and Testing Agency services.
 2. Pertinent sections of Division 01 specifying Structural Product Requirements: Structural Product Options, Substitution procedures and limitations, transportation, handling and storage.
 3. Pertinent sections of Division 03 specifying wood formwork construction and/or setting anchors in concrete.
 4. Pertinent section of Division 06 specifying wood construction and materials.
 5. Pertinent sections of other divisions specifying steel or concrete construction.

1.02 REFERENCES

- A. California Code of Regulations, Title 24, latest adopted edition (herein noted as CBC): Chapter 23 Wood.
- B. American National Standards Institute (ANSI) / American Wood Council (AWC) "NDS - National Design Specification for Wood Construction".
- C. National Institute of Standards and Technology (NIST) / Engineered Wood Association (APA) "PS 1 - Voluntary Product Standard for Structural Plywood".
- D. NIST / APA "PS 2 - Performance Standard for Wood-Based Structural-Use Panels".
- E. NIST "PS 20 - American Softwood Lumber Standard".
- F. Redwood Inspection Bureau (RIS) "Standard Specifications for Grades of California Redwood Lumber".
- G. West Coast Lumber Inspection Bureau (WCLIB) "Standard Grading Rules for West Coast Lumber No. 17".

- H. Western Wood Products Association (WWPA) "Western Lumber Grading Rules".
- I. American Wood Preservers Association (AWPA) "Book of Standards".

1.03 SUBMITTALS

- A. Submit in accordance with pertinent sections of Division 01 specifying submittal procedures. Submit for review prior to fabrication. Submittals that do not meet these requirements will be returned for correction without review.
 - 1. Substitutions for products specified require conformance to substitution requirements in Division 01.
 - 2. Review of materials and hardware for substitution to products specified is at the additional expense of the Contractor.
- B. Limitation of Review: Structural Engineer's review will be for general conformance with design intent as indicated in the Contract Documents and does not relieve Contractor of full responsibility for conformance with the Contract Documents. The General Contractor shall review and approve shop drawings prior to submittal to the Architect/Engineer.
- C. Product Data:
 - 1. Submit manufacturer's product data, specifications, and installation instructions for & location of framing connectors, wood preservative materials, application instructions, and fasteners. Include complete, accurate equivalence data when submitting alternate products to those specified. Provide samples of these items upon request.
 - 2. Submit product data and current ICC-ES report for machine-driven nails, fasteners, and equipment, including dimensions of all fasteners, including head, shank diameter and length.
 - 3. Submit samples of each and every type and size of proposed machine-driven nails and fasteners.
- D. Shop drawings: For manufactured wood products, submit each building as a complete unit. Do not mix components from multiple buildings or units of work in a submittal. Include all of the following;
 - 1. Indicate profiles, sizes, and spacing locations of structural members.
 - 2. Cross-reference all shop drawing detail references to contract document detail references.
 - 3. Secure all field measurements as necessary to complete this work.
- E. Manufacturer's Certificate: Submit all certifications of physical and chemical properties of materials as specified below in Article titled QUALITY ASSURANCE.
 - 1. Certify that wood products supplied for rough carpentry meet or exceed specified requirements, including specified moisture content.

1.04 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies, refer to pertinent sections of Division 01 and CBC Chapter 17A.

- B. All tests shall be performed by a recognized testing agency as specified in pertinent sections of Division 01.
- C. Inspection of fabricators is required per CBC 1704A.2 unless fabricator is registered and approved by the building official. Wood product quality standards:
 - 1. All wood products to comply with article REFERENCES.
 - 2. Factory-mark each piece of lumber and sheathing with type, grade, mill, and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.
 - 3. Sheathing panels to be marked by APA (The Engineered Wood Association).
- D. End-Jointed lumber shall not be used.
- E. Hardware and engineered wood products shall have current ICC ES Evaluation/research reports that are equivalent to products specified.
- F. Employ competent workers experienced in work of the types specified and required.

1.05 MOCK-UP

- A. Construct mock-ups of machine-driven nailed sheathing panels using submitted products and demonstrating conditions indicated. Locate where directed.
- B. Mock-up shall be accepted and approved by the Inspector of Record (IOR) before commencement of machine-driven nailing activity.
- C. Accepted mock-up shall remain exposed for reference for the duration of machine-driven nailing activity.
- D. Remove all mock-ups at the completion of the work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with pertinent requirements of Division 01.
- B. Delivery: Time delivery and installation of carpentry products to avoid delaying other trades whose work is dependent on or affected by this section and to comply with moisture content, protection and storage requirements.
- C. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and sheathing panels to prevent deformation and provide air circulation within stacks.
 - 1. Store materials for which a maximum moisture content is specified only in areas where relative humidity has been reduced to a level where specified moisture content can be maintained.
 - 2. Handle and store materials above ground to prevent damage, contamination, or accumulation of dirt or foreign materials.

3. Provide special protection for horizontal sheathing panels. Deformation of panels due to moisture is not acceptable.

1.07 PROJECT/SITE CONDITIONS

- A. Verify all conditions at project site affecting the work; work to field dimensions as required. Coordinate carpentry installation with size, location, and installation of service utilities.
- B. Sequence rough carpentry installation activities to allow sufficient time for:
 1. Review of all submittals, including machine-driven nail sample submittals.
 2. Fabrication of mock-ups and required durations as specified.
 3. Indicate submittal review, procurement, mock-up, and testing activities in the project schedule prior to the start of installation. Installation durations shall be based on hand-nailed installation methods specified.
 4. Attainment of specified maximum lumber moisture content.

PART 2 PRODUCTS

2.01 DIMENSIONED LUMBER

- A. General
 1. Size per industry standards for nominal sizes shown; S4S (sanded four sides).
 2. Warped/twisted and excessively checked members shall not be used regardless of grade marks.
 3. At the Contractor's option, engineered lumber of equivalent size and material properties may be substituted for solid sawn lumber where material is difficult to source due to length, availability, etc. Submit proposed substitution to Engineer for review prior to purchasing materials.
- B. Moisture content of framing:
 1. All lumber to be maximum 19% at time of fastener installation, except 3x and 4x studs may be 25% at time of sheathing panel nailing. All lumber to be maximum 19% at time of close-in, unless noted otherwise.
 2. The Owner's Testing Laboratory will test for moisture content prior to commencement of close-in.
 3. The Contractor shall recognize that excessive shrinkage of lumber results from excess moisture content at the time of installation. The Contractor will compensate for use of such lumber by waiting for acceptable moisture content before close in and/or by replacing/repairing lumber that has sagged, twisted, or warped prior to close in.
 4. Deviation from this specification would require structural redesign of connections and fasteners.
- C. Sills/ledgers on concrete: No. 2 pressure treated Douglas Fir
- D. Interior structural framing shall be Douglas Fir (D.F.) with grades as noted below, unless otherwise specified on the drawings. All grades are per WCLIB standard grading rules.

1. All permanently exposed (interior or protected from weather) framing shall be select structural grade with no box heart.
2. Except per 1 above, unless noted otherwise, minimum grades are:
 - a. Floor/roof joists/rafters (2x) and 2x8 & larger studs & plates: D.F. No. 1
 - b. 2x4 and 2x6 studs and plates: D.F. No. 1
 - c. 4x and larger: D.F. No. 1
 - d. Blocking: D.F. No. 2
 - e. 6x8 and larger posts and beams may be SGL/CGL per below unless noted otherwise on the drawings.
- E. Exterior structural framing (exposed to weather) shall be redwood select structural grade or pressure treated D.F. No. 1, unless noted otherwise.
- F. Framing not otherwise shown or specified: Douglas Fir construction grade per WCLIB paragraphs applicable to uses and sizes required.

2.02 STRUCTURAL SHEATHING PANELS

- A. Plywood: Structural sheathing shall conform to product standard PS-1 or PS-2. All panels shall have a minimum bond classification of "Exposure 1" and bear the trademark of the Engineered Wood Association (APA) or other qualified agency. Grades shall be "Rated Sheathing" or "Structural 1" as required on the drawings.
- B. Oriented Strand Board (OSB): All structural OSB shall be grade marked by a qualified agency for conformance with Product Standard PS-2 and shall be fabricated with exterior glue. Grades shall be as required on the drawings.

2.03 TREATED WOOD:

- A. Treated Lumber and Plywood: Comply with requirements of AWP Standard U1. See Standard U1 for "Use Category" designations. Do not provide higher Use Category lumber than that specified. Maximum moisture content shall be the same as required for "dimensioned lumber" as specified above.
- B. Preservative Treated Lumber
 1. General
 - a. Preservatives shall be waterborne. Preservative retention rate shall be as required per AWP Standards U1 & T1. Lumber shall be Douglas Fir No. 2 (or better). Cut faces of treated wood shall be brush treated (two complete applications) prior to installation.
 - b. Lumber less than 8 inches above grade and lumber less than 6 inches above exterior hard-surface flatwork shall be treated.
 - c. Each piece of wood shall be stamped by the wood preservative applicator to identify its treatment and preservative retention.
 2. Lumber at interior, non-weather exposed locations installed adjacent to concrete or masonry shall be Use Category UC2. Examples include sill plates & ledgers and lumber in contact with roofing, flashing, or water proofing. Borate treated lumber meeting AWP UC2 is acceptable in this application.
 3. Lumber at exterior locations, not in contact with soil/ground, shall be Use Category UC3B. Examples include Douglas Fir decking and deck framing.

4. Lumber in contact with soil/ground shall be Use Category UC4A. Examples include timber retaining walls.
 5. Poles, posts, and sheathing panels shall be treated as recommended by AWWPA Standard U1 per use and exposure.
 6. Maximum Volatile Organic Compound (VOC) content of field-applied preservative shall meet local air quality standards and the California Green Building Code. Provide either of the following:
 - a. Copper Azole (CA-B) per ICC-ES AC326.
 - b. Alkaline/Copper/Quaternary (ACQ).
- C. Fire Retardant Treatment: Product and application process must be recommended by manufacturer of treatment as being suitable for painting. Application shall be by a California State Fire Marshal approved licensed contractor.
1. Exterior Type: Use Category UCFB, chemically treated, and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Treat exposed exterior rough carpentry items, including stairways, balconies, and covered walkways.
 - b. Do not use treated wood in direct contact with the ground.
 2. Interior Type: Use Category UCFA, low temperature (low hygroscopic) type, chemically treated, and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Treat rough carpentry items as indicated.
 - b. Do not use treated wood in applications exposed to weather or where the wood may become wet.

2.04 FASTENERS AND ACCESSORIES

- A. General requirements for fasteners:
1. Fasteners shall be of adequate size, spacing, and number to resist design loads under intended use, and types shall be appropriate for the materials or conditions for which used.
 2. Provide washers, pre-drilling, etc. as required for proper installation and to prevent damage to framing.
 3. Fasteners shall be hot-dip galvanized (ASTM A153), mechanically galvanized (ASTM B695 class 55 minimum), stainless steel (type 303, 304, 305, or 316), silicon bronze, or copper by approved methods for the following applications:
 - a. Exterior, exposed use.
 - b. In contact with preservative or fire-retardant treated wood.
 - c. Nails in contact with preservative treated wood containing ammonia shall be stainless steel.
 4. Fasteners in moist corrosive atmosphere to be of stainless steel (type 303, 304, 305, or 316).
 5. Where the retention level of ACQ or MCQ preservative is greater than 0.40 pcf, CBA-A preservative is greater than 0.41 pcf, or CA-B preservative is greater than 0.21 pcf, provide stainless steel fasteners (type 303, 304, 305, or 316).

6. All fasteners specified by manufacturer shall be installed in framing hardware, unless noted otherwise.
 7. At borate treated lumber a clear zinc coating per ASTM F1941 is acceptable.
- B. Nails and nailing not otherwise shown or specified:
1. Comply with requirements of governing building code.
 2. For securing materials to hardened concrete or masonry provide hardened steel masonry nails or Simpson Strong-Tie "Titen" screws.
 3. For framing and general woodwork: Common bright wire nails (not box nails) with centered full-round heads per ASTM F1667 including Supplement S1. 16d cement coated sinker nails may be used in lieu of common nails for framing, where noted on the drawings. Unless otherwise noted on drawings, nail sizes shall be as follows:
 - a. 8d Common: 0.131" \varnothing x 2-1/2" long with 0.281" \varnothing head.
 - b. 10d Common: 0.148" \varnothing x 3" long with 0.312" \varnothing head.
 - c. 16d Common: 0.162" \varnothing x 3-1/2" long with 0.344" \varnothing head.
 4. Nails for sheathing panels shall be of common wire with full round heads and shall be of sufficient length to fully develop the nails.
 5. Machine-driven nails of all types must comply with the requirements of this section. All proposed nails shall match diameter and penetration of specified nails.
 6. Staples shall conform to length and gauges specified and shall be installed to match specified patterns and spacing.
 7. Powder-Driven Pins (PDP): Use only as approved by the Architect/Engineer; operators shall be qualified.
- C. Bolts: Malleable iron washers or steel plate washers, unless otherwise shown, shall be provided under all bolt heads and nuts.
1. Machine Bolts: ASTM A307 and ANSI/ASME B18.2.1, standard semi-finished machine bolts as shown or required. Nuts shall be standard size unless noted otherwise and shall be per ASTM A563.
 2. Anchor bolts or threaded rod anchors shall conform to ASTM F1554, ASTM A307, or ASTM A36. Anchor bolts shall be headed or end in two nuts tightened against one another, unless noted otherwise. Provide embedded plate washer as indicated on drawings. No upset threads allowed. No L or J bolts allowed.
- D. Lag screws: Standard hex lag screws per ANSI/ASME B18.2.1.
- E. Wood screws: Standard wood screws per ANSI/ASME B18.6.1.
- F. Framing hardware: Fabricated sheet metal timber framing connectors shall be manufactured from painted or galvanized G90 steel by Simpson Strong-Tie (connectors specified on drawings are per Simpson Strong Tie, USP Lumber Connectors, or approved equivalent. Connectors shall be at least 16 gauge material, (1/8 inch plate materials where welded), unless otherwise noted, punched for nailing. All heavy hardware to be fabricated from A36 steel per Division 05, Metals. All hardware intended for exterior exposed use shall be galvanized per G185 ASTM A653 or stainless steel.
1. For contact with preservative or fire-retardant treated wood, provide minimum G185 galvanizing per ASTM A653.

2. Nails and nailing shall conform to the manufacturer's instructions with a nail provided for each punched hole. Nails to be used with framing accessories are subject to the requirements specified in this Section for fasteners and anchors.
- G. Subfloor Glue: Water proof, water base, air cure type, cartridge dispensed conforming to APA Standard AFG-01 or ASTM D3498. Maximum Volatile Organic Compound (VOC) shall meet local air quality standards and the California Green Building Code.

2.05 SOURCE QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform testing for moisture content of all lumber at time of fastener installation.
- B. The Testing Agency will submit reports as specified in Division 01.

PART 3 EXECUTION

3.01 REQUIREMENTS FOR STRUCTURAL FRAMING

- A. General
 1. Refer to drawings for layouts, notes and details, provide framing as required; comply with governing building code requirements.
 2. Provide framing to achieve true alignments as surfaces receiving finish materials.
 3. It shall be the responsibility of the Contractor to provide and install all wood blocking, furring strips, or grounds detailed or required to provide anchorage for all finishes, accessories, fixtures, etc. as required to complete all work. All blocking and/or backing shall be securely bolted or otherwise anchored in place.
 4. Contractor shall be responsible for layout of anchor bolts, and other hardware embedded in concrete when placed by other trades.
 5. Provide and install all structural framing, blocking, fasteners, brackets, clips, etc. as required to complete work specified in the Construction Documents.
- B. Framing
 1. Sill Plates and Ledgers:
 - a. Sill plates and ledgers on concrete shall be anchored with bolts, unless noted otherwise, shall have full bearing on concrete, and shall be placed for sheathing panel nailing as indicated. All bolt nuts shall be provided with a cut plate steel washer for bearing on wood.
 - b. Provide a minimum of two sill anchor bolts per sill piece with a bolt no less than 4 1/2" and no more than 12" from the end of the sill. Bolts to be 5/8" diameter x 12" (18" at curb) long at 48" on centers, unless otherwise shown or noted. Provide additional anchor bolts each side of a notch or hole, as per a typical plate splice, where notch or hole is in excess of 1/3 the plate width. At shear walls, provide a plate washer 3" x 3" x 0.229" minimum between the sill and nut at anchor bolts. Plate washer to extend within 1/2 inch of the structural wall sheathing. Offset and/or stagger anchor bolts, or provide larger plate washer as required.
 - c. Anchor bolt holes in sill plates or ledgers shall be 1/16" maximum larger than anchor bolt.
 2. Stud Walls and Framing:

- a. Cut studs and posts with square ends, unless otherwise shown or noted. All posts and beams shall be "cut to bear" unless otherwise detailed.
 - b. All studs in walls shall be placed with the shortest dimension parallel to the run of the wall. Bearing studs shall extend full height to be the supporting framing as shown; non-bearing studs shall extend to the supporting framing.
 - c. Provide double studs on each side of all openings, unless shown or noted otherwise.
 - d. All openings in stud walls and partitions shall be framed with headers across the top, as shown, with a minimum size (6" nominal depth x stud width) resting on short cripple studs, and as shown on the drawings.
 - e. All stud partitions and walls shall have horizontal solid blocking not less than 2x and of the same width as the stud, fitted and nailed into the studs at mid-height of stud, for studs over 8 feet in height, except as otherwise shown or specified. This blocking shall be so spaced that there shall be no concealed air spaces greater than eight feet in any dimension.
 - f. Stud partitions containing plumbing, heating or other pipes shall be so framed as to give proper clearance for piping. Plumbing, heating and vent pipes exceeding 1-1/2" in inside diameter shall not be placed in partitions used as bearing or shear walls unless completely furred clear of the wall. No notching shall be allowed. Pipes shall be placed in the center of the plate using a neat bored hole and the plates shall be strapped on each side with 3" x 36" x 14 gauge steel punched for 10d nails 3" on center, staggered, or as shown on the drawings.
3. Top Plates
 - a. Top plates shall be double, set single. Corners where stud wall or partitions meet shall be framed with studs on all surfaces and blocking to form a "rigid" corner with nailing for all corners. Double top plates shall be lapped at corners. Lap splices and nailing per the drawings.
 4. Floor, Roof and Ceiling Framing
 - a. Joists and beams shall be accurately aligned and the position and spacing of all joists and beams shall be as shown and be coordinated with other framing and to other trades prior to actual construction.
 - b. Place all joists and beams with crown up. Cantilevered joists and beams shall be placed with the crown down.
 - c. Cutting of wood girders, beams or joists for electrical and mechanical lines shall be limited to cuts and bored holes not deeper than 1/5 of the beam depth from the top and located not farther from the support than three times the beam depth and not less than the beam depth. Cuts in excess of this, or single bored holes with a diameter of more than 1" are not permitted without special provisions for framing the beams. Location of all cuts in framing shall receive the prior review of the Architect/Engineer.
 - d. Provide vent holes in rafters and/or blocking as shown and/or directed by the Architect.

3.02 STRUCTURAL SHEATHING

A. General

1. Sheathing nailing shall be as required on the drawings. Do not overdrive (Do not break skin of sheathing face sheet). Over driving will be cause for rejection.
2. Form sheathing may be re-used for concealed sheathing provided the lumber at the time of re-use is approved by the Architect, meets with the framing grade requirements specified herein, is in good condition, and is thoroughly cleaned with all nails removed.

3. Pneumatic nailing devices shall be adjustable so that nail heads do not penetrate skin of sheathing. Contractor shall submit equipment and nails for review prior to use. Refer to PART 2 for other nailing requirements.
- B. Roof and Floor Sheathing: Lay with face grain perpendicular to roof rafters, roof trusses or floor joists. Stagger sheets. Block all unsupported sheet edges with 2x material unless noted otherwise.
- C. Wall Sheathing: Lay with face grain either parallel or perpendicular to studs. Exposed bottom edges shall be sealed as recommended by manufacturer. Block all unsupported sheet edges with 2x materials unless noted otherwise.

3.03 ROUGH HARDWARE

- A. General: Nails, spikes, screws, fabricated sheet metal anchors, ties, hangers and any other materials shown or required for the attachment of wood to concrete and wood to steel and wood to wood shall be furnished and installed as part of this work.
- B. Framing Nailing: All framing nailing shall conform to minimum requirements of the Building Code, and with details shown on the drawing.
- C. Bolts, Lag Screws and Washers:
 1. Bolts in wood shall be machine bolts unless otherwise noted and shall be of such length that the bearing length of the threads does not exceed $\frac{1}{4}$ of the full bearing length in the member holding the threads. Bolt holes in wood shall be $\frac{1}{32}$ " oversized. Bolt holes for sill plates may be $\frac{1}{16}$ " maximum oversize. Holes in steel shall be $\frac{1}{16}$ " oversize. See Section 3.1 for anchor bolts at sill plates and ledgers.
 2. Provide square plate or malleable iron washer and nut at head where bearing is against wood; cut washer under nut where it is against steel. Washer will not be required under head of carriage bolts. Provide malleable iron washers where exposed.
 3. All nuts shall be tightened when placed and retightened at completion of the job or immediately before closing with final construction.
 4. Lag screws shall be screwed (not driven) into place. Drill pilot hole to 70% of shank diameter. Drill clearance hole to full shank diameter and depth of unthreaded screw length.
- D. Wood Screws: Minimum penetration is 10 diameters unless noted otherwise. Where fastening hardwood timber species or where wood tends to split, provide pilot hole 70% of screw shank diameter.
- E. Proprietary Fasteners and Hardware: Install per manufacturer's published installation instructions (MPII) and code approval report (e.g. ICC ESR, IAPMO ER, etc). Provide MAX quantity, size, and length of fastener at hardware (i.e. joist hangers, framing, clips, etc) unless otherwise noted per plan.

3.04 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Coordinate installation of wood decking, metal-web wood joists, glued-laminated wood construction, shop-fabricated wood trusses, and wood I- joists.

- B. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members. Fasten curbs corner-to-corner and to rafters with framing connectors configured for this application.
- C. Blocking:
 - 1. Provide fire blocking at locations and spacing's as required by CBC Chapter 7. Locate other blocking, supplementary framing, backing plates and bracing to facilitate installation of finish materials, fixtures, equipment, services, accessories, and trim requiring attachment and support.
 - 2. Solid block joists and rafters over all supports with blocking of the same size and material as the joist or rafter.
- D. Furring:
 - 1. Nominal 1 inch x 3 inch minimum, continuous and spaced at 16 inches on center, maximum.
 - 2. Install plumb, rigid, and level. Shim where necessary to provide a true, even plane suitable to receive the finish required.
 - 3. Attach to concrete and masonry as shown in the contract drawings.
- E. Install miscellaneous metal angles, bolts, and other items; secure into formwork where embedded in concrete.
- F. Install accessory items not otherwise set under other sections; after completion of painting and other finishing work; in locations shown or directed by the Architect. Set items plumb, level, and secure using appropriate fastening as applicable.

3.05 FIELD APPLIED WOOD TREATMENT

- A. Field treat all end cuts and holes in preservative treated materials per PART 2.
- B. Apply two brush coats; or full-immersion dip not less than 15 minutes; or as required to thoroughly saturate all surfaces after cutting.
- C. Air dry 2-hours minimum before installation.

3.06 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum. Provide framed substrates meeting requirements for application of finishes specified in other sections.
- D. Exposed surfaces shall be free from dents and tool marks, unsanded rough or torn faces and corners, and other defects.

3.07 FIELD QUALITY CONTROL

- A. The Testing Agency, as specified in the Article QUALITY ASSURANCE, will perform the following tests and submit reports as specified in Division 01:
 - 1. Moisture content of all lumber at time of close-in.
 - 2. Periodic special inspection of nailing, bolting, and other fastening within the seismic-force-resisting system including shear walls, wood diaphragms, etc. per CBC Section 1705A.12.2.
 - 3. Special inspection of high load diaphragms per CBC Section 1705A.5.1 where designated on documents.

3.08 ADJUSTING

- A. Replace all defective work at Contractor's expense.
- B. Replace defective or damaged work with conforming work.
- C. Correct defects using means that will not injure the materials.
- D. Replace defective or damaged work which cannot be corrected in the field with new work, or return defective items to the shop for repair.
- E. Repair or replace framing lumber sagged, twisted or warped due to shrinkage from excessive moisture content at time of installation, or from other causes.
- F. Adjust to meet specified tolerances.
- G. Architect/Engineer shall review all proposals for the repair or replacement of damaged, defective, or missing work.
- H. Pay expenses incurred by Owner for Architect/Engineer's costs for (re-)design and obtaining approvals of Authorities Having Jurisdiction (AHJ) necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.
- I. Pay expenses due to re-testing and re-inspection necessitated by incomplete, inefficiently scheduled, improperly performed, defective or nonconforming work.

3.09 CLEANING AND PROTECTION

- A. Clean all surfaces upon completion of erection, leave free of grime and dirt. Remove unused materials, tools, equipment, and debris from the premises and leave surfaces broomed clean.
- B. Waste Disposal: Comply with the requirements of pertinent sections of Division 01 specifying cleaning and disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- C. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

- D. Prevent sawdust and wood shavings from entering the storm drainage system.
- E. Protect work from damage by subsequent operations.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wood door frames.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 08 1416 - Flush Wood Doors.
- C. Section 09 9123 - Interior Painting: Painting of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items:
 - 1. Door Frames: White birch; prepare for paint finish.

2.02 WOOD-BASED COMPONENTS

- A. Provide sustainably harvested wood, certified or labeled as specified in Section 01 6000 - Product Requirements.

2.03 LUMBER MATERIALS

2.04 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Opaque:
 - a. System - 1, Lacquer, Nitrocellulose.

- b. Color: As selected by Architect.
- c. Sheen: Flat.

B. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 07 0150.91
ROOFING REPAIR

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Provide all labor, equipment, and materials to maintain and protect the existing roof system..

1.02 RELATED SECTIONS

- A. Section 07 6200- Sheet Metal Flashing and Trim: Sheet metal flashing and trim.
- B. Section 06 1000 Rough Carpentry: Framing connectors and Hold Downs.

1.03 SYSTEM DESCRIPTION

- A. Maintenance roofing work including but not limited to:
 - 1. Flashing Installation at new penetrations.
 - 2. All flashings to consist of one ply of Polyester-Fiberglass-Polyester base sheet set in mastic covered by an additional layer of modified bitumen membrane.

1.04 PERFORMANCE REQUIREMENTS

- A. Make roof weathertight and watertight. All drainage to flow off roof, do not permit standing water.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide manufacturer's data sheets documenting conformance with existing roof membrane.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.
- D. Manufacturer's Field Reports: Indicate deviations or deficiencies observed during site visits, record method of resolution.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and approved by manufacturer.
 - 1. Installer's Field Supervision: Require Installer to maintain a full-time Supervisor/Foreman on job site during all phases of bituminous sheet roofing work and at any time roofing work is in progress, proper supervision of workmen shall be maintained. A copy of the specification shall be in the possession of the Supervisor/Foremen and on the roof at all times.
- C. Respond immediately to correction of roof leakage during construction. If the contractor does not respond within 24 hours, the Owner has the right to hire a qualified contractor and backcharge the original contractor.

1.07 PRE-INSTALLATION MEETING

- A. Convene two weeks before starting work of this section. Meet at Project site with Installer, installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in the around roofing that must precede or follow roofing work (including mechanical work if any), Architect/Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) Owner's insurers, test agencies, and governing authorities. Objectives to include:
- B. Review preparation and installation procedures and coordinating and scheduling required with related work.
 - 1. Review methods and procedures related to roofing work.
 - 2. Review structural loading limitations of deck.
 - 3. Review roofing systems requirements (drawings, specifications, and other contract documents).
 - 4. Review required submittals, both completed and yet to be completed.
 - 5. Review and finalize construction schedule related to roofing work and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 6. Review required inspection, testing, certifying, and material usage accounting procedures.
 - 7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including provision of temporary roofing over occupied spaces.
 - 8. Record discussion of conference, including decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
 - 9. Review notification procedures for weather or non-working days.

1.08 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing materials in a dry, well-ventilated, weather-tight place to ensure no possibility of significant moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover roll goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused rolled goods on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Contractor shall secure all material and equipment on the job site. If material or equipment is stored on the roof, the contractor shall ensure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

1.09 PROJECT CONDITIONS

- A. Coordinate roof repair installation with size, location and installation of roof mounted work.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Weather Condition Limitations: Do not apply materials during inclement weather or when a 40% chance of precipitation is expected.
- B. Materials shall be stored at room temperature until immediately prior to application when the ambient temperature is 40°F or below. Discontinue the application if the material can not be stored at a temperature which permits even distribution during application.
- C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.11 WARRANTY

- A. Correct defective Work within a one year period after Date of Substantial Completion.
- B. Provide one year manufacturer warranty for roof repair.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide products conforming to existing Bituminous roofing membrane.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Modified Flashing Ply: ASTM D-6162 Type III Grade G , 135 mil SIS and SB (Styrene-Isoprene-Styrene and Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane reinforced with a dual fiberglass scrim and polyester mat.
 - 1. "STRESSPLY "E" MINERAL" manufactured by The Garland Company.
- B. Asphalt Primer: V.O.C. compliant, ASTM D-41.
 - 1. "Garla Prime" manufactured by The Garland Company.
- C. Asphalt Roofing Mastic: V.O.C. compliant, ASTM D-2822, Type II.
 - 1. "Flashing Bond" manufactured by The Garland Company.
- D. Reinforcing Fabric: Fiberglass Mesh.
- E. Base Flashing Ply: ASTM D-4601 Type II, one ply of Polyester-Fiberglass-Polyester, as recommended and furnished by the membrane manufacturer.
- F. Deck Sheathing: Perlite board, ASTM C 728; 1/2 inch thick, as manufactured by Manville, Celotex.

2.03 ACCESSORIES

- A. Nails and Fasteners: Galvanized steel except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel.
- B. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28 gauge and not less than 1-inch in diameter. Discs shall be formed to prevent dishing. Bent or cup-shaped caps are not acceptable.
- C. Accessory Materials: Other materials not specifically indicated but required to achieve the results specified; commercial quality. Types recommended by manufacturer to suit conditions.

- D. Sealant: Compatible material of types specified in Section 07 9005.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. Do not proceed with roofing repairs until unsatisfactory conditions have been corrected in a manner acceptable to Roof System Manufacturer and Installer.
- B. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof repairs.
- C. Verify deck surfaces are dry and free of snow or ice.

3.02

3.03 WOOD DECK PREPARATION

- A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.
- B. Seal joints of plywood with tape.
- C. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.04 INSTALLATION

- A. Prepare all penetrations to be flashed and where shown on the drawings.
- B. All plies will be adhered with the following:
 - 1. With mastic. The base flashing and the modified membrane will be used as the flashing and nailed off 8" O.C. at all vertical surfaces.
- C. The entire sheet of the base flashing and the flashing membrane must be solidly adhered to the substrate. All base flashings shall be set in mastic and covered by an additional layer of modified bitumen membrane.
- D. Seal all vertical laps of flashing membrane with a three-course application of Flashing Bond and fiberglass mesh and aluminize.
- E. Seal junction of flashing membrane and roof with a three-course application of Flashing Bond and mesh.
- F. Install all work in accordance with manufacturer's instructions.

3.05 INTERFACE WITH OTHER WORK

- A. Coordinate with roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices to be coordinated with the roofing work as specified in other sections to avoid conflict or omission in waterproofing systems and to provide watertight installation.

3.06 FIELD QUALITY CONTROL

- A. At completion of roofing installation and associated work, meet with Installer, installer of associated work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.
- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party attending.

- C. Repair or replace (as required) deteriorated or defective work found at time above inspection to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- D. The Contractor is to notify the Owner upon completion of corrections.
- E. Following the final inspection, acceptance will be made in writing by the material manufacturer.

3.07 CLEANING and PROTECTION

- A. Clean roof and surrounding surfaces. Remove bituminous markings from finished surfaces.
- B. In areas where finished surfaces are soiled by bitumen or other source of soiling caused by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
- C. Repair or replace defaced or damaged finishes caused by work of this section.
- D. Protect installed work from subsequent construction operations.
- E. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings and counterflashings and as follows:
 - 1. Edge strip and flashing.
 - 2. Counterflashings for roof accessories, roof mounted equipment, vent stacks and similar items.
 - 3. Reglets and accessories.
- B. Sealants for joints within sheet metal fabrications.
- C. Foam Sealer tape for sheet metal and flashing applications.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood curbs and nailers.
- B. Section 07 0150.91 - Roofing Repair.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM A792 Steel Sheet, Aluminum-Zinc Alloy-Coated, by the Hot-Dip Process
- C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- E. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- F. ASTM B486 Paste Solder
- G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- H. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- I. ASTM D2178/D2178M - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2013a.
- J. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- K. California Code of Regulations, Title 24, Part 2, California Building Code (CBC), International Building Code
- L. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".
- M. FS QQ-L-201 Specification for Lead Sheet
- N. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- O. WH Warnock Hersey International, Inc. Middleton, WI.

- P. FM Loss Prevention Data Sheet.
- Q. NRCA National Roofing Contractors Association - Roofing Manual.
- R. Manufacturer's recommendations and specifications.

1.04 SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
 - 1. Indicate type, gauge and finish of metal.
- C. Product data: Provide manufacturer's specification data sheets for each product. Demonstrate compliance with specified attributes:
 - 1. Submit color chart for prefinished materials.
 - 2. Metal material characteristics and installation recommendations.
- D. CAL-GREEN Submittals: Product Data – VOC Limits: For adhesives sealants, fillers, primers and coatings, documentation including printed statement of VOC contents, comply with limits specified in related section.
- E. Certification:
 - 1. Submit certification that metal and fastening system furnished is Tested and Approved by Factory Mutual for 1-90 Wind Up-Lift Requirements.
- F. Provide approval letters from metal manufacturer for use of their metal within this particular roofing system type.
- G. Proof of fabricator and installer qualifications.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements , except as otherwise indicated.
 - 1. Factory Mutual Approval Standard 4435.
- B. Contractor's Warranty: The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be water-tight and secure for a period of five years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and make good any damage to other work or equipment caused by such leaks or the repairs thereof.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers, primers and coatings . Comply with limits specified in related section.

2.02 SHEET MATERIALS

- A. Galvanized Steel: ASTM A 653/ A 653M, with G90/ Z275 zinc coating; minimum 0.02 inch thick base metal, minimum thickness 24 gauge and greater as required by referenced standards for specific applications indicated.
- B. Aluminum: ASTM B 209 (ASTM B 209M), 3105 alloy, H14 temper; .040 inch thick; anodized finish of color as selected unless noted otherwise.

2.03 FABRICATION - GENERAL

- A. Fabricate in accordance with referenced standards. Form sections true to shape, accurate in size, square, and free from distortion or defects. Form pieces as recommended by SMACNA standard for conditions required.
 - 1. Provide reinforcements and supports as required for secure anchorage.
 - 2. Make joints rigid. Seams mechanically strong and soldered or sealed to make watertight.
 - 3. Fabricate corners in one piece with legs extending 30-inches each way to field joint. Lap, rivet, and solder or seal corner seams watertight.
 - 4. Turn up "end dam" flanges at ends of opening sill flashing pieces, lap with wall flashing and membranes to shed water.
 - 5. Fabricate cleats of same material as sheet, minimum 3/4 inches wide, interlockable with sheet.
 - 6. Hem exposed edges on underside 1/2 inch; miter and seam corners.
 - 7. Solvent clean all sheet metal. Coat surfaces to be in contact with roofing or otherwise concealed with specified asphaltic paint; 0.015-inch minimum uniform thickness.
- B. Fabricate cleats of same material as sheet, 1 gauge heavier, minimum 2 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Machine-roll flashing elements and joinery required to be curved or radiused. Do not field bend or "walk-down". Provide true curves and joinery utilizing "Pittsburgh lock" construction, minimizing joints. Segmented fabrication is not acceptable unless specifically noted and dimensioned on drawings.
- E. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- F. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- H. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.04 ROOF-RELATED SHEET METAL AND FLASHINGS

- A. Roof-Related Sheet Metal and Flashings: As indicated, as specified in related sections, as required by roofing material manufacturers and referenced standards. Coordinate work of this section with related sections. Provide complete systems without conflict or omission.

2.05 ACCESSORIES

- A. Reinforcement Metals:
1. Typical: Stainless steel or extruded aluminum.
 2. For copper work: Copper or Stainless Steel.
- B. Fasteners:
1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
 2. Fastening shall conform to Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent.
 3. Screws, bolts, washers, drive-ins.
 - a. For aluminum work: Stainless steel, aluminum, or zinc-aluminum alloy.
 - b. For galvanized steel work: Galvanized steel or cadmium plated steel.
 - c. For stainless steel work or dissimilar metals: Stainless steel.
 - d. For zinc alloy work: Steel, hot dip galvanized per ASTM A153, or stainless steel or aluminum.
 - e. For copper work: copper.
- C. Underlayment: Organic roofing felt, Type II ("No. 30").
- D. Primer: Galvanized iron type.
1. Product: Rust-Oleum 7400 System, Modified Alkyd Zinc Primer, <340 g/l VOC: www.rustoleum.com.
 2. Substitutions: Section 01 6000.
- E. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
- F. Sealant to be Exposed in Completed Work: 1; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.
- G. Flexible Flashing: 25 mil (0.64 mm), cold applied, self-adhering membrane consisting of a 3 mil (0.07 mm) high density, cross-laminated polyethylene film coated on one side with a 22 mil (0.56 mm) layer of rubberized asphalt adhesive; W. R. Grace "Vycor Plus".
- H. Sealer Tape: Medium Density Closed Cell EPDM or rubber blend tape single-coated with acrylic adhesive, for use in sheet metal and flashing applications.
1. Width and Thickness: As required for snug fit under low compression to exclude moisture.
 2. Tensile Strength, ASTM D 412: 65 PSI.
 3. Pres-On; P9100, www.pres-on.com.
 4. 3M
 5. Argent; www.argent-international.com.
 6. Substitutions: See Section 01 6000 - Product Requirements.
- I. Plastic Cement: 1, Type I.
- J. Flux: FS O-F-506.

- K. Solder: ASTM B 32; Alloy Grade 50A.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.
- C. Beginning of installation means acceptance of existing conditions.
- D. Field measure site conditions prior to fabricating work.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA Architectural Sheet Metal Manual.
 - 1. Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level in locations indicated.
 - 2. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction. Conform to referenced standards. Make metal joints watertight.
- C. Fastening of metal to walls and wood blocking shall comply with SMACNA Architectural Sheet Metal Manual, Factory Mutual 1-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.
- D. Underlayment: Where sheet metal installation occurs on cementitious or wood substrates, install roofing felt covered with slip sheet direct to substrate, do not allow sheet metal installation directly to concrete or wood.
- E. Coordinate sheet metal installation with roofing underlayment and air barrier and water-resistive barriers specified in related sections.
- F. All accessories or other items essential to the completeness of sheet metal installation and water tight envelope of the building, whether specifically indicated or not, shall be provided.
- G. Flashing: Joints at 10-foot maximum spacing and at 2-1/2-feet from corners. Butt joints with 3/16-inch space centered over matching 8-inch long backing plate with sealer tape in laps.
- H. Flanged flashings and roof accessories: Set on continuous sealer tape. Nail flanges through sealer tape and at 3-inch maximum spacing.
- I. Isolate metal from dissimilar metal with 2 coats of specified asphaltic paint, sealer tape or other approved coating, specifically made to stop electrolytic action. Use only stainless steel fasteners to connect isolated dissimilar metals.

- J. Joints, fastenings, reinforcements and supports: Sized and located as required to preclude distortion or displacement due to thermal expansion and contraction. Conceal fastenings wherever possible.
- K. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- L. Flexible Flashing Installation: Install at closure flanges, under metal copings, caps and platforms; fully adhered, free of voids, blisters and buckling.
 - 1. Prime substrates as recommended by flexible flashing manufacturer, allow to dry.
 - 2. Install flexible flashings in maximum feasible lengths to minimize lap joints.
 - 3. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before applying. Move along opening or joint, being careful to put flashing as evenly as possible over the opening. Avoid fishmouths.
 - 4. Press flashing firmly into place and roll using resilient roller with heavy hand pressure. Ensure continuous and intimate contact with substrate.
 - 5. If wrinkles develop, carefully cut out affected area and replace as outlined above.
 - 6. Minimize exposure time to that period recommended by the manufacturer.
- M. Apply plastic cement compound between metal flashings and felt flashings.
- N. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- O. Seal prefinished metal joints watertight.
- P. Solder other metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

3.04 OPENING FLASHING

- A. Flash all wall openings as follows.
 - 1. Install opening flashings after completion of air barriers.
 - 2. Install opening flashings (pre-molded corners and flexible flashings) in accordance with flexible flashing manufacturer's recommendations.
 - 3. Install premolded corner flashings at opening sill corners with nails or screws over layer of flexible flashing extended over face of sheathing and sill opening.
 - 4. Install flexible flashing across face of wall under opening, install additional layer as sill pan with ends turned up 3 inches, coordinate with weather-resistive barrier and jamb flashings to form water-shedding laps. Direct all water flow to exterior of building.
 - 5. Install flexible flashing at head and jamb under weather resistive barrier along opening header, coordinate to lap over sill pan described above, install flexible flashing across head of opening, extended past jamb flashings by 3 inches and secure with nails or screws to wall, fold weather resistive barrier down over head flashing and seal with tape.
 - 6. Flanged Fixtures (Window, Door, Louver, etc.): Set flanges of Head and Jamb in beads of sealant. Do not flash over bottom nailing flange. Do not seal bottom flange.

3.05 UTILITY WALL PENETRATION FLASHING INSTALLATION

- A. Select prefabricated facility services utility penetration flashing sizes and profiles required to suit conditions.
- B. Install in accordance with manufacturer's recommendations, properly lapped with weather resistive barrier and related flashing and finishes to shed water to the building exterior.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.
- C. Tolerances
 - 1. Exposed surfaces: Free of dents, scratches, abrasions, or other visible defects; clean, ready for painting.
 - 2. Set flashings and sheet metal to straight, true lines with exposed faces aligned in plane as indicated.

3.07 SHOP FABRICATED SHEET METAL

- A. Installer shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Install sheet metal to comply with Architectural Sheet Metal manual, Sheet Metal and Air Conditioning Contractor's National Associations, Inc.
 - 1. Hem exposed edges.
 - 2. Angle bottom edges of exposed vertical surfaces to form drip.
 - 3. Lap all corners with adjoining pieces, fasten and set in sealant.
- D. Form Joints for continuous strip flashings with a 1/4 inch opening between sections. Cover opening with a cover plate or back with an internal drainage plate formed to the profile of flashing piece. Embed cover plate in mastic, fastened through the opening between the sections and loose locked to the drip edges.

3.08 SCHEDULE

- A. Abbreviations:
 - 1. BUR = SBS Modified Membrane Roofing, type(s) specified in related section(s).
 - 2. AS = Asphalt Shingles, type(s) specified in related section(s).
- B. 24 ga. Galvanized Steel:
 - 1. Continuous Cleats/Hook Strips
 - 2. Securement Clips
 - 3. Siding stops and miscellaneous shapes as indicated.
 - 4. Stucco/Plaster Stops and miscellaneous shapes as indicated.
 - 5. Stucco/Plaster Termination Screeds, custom or specially formed types.
 - 6. BUR Counterflashings
 - 7. BUR, PVC Sleeper Covers
 - 8. BUR, PVC Curb Covers
 - 9. BUR Transition Flashings
 - 10. BUR Scuppers
 - 11. BUR, PVC, AS, RT Gutters and Gutter Expansion Joints
 - 12. BUR, PVC, AS, RT Downspout/Rainwater leader Inlets
- C. 20 ga. Galvanized Steel:
 - 1. Exhaust Fans
 - 2. Passive Vents

- D. Stainless Steel:
 - 1. Flashing in contact with aluminum items.
- E. Lead Flashing:
 - 1. AS, RT Vent Pipe and Conduit Penetrations, 4 lb.
 - 2. BUR Interior Drain Flashings, Vent Pipe and Conduit Penetrations, 4 lb.
- F. Types not otherwise scheduled: As recommended by referenced standards for application or condition indicated.

END OF SECTION

**SECTION 08 1416
FLUSH WOOD DOORS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush configuration; non-rated. Doors to receive reinstalled hardware removed from existing doors.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 8113 - Sustainable Design Requirements.
- C. Section 06 2000 - Finish Carpentry: Wood door frames.
- D. Section 09 9123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

- A. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- D. California Code of Regulations, Title 24, Part 2, California Building Code (CBC), International Building Code.
- E. California Code of Regulations, Title 24, Part 11 California Green Building Standards Code, "CAL-Green".
- F. Manufacturer's specifications and recommendations.
- G. National Wood Window and Door Association (NWWDA) standard: I.S. 1-87.
- H. AWI/AWMAC/WI - Architectural Woodwork Standards (AWS); 2009.

1.04 SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. CAL-GREEN Submittals:
 - 1. Product Data – VOC Limits: For adhesives, sealants, fillers, primers and coatings, documentation including printed statement of VOC contents, comply with limits specified in related section.
 - 2. Composite Wood Formaldehyde Limits: Provide certification that all products meet current CARB Airborne Toxic Control Measure (ATCM) for Composite Wood Formaldehyde Limits by Mandatory Compliance Dates as specified in related section.
- D. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

- 2. Include certification program label.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI/AWMAC/WI - Architectural Woodwork Standards (AWS); 2009, Section 9, Custom Grade.
- B. Finish doors in accordance with AWI/AWMAC/WI - Architectural Woodwork Standards (AWS); 2009, Section 5.
- C. Certifications: Furnish each shipment with affixed label or other identification indicating name of manufacturer and compliance with specified standard.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

- A. See Section 01 7000 - Contract Closeout for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Provide warranty for the following term: All Doors - Life of Installation.
- D. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers, primers and coatings . Comply with limits specified in related section.
- B. Composite Wood products must meet current CARB Airborne Toxic Control Measure (ATCM) for Composite Wood Formaldehyde Limits by Mandatory Compliance Dates as specified in Section 01 6116.

2.02 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Graham - Maiman Series Wood Doors: [//architectural.masonite.com/#sle](http://architectural.masonite.com/#sle).
 - 2. Marshfield DoorSystems, Inc: [//architectural.masonite.com/#sle](http://architectural.masonite.com/#sle).
 - 3. Oregon Door: www.oregondoors.com/#sle.
 - 4. VT Industries, Architectural Wood Doors: www.vtindustries.com
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.03 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. AWI/AWMAC/WI - Architectural Woodwork Standards (AWS); Section , Custom Grade.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Wood veneer facing for field opaque finish.

2.04 DOOR AND PANEL CORES

- A. Non-Rated Solid Core Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.
 - 1. Screw Withdrawal, Face: 700 lbf (3100 N).
 - 2. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.05 DOOR FACINGS

- A. Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.
- B. Facing Adhesive: Type I - waterproof all locations.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Prior to factory finish cut-out for hardware.
 - 1. Bevel or ease all corners at intersections of faces with edges, top, and bottom, 1/16-inch.
 - 2. Doors to receive paint finish: Clear seal all surfaces including faces, edges, top, bottom, cutouts, and rabbets.
- C. Cores Constructed with stiles and rails:
 - 1. Bevel lock edge 1/8 in 2.
 - 2. Cores
 - a. Glue all edges of adjacent components. Glue entire core assemble to edges.
 - b. Block for hardware at doors having mineral or particleboard cores. Provide solid blocking for through-bolted hardware.
- D. Provide solid blocks at lock edge for hardware reinforcement.
 - 1. Provide solid blocking for other throughbolted hardware.
- E. Fit door edge trim to edge of stiles after applying veneer facing.
- F. Vertical Exposed Edge of Stiles - Veneer Faces: Of same species as veneer facing.
- G. Fit door edge trim to edge of stiles after applying veneer facing.
- H. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- I. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
 - 1. Exception: Doors to be field finished.
- J. Provide edge clearances in accordance with the quality standard specified.

- K. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700.

2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Opaque:
 - a. System - 10, UV Curable, Water-based.
 - b. Color: As selected by Architect. to match adjacent wall color
 - c. Sheen: Semigloss.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

2.08 ACCESSORIES

- A. Wood Door Frames: As specified in Section 06 2000.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Conform to WI requirements for fit and clearance tolerances. Door clearance at head and jambs shall be 3/32-inch plus or minus 1/32-inch.
- D. Doors shall operate freely but not loosely and shall be free from rattling in closed position.
- E. Adjust width of non-rated doors by cutting equally on both jamb edges.
- F. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
- G. Use machine tools to cut or drill for hardware.
- H. Coordinate installation of doors with installation of frames and hardware.
- I. Install door louvers plumb and level.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure in compliance with prevailing codes.

- C. Repair damaged and defective work and eliminate functional and visual defects. Where repair is not possible replace work. Adjust for uniform appearance. No unfinished surfaces or irregularities in completed work.
- D. Protect installed work from subsequent construction operations until Owner's acceptance. Utilize durable protective wrappings using methods which will not damage surfaces or finishes. Do not remove until Owner acceptance following move-in.

END OF SECTION

**SECTION 09 2116
GYPSUM BOARD ASSEMBLIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gypsum wallboard.
- B. Joint treatment and accessories.
- C. Trim and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1000 - Rough Carpentry: Building framing.
- C. Division 09: Pertinent sections specifying finishes installed over gypsum board substrates.
- D. Divisions 22 and 23: Pertinent sections specifying building utility systems penetrating gypsum board.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009).
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- I. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 1995a.
- J. California Code of Regulations, Title 24, Part 2, California Building Code (CBC), International Building Code.
- K. California Code of Regulations, Title 24, Part 11, California Green Building Standards Code, "CAL-Green".
- L. Division of the State Architect (DSA) Interpretation of Regulations: IR 25-3, Drywall Ceiling Suspension Conventional Construction One-Layer.
- M. GA-214 - Recommended Levels of Gypsum Board Finish; Gypsum Association; 2007

- N. GA-216 - Application and Finishing of Gypsum Board; 2013.
- O. California Building Code, Title 24, Part 2, California Building Code, Chapter 8.

1.04 SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Provide complete submittals at the same time as submittals for work in related sections to permit review of complete and integrated systems and assemblies.
- C. Product Data: For each type of product indicated, demonstrate compliance with specified attributes.
- D. Product Data: Provide data on gypsum board.
- E. CAL-GREEN Submittals: Product Data – VOC Limits: For adhesives sealants, fillers, primers and coatings, documentation including printed statement of VOC contents, comply with limits specified in related section.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. VOC Limits for adhesives, sealants, fillers, primers and coatings . Comply with limits specified in related section.

2.02 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. Georgia-Pacific Gypsum: www.gpgypsum.com.
 - 2. National Gypsum Company: www.nationalgypsum.com.
 - 3. PABCO Gypsum: www.pabco gypsum.com.
 - 4. USG Corporation: www.usg.com.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - 5. Mold Resistant Paper Faced Products:
 - a. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard.
 - b. National Gypsum Company; Gold Bond XP Gypsum Board.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 Gypsum Wallboard ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 - 1. Products:
 - a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
 - c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated. Mechanically fastened.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
 - 2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.
 - 3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
- E. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions. Water resistant where used with water resistant backer board.
 - 1. Tape: 2 inch wide, creased paper tape for joints and corners, USG "Perf-A-Tape", or equal.
 - 2. Joint Compound: Drying type, vinyl-based, ready-mixed.
- F. Finishing Compound: Surface coat and primer, takes the place of skim coating.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.
- I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- J. Adhesives
 - 1. Modified contact adhesive: As recommended by the gypsum board manufacturer and having a placement time before setting of at least 15 minutes.
 - 2. Joint compound adhesive: As recommended by the gypsum board manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.
- B. Verify that framed substrates demonstrate flatness characteristics such that work of this section will meet specified tolerances.

3.02 INSTALLATION - GENERAL

- A. Install materials in accordance with gypsum board application and finishing standards referenced.
 - 1. Single layer application: Screw attachment.
 - 2. Float interior angles, except where required to conform to fire or acoustical separation requirements.
 - 3. Do not install scored, scratched, broken, damp, or otherwise damaged boards.
 - 4. Smooth cut edges and ends to obtain neat fitting joints.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Installation on Wood Framing: For non-rated assemblies, install as follows:
 - 1. Single-Layer Applications: Screw attachment.

3.05 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C 840, and required by Section 09 9000 Painting and Coating, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board, Tack Board, or Cementitious Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

**SECTION 09 9123
INTERIOR PAINTING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming woodwork.
- D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical equipment before installing equipment.
 - 2. flush wood doors and frames
 - 3. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, to match face panels.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Pertinent sections of Division 05 specifying shop-primed and galvanized metal items.

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 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 D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. Manufacturer's recommendations and specifications, including installation instructions.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

1.05 SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 4. Manufacturer's installation instructions.
 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
 6. Resin Type.
 7. Total VOC Content in grams per liter.
 8. Solids Content By Volume SCBV (not solids by weight). All products shall be minimum 35% SCBV.
 9. Composition-By-Weight. Demonstrate composition by percentage related to total weight of all components.
 10. Film Thickness Per Coat, Wet and Dry.
 11. Prime Pigment: Demonstrate prime pigment by percentage related to total volume of all components.
- C. Samples: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 3. Allow 15 days for approval process, after receipt of complete samples by Architect.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten (10) years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five (5) years experience and approved by manufacturer.

1.07 MOCK-UP

- A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B. Provide door and frame assembly illustrating paint color, texture, and finish.
- C. Locate where directed by Architect.
- D. Final color selections and acceptance will be made only after review of mock-ups under lighting conditions approximating finish conditions.
- E. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 DESIGN REQUIREMENTS

- A. Design Intent: Paint all exposed surfaces of Work, whether or not the item or surface is specifically identified within the Contract Documents.
 - 1. The number of coats specified is the minimum to be applied. Provide paint finishes of even, uniform color, free from cloudy or mottled surfaces. Provide one additional coat if necessary where "deep colors" are selected.
 - 2. Non-scheduled items: Provide manufacturer's approved and recommended system as set forth in Manufacturer's "Specifications Architectural Finishes".

2.02 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. Dunn Edwards; www.dunnedwards.com.
 - 3. Kelly-Moore: www.kellymoore.com.
 - 4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.03 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.
 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
 5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.04 PAINT SYSTEMS - INTERIOR - WOOD

- A. Paint WI-OP-3L - Wood, Opaque, Latex, Low-VOC 3 Coat: Cedar, redwood, architectural glue-laminated beams, typical interior wood trim with opaque finish. Provide number of coats necessary for stain resistance and uniform color.
1. One coat of latex primer sealer.
 2. Two coats of latex enamel; . Sheen selected by Architect.
 3. Dunn-Edwards Products:
 - a. DE INTER-KOTE Wood Primer IKPR00.
 - b. DE SPARTAWALL 100 % Acrylic Semi-Gloss SWLL50 Series.
 4. Kelly-Moore Products:
 - a. KM 973 Acryplex Low VOC Interior Enamel Undercoat.
 - b. KM 1050 Series Premium Professional Low VOC Interior Acrylic Latex.

2.05 PAINT SYSTEMS - INTERIOR - GYPSUM AND PLASTER

- A. Paint GI-OP-3A-L Gypsum Board/Plaster, Acrylic, Low-VOC, 3 Coat:
1. One coat of low odor/low-VOC vinyl acrylic primer sealer: pigmented.
 2. Two coats of low odor / low-VOC acrylic, sheen as selected by Architect.
 3. Note: Surfaces that prepared to a Level 5 Finish, using the Level 5 Primer/Prep Coat as specified in Section 09 2116 "Gypsum Board Assemblies", may omit primer coat specified above when topcoat manufacturer confirms in writing that this primer is compatible with the finish coats as specified.
 4. If any of the products below are discontinued, submit alternate products approved by the Manufacturer in writing.
 5. Dunn-Edwards Products:
 - a. DE VINYLASTIC Premium VNPR00.
 - b. DE SPARTAWALL 100 % Acrylic Semi-Gloss SWLL50 Series.
 6. Kelly Moore Products:
 - a. KM 971 Acry-Plex Low VOC Interior PVA Primer/Sealer.
 - b. KM 1010 Premium Professional Interior 100% Acrylic Enamel Series.

2.06 PRIMERS

- A. Primers: As required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
 - 1. If products specified are discontinued, submit alternate product approved by specified Manufacturer in writing.

2.07 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Sanding materials: 120-180 grit, for architectural woodwork, finish carpentry, wood doors, or other surfaces requiring touch-up.
- C. Patching Material: Latex filler.
- D. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the manufacturer-recommended maximums.

3.02 PROTECTION OF ADJACENT WORK

- A. Protect surrounding elements from damage from painting procedures. Provide temporary facilities and barricades required. Additional requirements specified in Division 01.
- B. Carefully remove and store removable items located in areas to be painted, including fittings and finish hardware; reinstall upon completion.
- C. Separate areas to be protected from painting areas using means adequate to prevent damage.
- D. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.

3.03 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.

- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

3.04 PREPARATION - EXISTING SURFACES

- A. General: As specified above and as follows below.
- B. Remove or repair existing coatings that exhibit surface defects. Feather-edge patches to make finished edges inconspicuous.
- C. Existing Gypsum Board Surfaces to be Painted: Remove dirt, loose texturing, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Surfaces to be clean, dry, free of dirt, dust, grease, oil, mildew, efflorescence and other contaminants affecting paint adhesion or performance. Completely remove all loose, peeling or checked paints by sanding, scraping or other methods. Fill all holes and defects with suitable patching or spackling material compatible with the substrate material, allow to completely dry and sand to approximate existing adjacent textures. Spot prime patched areas.

3.05 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.06 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.07 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.08 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.09 SCHEDULE - SURFACES NOT REQUIRING PAINTING BY THIS SECTION

- A. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished except those specifically noted in this section to be finished; materials and products having factory-applied primers are not considered factory finished.
 - 2. Equipment, ductwork, conduit and electrical items, with factory finishes suitable for interior exposure, where concealed from public or occupant view in custodial or utility spaces.
 - 3. Items indicated to receive other finishes.
 - 4. Items indicated to remain unfinished.
 - 5. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead items.
 - 7. Marble, granite, slate, and other natural stones.
 - 8. Ceramic and other types of tiles.
 - 9. Pre-finished wall, ceiling, roof and floor materials or coverings, unless specifically scheduled for field painting, including, but not limited to:
 - 10. Floors, unless specifically indicated.
 - 11. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco unless specifically indicated.
 - 12. Glass.
 - 13. Concealed pipes, ducts, and conduits.

3.10 SCHEDULE - SURFACES TO BE FINISHED

- A. General: Paint the surfaces described below under Schedule - Paint Systems. All surfaces exposed to interior atmosphere, or visible to the eye, unless specifically excluded by the Article titled "Do Not Paint or Finish the Following Items". If a coating system is not specified for a particular surface or substrate, provide a three-coat finish system recommended by the paint or coating manufacturer for that surface or substrate. Include all preparation necessary as appropriate for a similar substrate listed in the Article titled "PREPARATION", or preparation for that substrate as recommended by the paint or coating manufacturer.
- B. Mechanical and Electrical: Use paint systems defined for the materials to be finished.
 - 1. Paint all conduit, insulated and exposed pipes, boxes, hangers, brackets, collars and supports, mechanical equipment, electrical equipment, and exposed ducts occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint shop-primed items occurring in finished areas.
 - 3. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 4. Paint dampers exposed behind louvers, grilles, to match face panels.

- C. Finish top, bottom, and side edges of interior doors the same as exposed faces.
- D. Paint access doors, fire hose and extinguisher cabinets, panelboards, conduits and exposed plumbing piping.

3.11 SCHEDULE - PAINT SYSTEMS

- A. Gypsum Board: Finish all surfaces exposed to view, GI-OP-3A..
 - 1. Interior Ceilings and Bulkheads: Flat sheen.
 - 2. Interior Walls: Semi-gloss Sheen at Toilet Rooms, Custodians, Storage Room, Food Service.
 - 3. Interior Walls: Eggshell at Classrooms, Corridors, Administrative Offices and Work Rooms.
- B. Wood: Finish all surfaces exposed to view.
 - 1. Interior Opaque Finish: WI-OP-3L
 - a. Doors, Trim and frames: Semi-gloss sheen.
- C. Wall and Substrate Surfaces Under Wall Covering: GI-P-1A.

3.12 SCHEDULE - COLORS

- A. Interiors, allow individual schedule for each Building:
 - 1. Paint access doors and panels same as walls and wainscots.
 - 2. Wood Trim; as selected, allow for deep tones.
 - 3. Doors and Frames for Utility or staff access only, as selected; match walls/wainscot.
 - 4. Mechanical or other equipment exposed to view; as selected or match wall/wainscot as directed.

END OF SECTION

SECTION 23 0000

HEATING, VENTILATING, AIR CONDITIONING

PART 1 GENERAL

1.01 SUMMARY

- A. The requirements of the General Conditions, Supplemental General Conditions, Division 01 Sections and Section 23 0500 - General Mechanical apply to all work herein.
- B. Section includes furnishing and installation of complete "Heating, Ventilating, Air Conditioning" systems, including but not necessarily limited to the following:
 - 1. VRV HVAC split system;
 - 2. Packaged rooftop air conditioning;
 - 3. Gravity relief ventilators;
 - 4. Thermal and sound insulation for all piping and ductwork supplied under this Section;
 - 5. Refrigerant piping and appurtenances;
 - 6. Condensate drainage piping;
 - 7. Ductwork, inclusive of all air turns, dampers, grilles, diffusers, fire dampers, sound traps, supports, bracing and fresh air/combustion air ducts;
 - 8. Flashings, curbs and caps in connection with all equipment, piping and ductwork supplied under this Section;
 - 9. Temperature control wiring and control devices;
 - 10. Start up, adjusting, and balancing.
- C. Related Sections
 - 1. Division 07 Section for sheet metal flashing and trim
 - 2. Division 09 Section for finish painting
 - 3. Section 22 0000 - Plumbing
 - 4. Section 23 0500 - General Mechanical
 - 5. Section 23 0593 - Testing, Adjusting and Balancing for HVAC
 - 6. Section 23 0923 - Controls for HVAC
 - 7. Division 26 Section for basic electrical requirements
- D. The Contractor shall furnish all materials and labor under the scope of the Contract, unless otherwise noted. Anything accepted as standard trade practice reasonably incidental to the completion of the system shall be furnished without additional cost to the Owner. The Contractor shall understand that the work herein described shall be complete in every detail, notwithstanding every item necessarily involved is not particularly mentioned, and the Contractor shall be held to provide all labor and material necessary for the entire completion of the work.
- E. Comply with applicable requirements in ASHRAE 62.1 and ASHRAE 90.1

1.02 SUBMITTALS

- A. All submittals shall be in accordance with the requirements of Division 01 Sections and the following.
- B. Product Data
 - 1. For each type of product indicated, include manufacturer's specifications, data sheets, and certified drawings on major equipment. Include physical and performance data such as weights, sizes, capacities, required clearances, performance curves, acoustical characteristics, finishes, color selection, and accessories.

2. Include certified drawings on major equipment.
- C. Coordinated Layout / Shop Drawings
1. Prepare complete consolidated and coordinated layout drawings for all new systems, and for existing systems that are in the same areas. Shop drawings shall be prepared using AutoCAD 2012 or newer and shall be drawn at a minimum $\frac{1}{4}'' = 1' - 0''$ scale.
 2. All drawings shall be fully coordinated with HVAC, Plumbing, Fire Protection, Electrical, Structural, and Architectural work. Drawings shall be coordinated and dimensioned indicating equipment, pipe, duct, fire protection, and electrical in relation to architectural and structural features. Indicate exact locations of valves, piping specialties, access doors, etc.
 3. Clearly identify and dimension the proposed locations of the principal items of equipment and adequate clearance for all equipment, piping, pumps, valves and other items. Provide detailed layout of all piping systems showing the proposed routes.
 4. Show the access means for all items requiring access for operations and maintenance.
 5. Submit shop drawings to Architect for approval, prior to fabrication or installation of any work. Do not install equipment or piping until drawings have been approved. Any work installed without prior shop drawing approval shall be removed at the Contractor's expense.
 6. Use of contract documents for shop drawings is not acceptable.
- D. Shop-wiring diagrams of temperature controls and air conditioning unit controls.
- E. Equipment manufacturer shall design, construct, and certify that his equipment satisfies the special minimum seismic resistance requirements for this project and shall submit calculations or test results supporting his certification.
- F. Field quality-control test reports.
- G. Operation and maintenance data
1. Contractor shall provide all operating and maintenance instructions provided by the manufacturer, describing proper operation and maintenance of any equipment and devices installed. Operating and maintenance instructions shall cover maintenance, adjustment, and operation of each piece of apparatus.
 2. Contractor shall also provide a parts list of all equipment and component parts for all equipment under this Section. The equipment list shall include manufacturer's name, model number, and local representative, service facilities and normal channel of supply for each item.
 3. Data shall include a table of contents identifying items therein, and index tabs for each system. Neatly obscure or cross out inapplicable data from manufacturer's literature. Include the following:
 - a. Manufacturer's brochures, ratings, certified shop drawings, lubrication charts and data, and parts list with part numbers. Mark each sheet with equipment identification number and actual installed condition or system and location of installation. Specifically identify which options are provided.
 - b. Description of start-up and operating procedures for each system, including controls diagrams and description of operating sequences.
 - c. Recommend preventative maintenance schedule and procedures.
 4. Submit data to the Architect for approval. Final acceptance of the work will not be made until a satisfactory submission of this material is received and approved by the Architect.
- H. As-built Drawings
1. Complete and detailed shop drawings shall be maintained throughout the coordination and construction phase, indicating all equipment and trades' work clearly. All equipment including piping, etc. shall clearly identify both top and bottom elevations as

well as distances from equipment to established building lines. Coordinate with other trades and field conditions and show dimensions and details including building construction and access for servicing. All changes in the work shall be recorded on this set on a daily basis. In addition to changes made during course of work, show the following:

- a. Exact location, type and function of concealed valves and controllers.
 - b. Exact size, elevations and location of underground and under floor piping.
2. Submit to Architect for approval.
- I. Warranty
 1. Equipment warranties shall be provided for all equipment, with all necessary information filled in, except purchase date, in favor of the Owner.
 - J. Refer to mechanical equipment specified herein for additional requirements

1.03 DEMONSTRATION & TRAINING

- A. The Owner's authorized representative shall be instructed in the operation and servicing of all heating, ventilating, and air conditioning systems, subsystems and equipment.
 1. Provide a minimum of one day of instruction time. All instruction shall be provided at no cost to the Owner.

PART 2 PRODUCTS

2.01 REFRIGERANT PIPING AND APPURTENANCES

- A. Refrigerant piping shall be Type "ACR" ASTM B 280, drawn temper, seamless copper tube.
- B. Pipe fittings and unions shall be wrought-copper with brazed joints. ASME B16.22. Mechanical joints on refrigerant piping are prohibited. All refrigerant piping joints shall be brazed. Lead-free silver solder, minimum 15% silver content. Harris "Stay Silv 15" or equal.
- C. Flexible connectors shall be bronze, double braided, with inlet and outlet connections as required. Metraflex BBS series or equal.
- D. Sight glasses shall be color change moisture indication type, replaceable element, filter screen and pad, sweat solder ends; Sporlan "See-All", Henry, or equal.
- E. Charging and purge valves shall be forged brass, diaphragm packless, globe type, angle or straight through, one end solder, one end flare; Henry 623 and 643 series, Sporlan, or equal.
- F. Solenoid valves shall be of forged brass, extended solder end connections, molded coil; Sporlan "E" series or equal. ARI 760 & UL 429
- G. Filter driers shall be replaceable media, angle type; Henry "Dri-Cor" or equal; ARI 730.
- H. Electronic thermostatic expansion valves shall have stainless steel body and connections, ceramic slide and port, linear flow capacity, continuous modulation, and direct coupling of motor and valve; Emerson "EX" series or equal.
- I. Pipe hangers: All refrigerant piping shall be supported 8' on center. Hangers and supports shall be as specified in Section 23 0500 - General Mechanical".
- J. Split system fan-coil units and heat pump units shall have brazed sweat-fitting connections on the refrigerant piping between the units with a flexible piping section at the outdoor unit.

2.02 CONDENSATE DRAINAGE PIPING

- A. Condensate drainage piping shall be Anvil, Mueller, Watts, or approved equal.

1. 1 ¼ inch and larger shall be type DWV seamless copper tube, ASTM B 306.
 2. 1 inch and smaller shall be type M, drawn temper, seamless copper tube, ASTM B 88.
- B. Drainage fittings shall be ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings. 1 ¼ inches & smaller, standard pressure fittings.
- C. Solder shall be ASTM B 32, lead free with ASTM B 813, water-flushable flux.
- D. Acidic condensate drainage pipe shall be Schedule 40 CPVC & fittings.

2.03 VALVES

- A. General Requirements:
1. All valves, except pressure reducing and control valves, shall be the same size as the pipe to which they are installed.
 2. All valves of a particular type and size range shall be the product of one manufacturer.
 3. Valve body materials shall be compatible with piping system materials.
 4. Provide a union immediately downstream from each valve, unless the valve is flanged.
 5. All valves shall be installed with the stem 45 degrees above horizontal, if possible. In no case shall the stem be installed below horizontal.
 6. Where insulation is indicated, install extended stem valves arranged in proper manner to receive insulation.
- B. Ball Valves: Nibco T-685-80, Watts B-6080, or KITZ 58; two-piece, full port, lever handle, 600 psi CWP.
- C. Triple Duty Valves: Bell & Gossett "3D, 3DV or 3DS" series or approved equal, triple duty angle pattern valves designed to perform the functions of a non-slam check valve, shut off valve, and calibrated balance valve.
- D. Circuit Setters: ITT Bell & Gossett, Circuit Setter Plus series, Model CB, calibrated balance valves with NPT and solder connections. Valves shall be designed to allow installing contractor to pre-set balance points for proportional system balance prior to system start-up. All valves ½" to 3" pipe size to be of bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports shall be fitted with internal EPT inserts and check valves. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves shall have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplates to assure specific valve settings. Valves shall be designed for positive shut-off.

2.04 UNIONS

- A. Steel Pipe: malleable iron, 150 lb., ground joint, Anvil figure 463, Kuhns, or equal.
- B. Copper Pipe: soldered joint, Nibco series 633 or 733, Mueller, or equal.
- C. Dielectric: Epco, Watts, Wilkins, or equal.

2.05 GRAVITY RELIEF VENTILATORS

- A. Greenheck model GRSR relief gravity ventilator, as scheduled on the Drawings, or approved equal.
- B. Each unit shall bear a permanently affixed manufacture's nameplate containing the model number and individual serial number
- C. Hood shall be constructed of aluminum. Internal structure shall be constructed of galvanized steel.

- D. Birdscreen shall be constructed of ½ inch galvanized mesh and mounted horizontally across the intake area of the hood.
- E. Housing shall be constructed of aluminum, including windband and curb cap. Windband shall be one piece spun aluminum construction and maintain original material thickness throughout the housing. Windband shall include an integral rolled bead for strength. Curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to roof.
- F. Options / Accessories
- G. Insulated roof curb, to be mounted onto roof with fan.
- H. Gravity type backdraft damper, with galvanized frames with pre-punched mounting holes. Damper shall be balanced for minimal resistance to flow.

2.06 GRAVITY EXHAUST COMBINATION LOUVER DAMPER

- A. Ruskin ELBD375E extruded aluminum dampers with bird screen in removable frame, where shown on the Drawings or approved equal. Louvers shall be automatic exhaust dual combination louver damper. Stationary blades with extruded vinyl seats and automatic backdraft blades shall be entirely contained within a 6" frame. Louver components (heads, jambs, sills, blades & mullions) shall be factory assembled.
- B. Louver sizes too large for shipping shall be built up by the Contractor from factory assembled louver sections to provide overall sizes required. Louver design shall limit single section blade span to 60" and shall be designed to withstand a wind load of 30 lbs. per sq. ft. Additional structural supports provided by others may be required.

2.07 THIN LINE CONTROL DAMPER

- A. Ruskin CD40 low leakage dampers, where shown on the Drawings or approved equal.
- B. Frames shall be 4" x 1" x .081" (minimum thickness) 6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blades shall be airfoil type extruded aluminum (maximum 4" [102] depth) with integral structural reinforcing tube running full length of each blade.
- C. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket that enables air pressure from either direction to assist in blade to blade seal off. Blades seals shall be mechanically locked in extruded blade slots, yet shall be easily replaceable in field. Adhesive or clip-on type blade seals are not acceptable.
- D. Bearings shall be non-corrosive molded synthetic. Axles shall be hexagonal (round not acceptable) to provide positive locking connection to blades and linkage. Linkage shall be concealed in frame.

2.08 DRAINABLE THIN LINE STATIONARY LOUVER

- A. Ruskin EFF211D extruded 6063T6 aluminum alloy louvers where shown on the Drawings or approved equal. Louvers shall be stationary type.
- B. Louvers shall have a minimum of 38% free area based on a 48" wide x 48" high. Stationary blades shall be contained within a 2" frame. Louver components (heads, jambs, sills, blades, and mullions) shall be factory assembled by the louver manufacturer.
- C. Louver sizes too large for shipping shall be built up by the contractor from factory assembled louver sections to provide overall sizes required. Louver design shall incorporate structural

supports required to withstand a wind load of 20 lbs. per sq. ft. (.96kPa) (equivalent of a 90 mph wind..

2.09 AIR PURIFICATION SYSTEM

- A. Provide Global Plasma Solutions

2.10 REGISTERS, GRILLES AND DIFFUSERS

- A. Air terminals shall be Titus, Price, or approved equal, as scheduled on the Drawings.
- B. All terminals shall be steel and shall be factory painted "off-white", unless otherwise noted. Air terminals for installation in gypsum board shall have a 1" border for surface mounting. All air terminals for installation in lay-in ceilings shall have a lay-in frame to match the specified grid system.
 - 1. Wall Return Grilles (WRG)
 - a. Steel return grilles shall be TITUS Model 355R (½-inch blade spacing), as scheduled on the Drawings or approved equal. The fixed deflection blades shall be available parallel to the long or short dimension of the grille. Construction shall be of steel with a 1¼-inch wide border on all sides. Screw holes shall be countersunk. Corners shall be welded with full penetration resistance welds.
 - b. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test performance data. Blades shall be firmly held in place by mullions from behind the grille and fixed to the grille by welding in place. Blade deflection angle shall be available at 35°.
 - 2. Ceiling Return Grille, Exhaust Grille (CR) (EG)
 - a. Exhaust grilles shall be Titus 50F with aluminum grid and aluminum border, as scheduled on the Drawings or approved equal.
 - b. Grilles must provide a free area of at least 90%. Outer borders shall be constructed of heavy extruded aluminum with a thickness of 0.040-0.050 inch and shall have countersunk screw holes. Border width shall be 1¼ inches on all sides and shall be interlocked at the four corners and mechanically staked to form a rigid frame.
 - c. Aluminum grid size: ½ x ½ x ½ inch

2.11 ACCESS PANELS

- A. Where construction is not inherently accessible, provide adequately sized and conveniently located access doors in ceilings, walls, and furring for access to controls and for servicing valves, equipment, etc.
- B. Access doors shall be flush, prime coated steel except for tiled surfaces, screwdriver operated cam locks, except for fire-rated, which shall be as indicated below. Minimum size shall be 12" x 12". Provide larger sizes where required.
 - 1. 1. Fire Rated walls and ceilings: Milcor style UFR, Karp style KRP, or approved equal, U.L. Class B, 1½ hour rated, 20-gauge steel door; 16-gauge steel frame; insulated, self-closing, continuous piano hinge; keyed paddle latch, interior latch release.
 - 2. 2. Drywall ceilings or walls: Milcor style DW, Karp style KDW or approved equal, drywall bead; 16-gauge steel frame & door or 16-gauge steel frame & 14-gauge steel door; concealed spring hinge
 - 3. 3. Masonry walls: Milcor style M, Karp style DSC-214M, or approved equal, 16-gauge steel frame & door or 16-gauge steel frame & 14-gauge steel door; spring loaded hinge
 - 4. 4. Tiled walls and ceilings: Milcor style MS, Karp style DSC-214M(S), or approved equal, 16-gauge stainless steel frame & door or 16-gauge stainless steel frame & 14-gauge

- 5. stainless steel door; satin finish; spring loaded hinge
 - 5. Plastered walls and ceilings: Milcor style K, Karp style DSC-214PL, or approved equal, 16-gauge steel frame; 14-gauge steel door; casing bead; concealed spring hinge or continuous piano hinge
- C. Doors shall be delivered to the General Contractor for installation.

2.12 AIR PURIFICATION SYSTEM

- A. Global Plasma Solutions needlepoint bi-polar ionization system, model GPS-FC24-AC or approved equal, shall be mounted and wired within the air handling units, where indicated on the Drawings. The contractor shall follow all manufacturer IOM instructions during installation. Standard features shall include universal voltage input, in-line On/Off switch, programmable auto-cleaning cycle, operation status LED, integral Building Automation System alarm contacts, magnets for easy installation and replaceable carbon fiber brush emitters.
- B. The GPS units shall be UL, cUL listed and shall comply with UL 867, OSHPD Seismic (OSP), IAQP, and CE. The maximum allowable ozone concentration per the UL 867-2007 chamber test shall be 0.007 PPM. The maximum peak ozone concentration per the UL 867-2007 peak test as measured 2 inches away from the electronic air cleaner's output shall be no more than 0.0042 PPM
- C. Each unit shall be designed with a molded casing, self-cleaning system, self-cleaning test button, power status LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS or the optional DDC controller.
- D. Electrical Requirements:
 - 1. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 24VAC to 240VAC, universal 2 wire input, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.
- E. Control Requirements:
 - 1. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset circuit breakers. Systems with manual fuses shall not be allowed.
 - 2. Integral airflow sensing shall modulate the Plasma output as the airflow varies or stops. A mechanical airflow switch shall not be acceptable as a means to activate the Plasma device due to high failure rates and possible pressure reversal.
 - 3. All Plasma devices shall have a means to interface with the BAS system. Dry contacts shall be provided to prove there are ions being produced. Systems providing indication that power is applied to the Plasma device, but not directly sensing the power at the ion output, shall not be acceptable.
- F. Ionization Requirements:
 - 1. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and integral power supply. Ionization systems requiring isolation transformers shall not be acceptable.
 - 2. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced.
 - 3. Ionization output from each electrode shall be a minimum of 160 million ions/cc when tested at 2" from the ionization generator.

4. All manufacturers shall provide documentation by an independent NELAC accredited laboratory that proves the product has the minimum kill rates for the following pathogens given the allotted time and in a space condition:
 - a. MRSA - >96% in 30 minutes or less
 - b. E.coli - > 99% in 15 minutes or less
 - c. TB - > 69% in 60 minutes or less
 - d. C. diff - >86% in 30 minutes or less

2.13 VARIABLE REFRIGERANT VOLUME HVAC SYSTEM - OUTDOOR UNIT

- A. Daikin model REYQ_XAYD as scheduled on the Drawings or approved equal. The system shall consist of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a three-pipe refrigeration distribution system using PID control and Daikin VRV condenser unit.
- B. The condenser shall be a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant.
- C. The condensing unit may connect an indoor evaporator nominal capacity up to 200% of the condensing unit nominal capacity. All zones are each capable of operating separately with individual temperature control.
- D. A dedicated hot gas pipe shall be required to ensure optimum heating operation performance.
- E. The outdoor units shall be able to connect to the indoor unit models FXMQ and FXTQ. The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system
- F. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously or all of the indoor units associated with each branch of the cool/heat selector box (BSF_Q54T). Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.
- G. Wiring:
 1. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
 2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
 3. The control wiring maximum lengths shall be as shown below:

	CONDENSER TO INDOOR UNIT	CONDENSER TO CENTRAL CONTROLLER	INDOOR UNIT TO REMOTE CONTROL
CONTROL WIRING LENGTH	6,560ft (2,000m)	3,280ft (1,000m)	1640 ft. (500m)
WIRE TYPE	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

- H. Refrigerant Piping
 1. The system shall be capable of refrigerant piping up to 540ft actual or 623ft equivalent from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280ft of piping between the condensing and indoor units with 295 feet maximum vertical difference, without any oil traps or additional components.
 2. REFNET™ piping joints and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance.

- a. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

I. General:

1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls.
2. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
3. High/Low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.
4. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
5. The connection ratio of indoor units to condensing unit shall be permitted up to 200% of nominal capacity.
6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
7. The condensing unit shall be modular in design and should allow for side-by-side installation.
8. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
9. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
10. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
11. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

J. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed galvanized steel panels coated with a baked enamel finish.

K. Fan:

1. The condensing unit shall consist of one or more propeller type, direct-drive 600W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
3. The condensing unit shall have configurable settings for intermittent fan operation to help minimize snow accumulation on fan blades when the system is off.
4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

L. SOUND:

1. Nominal sound pressure levels shall be as shown below.

MODEL NUMBER	SOUND PRESSURE LEVEL dB(A)
REYQ240XAYD*	64

REYQ312XAYD*	68
REYQ384XAYD*	67.5
REYQ456XAYD*	70

2. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

OPERATION SOUND dB(A)	NIGHT MODE SOUND PRESSURE LEVEL dB(A) APPROX.
Level 1	55
Level 2	50
Level 3	45

M. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins shall be coated with an anti-corrosion hydrophilic blue coating as standard from factory with a salt spray test rating of 1000hr per ASTM B117 test standards.
5. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for a drain pan heater. The lower part of the coil shall be used for inverter cooling and be on or off during operation enhancing the defrost operation.
6. The condensing unit shall be factory equipped with condenser coil guards on all sides.

N. Compressor:

1. The Daikin inverter Flash Vapor injection scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit.
 - a. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.
2. The inverter driven compressors in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "K-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type.
 - a. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The compressor's motor shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
7. The compressor shall be mounted on vibration dampening rubber grommets to minimize the transmission of vibration, eliminating the standard need for external spring isolation.
8. In the event of compressor failure, the remaining compressors, if applicable, shall

continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be manually activated to specifically address this condition for single module and manifold systems.

9. In the case of multiple condenser modules, combined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours. When connected to a central control system sequential start is activated for all system on each DIII network.

O. VRV Accessories

1. BHFP26P100U heat recovery/dual module connection piping kit
2. BHFP26P151U heat recovery/triple module multi connection piping kit
3. BRC1E73 Navigation Remote Controller
4. KHFP26A100 Closed Pipe Kit for Branch Selector Box
5. KHRP2A250T Multi-port Twinning Kit
6. DCM601A71 Intelligent Touch Manager

2.14 BRANCH SELECTOR BOXES

- A. Daikin "Flex" series, models BSF_Q54TVJ, 4, 6 and 8-port branch selector boxes as scheduled on the Drawings or approved equal. The flex series boxes shall be designed with left, right, and pass through (in series) piping orientation. Access too EEV heads shall be through side panels.

1. Each branch of the branch selector box shall consist of three electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the box and main processor and between the box and indoor units.
2. The branch selector box shall control the operational mode of the subordinate indoor units. The use of three EEV's ensures continuous heating during defrost (multiple condenser systems), no heating impact during changeover and reduced sound levels.

B. General:

1. The branch selector boxes are designed specifically for use with VRV IV series heat recovery system components.
 - a. These selector boxes shall be factory assembled, wired, and piped. The branch controllers must be run tested at the factory.
 - b. These selector boxes must be mounted indoors.
 - c. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.
2. The number of connectable indoor units shall be 5. The maximum capacity index of connectable indoor units per branch shall be 54 or less.)
3. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed

Model No	BSF4Q54TVJ	BSF6Q54TVJ	BSF8Q54TVJ
Operating sound dB(A)	37	40.5	40.5
Max. sound dB(A)	47	50	50

C. Unit Cabinet

1. These units shall have a galvanized steel plate casing.
2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
3. The cabinet shall contain one subcooling heat exchanger per branch.

D. Refrigerant Valves:

- a. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.

- b. The refrigerant connections must be of the braze type.
 - c. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
 - d. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.
- 2. Electrical:
 - a. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
 - b. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.
- E. Standard accessories include stopper pipes, Clamps, Insulation tubes, Vinyl tube, Cushion rubbers, Installation manual.

2.15 SPLIT SYSTEM INDOOR UNIT - (FXMQ-PB)

- A. Daikin indoor unit FXMQ-PB as scheduled on the Drawings or approved equal.
- B. The indoor unit shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. The to be connected to outdoor unit model REYQ heat recovery model. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E73. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.
 - 1. The Daikin indoor unit FXMQ_PB shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
 - 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 - 3. Both refrigerant lines shall be insulated from the outdoor unit.
 - 4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet and has a built-in safety shutoff and alarm.
 - 5. The indoor units shall be equipped with a return air thermistor.
 - 6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 - 7. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet:
 - 1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
 - 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
- D. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.
3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
4. The airflow rate shall be available in three settings.
5. The fan motor shall be thermally protected.
6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

F. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

G. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

H. Accessories to be provided (See equipment schedule remarks):

1. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.
2. Air side Economizer designed for connection to the rear of unit.

2.16 SPLIT SYSTEM INDOOR UNIT (FXTQ_TA)

- A. Daikin indoor unit FXTQ_TA multi-position air handling unit as scheduled on the Drawings or approved equal. The unit shall be floor mounted vertical, horizontal left, horizontal right, or downflow, operable with refrigerant R-410A, equipped with an electronic expansion valve and direct-drive ECM type fan with constant CFM programming, for installation within a conditioned space. When installed in a vertical configuration it shall have top discharge air and bottom return air. When installed in a horizontal right or horizontal left configuration, it

shall have a horizontal discharge air and horizontal return air. When installed in a downflow configuration it shall have bottom discharge and top return air. The units shall be connected to outdoor unit model REYQ heat recovery model.

- B. The FXTQ_TA series shall have a factory integral disconnect switch. . Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote control BRC1E73.
- C. The Daikin indoor unit FXTQ_TA components shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, brazed connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
- D. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
- ~~E.~~ Both refrigerant lines shall be insulated from the outdoor unit.
- F. Return air shall be through an optional or field supplied filter.
- G. Condensate draining shall be made via gravity or external condensate pump.
- H. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
- I. The voltage range will be 253 volts maximum and 187 volts minimum.
- J. Unit Cabinet:
 - 1. The cabinet shall be constructed with sound absorbing, foil-faced insulation to control air leakage.
 - 2. Select an installation location with adequate structural support, space for service access and clearance for air return and supply duct connections.
 - 3. A field supplied secondary drain pan shall be installed where required by national, state, or local code.
- K. Fan:
 - 1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
 - 2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.2 to 1.0. HP.
 - 3. The airflow rate shall be available in high setting.
 - 4. The fan motor shall be thermally protected.
- L. Filter:
 - 1. The return air shall be filtered by means of an optional or field supplied filter.
- M. Coil:
 - 1. Coils shall be of the direct expansion type constructed from aluminum tubes expanded into aluminum fins to form a mechanical bond.
 - 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 - 3. The coils shall be a 2- to 4-row cross fin copper evaporator coil with 14 to 16 fpi design completely factory tested.
 - 4. The refrigerant connections shall be brazed connections and the condensate will be 3/4 inch outside diameter PVC.
 - 5. A thermistor will be located on the liquid and gas line.
- N. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- O. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
 3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

2.17 PACKAGED ROOFTOP AIR CONDITIONING

- A. Carrier model 50FCQA06A3A5 as scheduled on the Drawings or approved equal. The 50FCQ unit is an outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and heat pump heating duty.
- B. The A/C unit shall be factory assembled as a single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up. Unit shall use Puron® (R-410A) refrigerant.
- C. Quality Assurance
1. Unit shall meet ASHRAE 90.1 minimum efficiency requirements.
 2. Unit shall be rated in accordance with AHRI Standards 340/360.
 3. Unit shall be designed to conform to ASHRAE 15.
 4. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards.
 5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 6. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
 7. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by ISO 9001.
 8. Roof curb shall be designed to conform to NRCA Standards.
 9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory and must be available upon request.
 10. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
 11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
 12. Unit shall be tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
- D. Operating Characteristics
1. Unit shall be capable of starting and running at 115°F ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at +/-10% voltage.
 2. Compressor with standard controls shall be capable of operation down to 40°F, ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures down to 25°F.
 3. Unit shall discharge supply air vertically or horizontally as shown on Drawings.
 4. Unit shall be factory configured for vertical supply & return configurations.

5. Unit shall be field convertible from vertical to horizontal airflow on all models. No special kit required.
6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.

E. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F): 60, hardness: H-2H pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 or 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2--in. thick, 1-pound density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the gas heat compartment.
4. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory installed or field installed), standard.
5. Base Rail
 - a. Unit shall have base rails on a minimum of 2 sides.
 - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
 - d. Base rail shall be a minimum of 16 gauge thickness.
6. Condensate pan and connections:
 - a. Shall be a sloped condensate drain pan made of a non-corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 3/4"-14 NPT drain connection, possible either through the bottom or side of the drain pan.
7. Top panel:
 - a. Shall be a single piece top panel on all sizes.
8. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet at a single, factory--prepared, knockout location.
 - b. Thru-the-base capability.
 - 1) Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
 - 2) No basepan penetration, other than those authorized by the manufacturer, is permitted.
9. Component access panels (standard)
 - a. Cabinet panels shall be easily removable for servicing.
 - b. Unit shall have one factory installed, tool-less, removable, filter access panel.
 - c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.
 - d. Handles shall be UV modified, composite. They shall be permanently attached and recessed into the panel.
 - e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
 - f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

F. Coils

1. Standard Aluminum Fin/Copper Tube Coils:

- a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
 - b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
 - c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
- G. Insulation
 1. Evaporator fan compartment:
 - a. Interior cabinet surfaces shall be insulated with a minimum 1/2-in. thick, minimum 1 1/2 lb density, flexible fiberglass insulation bonded with a phenolic binder, neoprene coated on the air side.
 - b. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 2. Electric Heat Compartment:
 - a. Aluminum foil-faced fiberglass insulation shall be used.
 - b. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- H. Filter Section
 1. Filters access is specified in the unit cabinet section of this specification.
 2. Filters shall be held in place by a pivoting filter tray, facilitating easy removal and installation.
 3. Shall consist of factory installed, low velocity, throw-away 2-in. thick fiberglass filters.
 4. Filters shall be standard, commercially available sizes.
 5. Only one size filter per unit is allowed.
- I. Refrigerant Components
 1. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Fixed cooling orifice metering system on 04-06 models and TXV on 07 size models shall include a multiple feed distribution system that optimizes coil performance. Fixed heating orifice metering system on all 04-07 models shall include a multiple feed distribution system that optimizes coil performance.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gage connections on suction and discharge lines.
 - d. Pressure gage access through a specially designed access port in the top panel of the unit.
 - e. Suction line accumulator to provide protection in all operating modes from cooling, heating and reverse cycle switching.
 2. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.
 - a. The plug shall be easy to remove and replace.
 - b. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.
 - c. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
 - d. The plug shall be made of a leak proof, UV-resistant, composite material.
 3. Compressors
 - a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
 - b. Compressor motors shall be cooled by refrigerant gas passing through motor

- windings.
 - c. Compressors shall be internally protected from high discharge temperature conditions.
 - d. Compressors shall be protected from an over--temperature and over--amperage conditions by an internal, motor overload device.
 - e. Compressor shall be factory mounted on rubber grommets.
 - f. Compressor motors shall have internal line break thermal, current overload and high- pressure differential protection.
 - g. Crankcase heaters shall not be required for normal operating range, unless required by compressor manufacturer due to refrigerant charge limits.
 - h. Compressors shall be a singlestage cooling capacity design
- J. Evaporator Fan and Motor with EcoBlue™ Technology
- 1. Direct Drive Evaporator fan motor:
 - a. Shall be a ECM motor design.
 - b. Shall have permanently lubricated bearings.
 - c. Shall have inherent automatic-reset thermal overload protection.
 - d. Shall have slow ramp up to speed capabilities.
 - e. Shall require no fan/motor belts for operation, adjustments and or initial fan speed set up.
 - f. Fan DC voltage set up on Unit Control Board can eliminate the need of removal of blower access door, required on conventional belt drive systems.
 - g. Shall be internally protected from electrical phase reversal and loss.
 - 2. Evaporator Fan:
 - a. Shall be easily set with selection switch and adjustment pot on unit control board or through SystemVu™ controller.
 - b. Single speed indoor fan operation provided
 - c. Blower fan shall be a Vane Axial fan design with 75% less moving parts than a conventional belt drive system.
 - d. Shall be constructed of a cast aluminum stator and high impact composite material on rotor and air inlet casing.
 - e. Shall be a patented pending design with a corrosion resistant material and dynamically balanced.
 - f. Shall have slow ramp up to speed capabilities.
 - g. Shall be a slide out design with two screw removal.
- K. Condenser Fans and Motors
- 1. Condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft-down design.
 - 2. Condenser Fans:
 - a. Shall be a direct-driven propeller type fan constructed of high impact composite material.
 - b. Shall have high impact composite blades completely formed into one piece without blade fasteners or connectors and shall be dynamically balanced.
- L. Thermostats
- 1. Thermostat must
 - a. Energize both "W" and "G" when calling for heat.
 - b. Have capability to energize 2 different stages of cooling, and 2 different stages of

- heating.
 - c. Include capability for occupancy scheduling.
- M. Electric and Electronic Control System for HVAC
1. Shall be complete with self-contained low-voltage control circuit protected by a resettable circuit breaker on the 24-v transformer side. Transformer shall have 75VA capability.
 2. Shall utilize color-coded wiring.
 3. Shall include a Unit Control Board to provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high-pressure switches. Controller shall also provide an intuitive means to adjust the indoor fan speed through a simple switch and pot adjustment design.
 4. Unit shall include a minimum of one 8-pin screw terminal connection board for connection of control wiring.
 5. Shall include integrated defrost system to prevent excessive frost accumulation during heating duty, and shall be controlled as follows:
 - a. Defrost shall be initiated on the basis of time and coil temperature.
 - b. A 30, 60, 90, 120 minute timer shall activate the defrost cycle only if the coil temperature is low enough to indicate a heavy frost condition.
 - c. Defrost cycle shall terminate when defrost thermostat is satisfied and shall have a positive termination time of 10 minutes.
 6. Defrost system shall also include:
 - a. Defrost Cycle Indicator LED.
 - b. Dip switch selectable defrost time between 30, 60, 90 and 120 minutes. Factory set at 30 minutes.
 - c. Molded plug connection to ensure proper connection
 7. Safeties:
 - a. Compressor over-temperature, over-current. High internal pressure differential.
 - b. Low-pressure switch.
 - 1) Low pressure switch shall use different color wire than the high-pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
 - c. High-pressure switch.
 - 1) High pressure switch shall use different color wire than the low-pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
 - d. Automatic reset, motor thermal overload protector.
- N. Options/Accessories to be provided
1. Integrated Economizer X, MicroMetl, ECD-SRT12CA series, factory installed
 - a. Economizer with power exhaust, ultra-low leak, vertical return module, Honeywell controller and actuator
 - b. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.
 - c. Economizer shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.
 - d. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - e. Ultra Low Leak design meets California Title 24 section 140.4 and ASHRAE 90.1 requirements for 4 cfm per sq.ft. on the outside air dampers and 10 cfm per sq. ft. on

- the return dampers.
- f. Economizer controller shall be the Honeywell W7220, field mounted in the unit's control box. The economizer shall provide:
 - 1) 2-line LCD interface screen for setup, configuration and troubleshooting.
 - 2) On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24, ASHRAE 90.1 and IECC .
 - 3) Sensor failure loss of communication identification.
 - 4) Automatic sensor detection.
 - 5) Capabilities for use with multiple-speed or single speed indoor fan systems.
 - 6) Utilize digital sensors: Dry bulb and Enthalpy.
- g. Economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
- h. Economizer controller shall accept a 2 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
- i. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
- j. Economizer shall be capable of introducing up to 100% outdoor air.
- k. Economizer shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements.
- l. Economizer shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.
- m. Dry bulb outdoor air temperature sensor shall be provided as standard. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F. Additional sensor options shall be available as accessories.
- n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
- o. Dampers shall be completely closed when the unit is in the unoccupied mode.
- p. Compressor lockout temperature shall be adjustable from -45°F to 80°F, set at a factory de-fault of 32°F.
- q. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.
- 2. Propeller Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Power exhaust shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0 to 100% adjustable setpoint on the economizer control
- 3. Unit-Mounted, Non-Fused Disconnect Switch:
 - a. Switch shall be factory-installed, internally mounted.
 - b. National Electric Code (NEC) and UL approved non-fused switch shall provide unit power shutoff.
 - c. Shall be accessible from outside the unit.
 - d. Shall provide local shutdown and lockout capability.
- 4. Indoor Air Quality CO2 Sensor:
 - a. Shall be able to provide demand ventilation indoor air quality (IAQ) control.
 - b. The IAQ sensor shall be wall mount with LED display. The setpoint shall have adjustment capability
- 5. Smoke detectors (factory-installed only):
 - a. Shall be a Four-Wire Controller and Detector.
 - b. Shall be environmental compensated with differential sensing for reliable, stable, and

- drift-free sensitivity.
- c. Shall use magnet-activated test/reset sensor switches.
- d. Shall have tool-less connection terminal access.
- e. Shall have a recessed momentary switch for testing and resetting the detector.
- f. Controller shall include:
 - 1) One set of normally open alarm initiation contacts for connection to an initiating device circuit on a fire alarm control panel.
 - 2) Two Form-C auxiliary alarm relays for interface with rooftop unit or other equipment.
 - 3) One Form-C supervision (trouble) relay to control the operation of the Trouble LED on a remote test/reset station.
 - 4) Capable of direct connection to two individual detector modules.
 - 5) Can be wired to up to 14 other duct smoke detectors for multiple fan shutdown applications.
- 6. MERV-8 Return Air filters:
 - a. Upgrade standard unit filters to MERV-8 filters.
- 7.

2.18 VIBRATION ISOLATORS

- A. Unless otherwise noted on the equipment schedule, all mechanical equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. All isolators shall be Mason Industries, Kinetics, or approved equal. Rated deflections and model numbers shall be as scheduled on the drawings.
- B. Spring equipment mounts, earthquake motioned restrained:
 - 1. Mounts shall incorporate a single spring vibration isolator built into a welded steel mount assembly, designed and engineered to limit movement of supported equipment during an earthquake without degrading the vibration isolation of the spring during normal equipment operating conditions.
 - 2. Mounts shall incorporate a welded steel plate and motion limit assembly, and steel spring isolator, engineered as a system to accept a force of 1.3 times the rated load capacity of the spring isolator without yield or failure, and shall limit movement of the point of level bolt connection to supported equipment to 0.75 inches in any direction, relative to any fixed point on the mount assembly, while subjected to the minimum force specified.
 - 3. The motion limit assembly shall be welded to a steel base plate having a 1/4" thick ribbed neoprene noise stop pad, and drilled holes for bolting to supporting structures.
 - 4. Springs shall be wound steel, using high strength, heat treated spring alloy steel and shall have a horizontal spring stiffness equal to or greater than 1.3 times the rated vertical spring stiffness. The outside diameter of each spring shall be a minimum of 0.8 times the rated vertical spring height.
 - 5. Springs shall be selected to provide the tabulated minimum operating static deflections and shall provide a 50% overload capacity before reaching solid state. Springs shall be designed to reach solid state before exceeding the spring steel fatigue point.

2.19 DUCTWORK

- A. Sheet Metal Ductwork:
 - 1. Ducts and plenums shall be fabricated and installed in conformance with the latest editions of: NFPA Pamphlet No. 90A; California Building Code; California Mechanical Code and the SMACNA HVAC Duct Construction Standards (Metal & Flexible). Ducts and plenums shall be constructed of G-60 coated galvanized steel of lockforming grade

conforming to ASTM A653 and A924 standards. Seals shall be airtight Class "B" seals at all transverse joints and longitudinal seams. Tables and figures hereinafter referenced are from the 2005 edition of the SMACNA HVAC Duct Construction Standards (Metal and Flexible).

2. Rectangular duct construction shall conform to Table 2-3. All transverse joints shall be flanged per Table 2-32, with corner closures or "Duct Mate" flanged connections with corner closures per Figure 2-16 or 2-17. Elbows shall be standard radius (Type RE 1) or square throat with vanes (Type RE 2) per Figure 4-2, with double thickness turning vanes per Figures 4-3 and 4-4. Offsets and transitions shall be per Figure 4-7. Supply, return, and exhaust branch connections shall be per Figure 4-5 or 4-6. Splitters SHALL NOT be used.
3. Round ducts shall be spiral, United McGill or equal. All transverse joints and longitudinal seams shall have Class "B" seals. All branches in round duct systems shall be made with factory fabricated reducing wye branches. Duct turns shall be made with standard, factory fabricated, three-piece elbows.
4. Lined ducts shall be fabricated such that the net inside dimensions equals the duct sizes shown on the Drawings.
5. Flexible ducts shall be acoustical type, Flexmaster "6M", Casco "Silent Flex - SF-18M", or approved equal. Flexible ducts shall be used only where shown on the Drawings, and maximum length of any given flexible duct shall not exceed 7 feet. Galvanized sheet metal elbows shall be used for turns greater than 45 degrees on flexible ducts 10 inches and larger. Connections to rectangular ducts shall be made with "spin-in" fittings with air scoops. The installation of flexible ducts shall conform to Figure 3-10, with the exceptions noted herein.
6. Supports for horizontal ducts and plenums shall be fabricated per Figures 5-5 and 5-6 and Tables 5-1, 5-2 and 5-3. The maximum distance between hangers shall be 8 feet for rectangular ducts and 12 feet for round ducts. Attachments to the structure shall be made with adequately sized lag bolts for strap hangers and adequately sized machine bolts and side beam brackets for rod hangers. Supports for vertical ducts shall be band iron strap or angle bracket type per Figures 5-8 and 5-9.
7. All roof-mounted ductwork shall be water tight and sloped to shed water. All transverse joints shall be T-25 flanged Ductmate "25" or approved equal.
8. Outside air intakes shall be type 316 stainless steel.

B. Fiberglass Ductwork:

1. Fiberglass ductwork is unacceptable and may not be used on this project.

C. Specialties:

1. Duct Mounted Access Doors
 - a. Including those for removing filters, duct access doors shall be fabricated as detailed in Figure 7-2, with sash locks, piano hinges, and cam latches. Round duct shall be fabricated as detailed in Figure 7-3.
 - b. Access doors shall be double wall, rectangular, insulated or uninsulated same as duct. Insulation fill and thickness shall be as indicated for pressure class.
 - c. Access doors shall have a vision panel and an unobstructed full swing.
 - d. Fabricate doors airtight and suitable for duct pressure class.
2. Dampers:
 - a. Provide butterfly or multiple blade dampers where indicated on the Drawings or as required for balancing air quantities, to values shown without generating excessive noise. Provide Duro-Dyne "KS-385", or approved equal, locking quadrants on each manual damper. Locate dampers in furred ceilings near access panels where possible.

- b. Butterfly dampers shall be constructed as per Figure 7-4, Figures A, B, and C.
- c. Multi-blade dampers shall conform to Figure 7-5.
- d. Motorized dampers - See Temperature Controls.
- 3. Remote Actuators: Young Regulator Company, Round Cable Controlled Dampers Model 5020-CC or 830A-CC (rectangular) and Remote Cable Control System Kit Model 270-301EZ. All dampers in inaccessible ceilings shall have remote actuators.
- 4. Air Extractors: Duct mounted volume extractors made of galvanized steel with 1-inch blade spacing, Titus model "AG-45", or equal.
- 5. Flexible Duct Connections: Duro-Dyne "Metal-Fab" with Durolon, Ventfabrics "Ventglas", or approved equal. Install at each point where a blower unit is connected to a duct. A minimum clearance of 3" between the duct and the source of vibration shall be maintained. Install per Figure 7-8.
- 6. Screens: Install removable bird screens at ALL outside air intakes and exhaust air discharges. Screens shall be fabricated from 1/2" x 14 gauge mesh secured in full frames. Screens and frames shall be constructed of the same material as the duct, hood, or equipment to which attached.
- 7. Access Panels: Milcor, Style M, prime coated steel, or approved equal. Minimum size shall be 10" x 10". Provide larger sizes where required. Locks shall be flush, screwdriver operated. Provide as required for concealed ducts at all fire dampers, electric duct heaters, and automatic dampers except at suspended acoustical ceilings.
- 8. Joints: Tape all joints airtight using Hardcast - Carlisle, type "DT" pressure-less tape and "RTA 50" sealant, or McGill AirSeal, "Uni-Flex" duct sealer. Install per manufacturer's directions.

2.20 INSULATION

A. General

- 1. All duct insulation materials including jackets, tapes, adhesives and coatings shall meet ASTM E84/UL 723 "25/50 Flame Spread/Smoke Development" requirements and NFPA 90A and 90B.

B. Exterior of Ductwork: (Flexible Duct Wrap)

- 1. Unless specified to be lined, all ductwork shall be externally insulated by wrapping with formaldehyde-free, flexible glass fiber blanket or inorganic glass mineral wool wrap, with factory applied FSK vapor barrier jacket. Thickness shall be 2 inches unless noted or required otherwise.
- 2. Duct wrap shall meet the requirements of ASTM C1290, ASTM C553, and ASTM C1136. Corrosiveness shall meet ASTM C665. Mold growth/fungi resistance shall meet ASTM C1338.
 - a. Johns Manville "Microlite FSK", Knauf "Atmosphere Duct Wrap", or Certaineed "SoftTouch" or "Wide Wrap".

C. Interior of Ductwork: (Duct Liner)

- 1. All ducts exposed to the weather shall be internally insulated. All other ductwork within 10 feet of a fan (supply and return) shall be internally insulated. Duct liner shall be installed in supply and return ducts and plenums where noted on the Drawings. Exhaust ductwork need not be insulated.
- 2. Duct liner shall meet the requirements of ASTM C1071. Operating temperature shall meet ASTM C411. Microbial growth shall meet ASTM C1338, and ASTM G21 and G22.
 - a. Type I - Flexible Duct Liner: Johns Manville "Linacoustic RC", Knauf "Atmosphere Duct Liner", or Owens Corning "QuietR Rotary Duct Liner". Thickness shall be 1 1/2 inches, unless otherwise noted.
 - b. Type II - Plenum Liner Board: Johns Manville "Linacoustic R-300", Owens Corning

"QuietR Duct Liner Board", or Knauf Insulation "Atmosphere Rigid Plenum Liner".
Thickness shall be 1 ½ inches, unless otherwise noted.

D. Refrigerant Piping:

1. Insulate all refrigerant liquid, vapor, and suction lines, fittings, and valves with flexible elastomeric thermal insulation, Resolco Insul-Phen rigid closed cell phenolic foam, or equal. Install according to manufacturer's suggested installation procedures, UV protected.
2. Liquid, suction, and hot gas (where applicable) lines shall be insulated individually.
3. Oil equalization lines between multiple condensing units shall be insulated.

E. Piping insulation thickness shall be as follows:

FLUID TEMPERATURE RANGE (°F)	CONDUCTIVITY RANGE (in Btu-inch per hour per square foot per °F)	INSULATION MEAN RATING TEMPERATURE (°F)	NOMINAL PIPE DIAMETER (in inches)				
			1 and less	1 to <1.5	1.5 to < 4	4 to < 8	8 and larger
			INSULATION THICKNESS REQUIRED (in inches)				
Space cooling systems (chilled water, refrigerant and brine)							
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
Below 40	0.20-0.26	50	1.0	1.5	1.5	1.5	1.5

- F.** All tanks, expansion tank, pumps, volutes, valves and strainers shall be completely insulated with ½" Armaflex glued and sealed, vapor tight, in place with Armstrong #520 adhesive.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A.** Prior to commencing the work of this Section, the Contractor shall inspect the installed work of other trades and verify that their work is sufficiently complete to permit the start of work under this Section, and that the completed work will be in complete accordance with the original design. In the event of discrepancy, immediately notify the Architect and proceed as directed.

3.02 GENERAL INSTALLATION

- A.** Provide all necessary cutting in connection with the work of this Section. No structural members shall be drilled, bored, or notched in a manner which will impair their structural capacity. All penetrations of concrete or masonry shall be made with core drills. No cutting shall be done without the approval of the Architect.

3.03 HEATING & AIR CONDITIONING EQUIPMENT INSTALLATION

- A.** All units shall be set with curbs plumb, level, and securely attached through framed opening with bolts and/or lag screws as noted on the Drawings. Connections to ductwork shall be secured, filter racks shall be aligned, enclosures and ductwork connections shall be fully waterproofed, and all utility and control connections shall be complete.
- B.** Rig and install in full accordance with manufacturer's requirements, project drawings, and contract documents. Refer to the manufacturer's installation manual for full requirements.
- C.** Locate indoor and outdoor units as indicated on drawings. Provide service clearance per manufacturer's installation manual. Adjust and level outdoor units on support structure.
- D.** Components / Piping:

1. Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer's installation manual for full instructions.
 2. Traps, filter driers, and sight glasses are NOT to be installed on the refrigerant piping or condensate lines.
 3. Standard ACR fittings rated for use with R410A are to be used for all connections. Proprietary manufacturer-specific appurtenances are not allowed.
- E. Insulation:
1. Refrigerant lines, as well as any valves, shall be insulated end to end with ½" closed-cell pipe insulation. If state or local codes require insulation other than that specified above, the greater insulation shall be used.
- F. Electrical:
1. Installing contractor shall coordinate electrical requirements and connections for all power feeds with electrical contractor. Refer to Division 26 for additional information.
- G. Third Party Controls:
1. Installing contractor shall coordinate all BAS/BMS control requirements and connections with controls contractor.

3.04 INSULATION

- A. Exterior Ductwork:
1. Duct wrap shall be cut in a manner to meet the manufacturers' stretch-out guideline to provide a 2" staple lap and have minimum compression at the corners. All joints shall be lapped 2" and stapled with outward clinching staples 2" on center. The insulation shall be mechanically fastened to the underside of all ducts 24" wide or more using cup-head pins, weld pins, or stick pins with speed clips 18" on center. Insulation shall not be compressed to comply with required installed R-value. All joints and penetrations of the vapor barrier jacket shall be sealed with a minimum 3" wide matching pressure sensitive tape. Pressure-sensitive tape shall be firmly rubbed in place immediately after application using a "squeegee" type tool.
 2. When a vapor seal is required, two coats of vapor retarder mastic reinforced with one layer of 4" wide, open weave glass fabric may be used in lieu of pressure-sensitive tape. Mastic shall be brushed onto joint and glass fabric imbedded in it. A second coat of mastic shall be brushed over the glass fabric until the fabric is filled. Mastics shall be applied in accordance with application instructions on the container.
- B. Interior Duct Liner
1. Apply to the inside face of ducts, coated side facing air stream. Fasten using fire retardant adhesive and secure with mechanical fasteners at 12" maximum o.c., both directions, for velocities up to 2,500 fpm. Velocities over 2,500 fpm shall have fastener spacing of 6" o.c.
 2. Exposed edges must be factory or field coated with adhesive. Metal nosing shall be installed in all liner leading edges facing the airstream at fan discharge, at access doors, and at any interval of lined duct preceded by unlined duct.
 3. Insulation with torn or broken coatings shall be removed and replaced. Loose corners, edges, and butt joints will not be accepted.
 4. Maximum velocity: 5,000 ft/min.
- C. Refrigerant Piping:
1. The insulation shall be installed in accordance with the manufacturer's instructions. All joints and seams shall be sealed with waterproof vapor retarder adhesive. All pipes exposed to the weather shall be coated to protect the insulation from ultra-violet radiation in accordance with the manufacturer's published instructions.

3.05 FILTERS

- A. During construction, protect all filters upstream of air handling units with blankets of 2" fiberglass filter media or 2" disposable panel filters. UL Class 2 listed.
- B. Systems shall not be operated without properly installed filters. Filters used during construction shall be removed and replaced with new filters after construction is completed and the systems are ready for final acceptance by the owner.

3.06 DUCTWORK

- A. All ductwork shall be installed within spaces provided, where possible. Ducts shall be installed true to line and grade, fully secured to structural framing with specified hangers and supports, insulated, and vibration isolated.
- B. Each section of supply air ductwork shall be cleaned, dust and oil free, at the shop using a degreasing agent and detergent and sealed airtight at both ends with visqueen and tape. Supply ducts shall be additionally cleaned with a disinfecting solution. Ends of all supply and internally insulated exhaust ducts shall be kept sealed until the time they are joined. When duct sections are joined, wipe down all interior surfaces with a clean tack cloth. If tack cloth shows any dust, then re-clean duct as described above. The intent is that no foreign matter be allowed to enter the ductwork at any time after factory cleaning and during construction.
 - 1. Unlined exhaust ducts shall be vacuum cleaned when installed, but shall otherwise be exempt from shop cleaning and sealing.

3.07 TESTS, INSPECTIONS

- A. Contractor shall not allow or cause any work of this Section to be covered or enclosed until it has been inspected, tested, and approved by the Architect and the authorities having jurisdiction over the Work. Should any of this work be enclosed or covered up before such inspection, testing, and approval, this Contractor shall uncover the work, have the necessary inspections, tests, and approvals made and, at NO expense to the Owner, make all repairs necessary to restore both his work and that of other contractors which may have been damaged to be in conformity with the Contract Documents.
- B. Furnish all necessary labor, materials, and equipment for conducting tests, and pay all expenses in connection therewith. Should leaks develop while testing, repairs shall be made, and tests shall be repeated until a satisfactory test is obtained.
- C. In any test, proper safety procedures and equipment shall be used, including personal protective equipment such as protective eyewear and clothing. Installers shall always consider local conditions, codes and regulations, manufacturer's installation instructions, and Architects' specifications in any installation.
- D. Make all necessary control adjustments and balancing of air and water flows. Operate the entire system for a period of time not less than 3 working days for the purpose of proving satisfactory performance. During this period, instruct such persons as the Owner and/or Architect may designate in the proper operation of the systems. Should further adjustment prove necessary, operating tests shall be repeated until a satisfactory test result is obtained.
 - 1. Condenser water piping shall be hydrostatically tested at 125-psi pressure and proved tight before covering. Tests may be made in sections provided connection to service previously tested is included in each succeeding test. Systems shall be tight for eight hours.

3.08 INSTALLATION, REFRIGERANT PIPING

- A. Piping installation shall comply with all federal, state, and local regulations and industry

guidelines. In addition, the following practices shall be followed.

1. All piping shall be stored with ends sealed to prevent entry of moisture and debris.
 2. A pipe cutter specific to the piping material applied shall be used.
 3. All factory and field cut tube ends shall be de-burred and cleaned.
 4. Flared fittings shall be formed using tools recommended by the equipment manufacturer.
 5. Flare nuts shall be tightened with torque wrench furnished by the equipment manufacturer.
 6. Piping shall be continuously purged with dry nitrogen while soldering. Care shall be taken when soldering near valves or other equipment that may be damaged by extreme heat.
- B. 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 Shop Drawings.
- C. Install refrigerant piping according to ASHRAE 15.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. 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.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Install piping adjacent to machines to allow service and maintenance.
- H. Install piping free of sags and bends. Install fittings for changes in direction and branch connections. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- I. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- J. Install refrigerant piping in protective conduit where installed belowground. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- K. Slope refrigerant piping as follows:
1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 2. Install horizontal suction lines with a uniform slope downward to compressor.
 3. Use double-suction riser for maximum compressor efficiencies if load variation is expected.
 4. Install traps and double risers to entrain oil in vertical runs.
 5. Liquid lines may be installed level.
- L. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- M. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

- N. All refrigerant piping and valves shall be identified.

3.09 REFRIGERANT PIPING TESTING

- A. Prior to charging with refrigerant, piping shall be tested for leaks under 550 psi pressure using a mixture of 95% nitrogen and 5% hydrogen gas. (WARNING! OXYGEN OR ACETYLENE SHALL NOT BE USED IN PLACE OF DRY NITROGEN. A VIOLENT EXPLOSION MAY RESULT!).
- B. All joints shall be tested for leaks using an electronic hydrogen leak detector. Pressure and leak tests on refrigeration piping and equipment shall be done in accordance with local code requirements and the American Standard Safety Code for Mechanical Refrigeration (ANSI B9.1).
- C. Piping shall be continuously purged with dry nitrogen while brazing. Care shall be taken when soldering near valves or other equipment that may be damaged by extreme heat.
- D. Be sure that all controls, relief valves or rupture discs that could be damaged by test pressure are removed before beginning pressure test.
- E. Precautions shall be taken to keep moisture out of the system, and a drier shall be used.
- F. After successful completion of pressure tests, the entire system shall be purged with dry nitrogen and then evacuated with a standard vacuum pump to remove all moisture and non-condensibles. Three evacuations shall be required, and shall be down to 500 microns absolute pressure. Break the first two vacuums with dry nitrogen. Charge with refrigerant after third evacuation.
- G. The contractor shall notify the Architect 48 hours prior to the time and date of the evacuation.
- H. The refrigerant charge shall be calculated and weighed into the system.
- I. Service technicians shall be certified in the use of CFC and HCFC refrigerant recovery and recycling equipment and shall use UL listed and labeled recovery equipment when discharging refrigerant.

3.10 CLEANUP

- A. Upon completion of the work of this Section, remove all material, debris, and equipment associated with or used in the performance of this Work.

END OF SECTION

SECTION 23 0500

GENERAL MECHANICAL

PART 1 GENERAL

1.01 SUMMARY

- A. Drawings and general provisions of the Contract, including General and Special Conditions and all Division 01 Specification Sections, apply to this Section.
- B. This Section includes the following:
 - 1. General requirements specifically applicable to all Division 23 Sections;
 - 2. Some piping material and installation instructions common to most piping systems;
 - 3. Mechanical demolition (when indicated on the Drawings);
 - 4. Equipment installation requirements common to equipment sections;
 - 5. Concrete bases;
 - 6. Supports and anchorages;
 - 7. Pipe and equipment identification;
- C. This Section applies to all work of Division 23.

1.02 QUALITY ASSURANCE

- A. Regulatory compliance: All work performed under Division 23 shall comply with the latest currently adopted editions of all codes, ordinances, and regulations, and all requirements of the Authorities Having Jurisdiction. Comply with provisions of the following, except as otherwise shown or specified.
 - 1. California Building Code (CBC)
 - 2. California Code of Regulations Titles 8, 17, 19, 20, 21 & 22
 - 3. California Electric Code (CEC)
 - 4. California Energy Code
 - 5. California Energy Conservation Code (Title 24)
 - 6. California Fire Code (CFC)
 - 7. California Green Building Standards Code
 - 8. California Mechanical Code (CMC)
 - 9. California Occupational Safety & Health Administration (CAL-OSHA)
 - 10. California Plumbing Code (CPC)
 - 11. California State Fire Marshall (CSFM)
 - 12. City Fire Marshal requirements
 - 13. National Fire Protection Association
 - 14. Other applicable state laws.
- B. Where material or equipment is specified to conform to referenced standards, the most recent edition of the standard in effect at the time of bid shall be used.
 - 1. Air Moving and Control Association, Inc. (AMCA)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society of Mechanical Engineers (ASME)
 - 4. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 - 5. American Society for Testing and Materials (ASTM)
 - 6. Air-Conditioning and Refrigeration Institute (ARI)
 - 7. Associated Air Balance Council (AABC)

8. Canadian Standards Association International (CSA)
 9. National Electrical Manufacturers Association (NEMA)
 10. National Fire Protection Association (NFPA)
 11. Office of Statewide Health Planning and Development (OSHPD)
 12. Sheet Metal and Air Conditioning Contractors Nation Association (SMACNA) Standards
 13. Underwriters Laboratories (UL)
 14. Comply with all ADA requirements for disabled access.
- C. Minimum requirements: The requirements of these are the minimum that will be allowed unless such requirements are exceeded by applicable codes or regulations, in which the regulatory codes or regulation requirements shall govern.
- D. When the Contract Documents call for materials or construction of a higher standard than is required by the above, the Contract Document requirements shall take precedence over the requirements of the said laws, rules, and/or regulations, accepting that nothing in the Contract Documents shall be interpreted as permitting work in violation of said laws, rules, and/or regulations. The Contractor for this work shall furnish any additional materials and/or labor as may be required for compliance with these laws, rules, and/or regulations though such materials and/or labor are not specifically set forth in the Contract Documents, with no additional charges to Owner.

1.03 CONTRACT DRAWINGS

- A. The Contract Drawings indicate diagrammatically the general layout of the mechanical systems and other related work. The data given herein and on the Drawings is as exact as could be reasonably secured, but absolute accuracy is not guaranteed. Field verification of scaled dimensions taken from the Drawings is required. Exact locations, distances, elevations, etc. will be governed by shop drawings, the building itself, and actual field conditions.
- B. Contractor shall review and compare the Architectural, Structural, Plumbing, Mechanical and Electrical Drawings and all Owner supplied equipment Drawings and adjust their work to be in conformity with the conditions indicated thereon. Discrepancies between different Drawings, between Drawings and actual field conditions, or between Drawings and Specifications, shall be brought to the attention of the Architect promptly for a determination of the modifications to be affected.
- C. Provide offsets, fittings, and accessories required to meet project conditions, even when not shown.
- D. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner, providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.

1.04 SUBMITTALS

- A. General:
1. All submittals shall be in accordance with the requirements of the General Conditions and Division 01 Sections for Submittal Procedures and Product Requirements.
 2. Before any fixtures, materials, or equipment are purchased, the Contractor shall submit to the Architect for approval, a complete list of materials, fixtures, and equipment, giving the manufacturers' names, catalog number, capacity, size, power requirements, and other pertinent data. Submittal lists and drawings shall be specifically applicable to this project, shall include identifying marks assigned by Specifications and Drawings, and shall not contain extraneous material or optional choices.

3. Product names referenced in the specifications are used as standards of quality. Other materials shall not be used unless approved in writing. Review is required even though the term "or equal" is used. Review of submittals will be only for general conformance with design concept. Review will not include quantities, dimensions, construction methods, or coordination with the work of other trades.
 4. The Contractor shall submit for the approval of the Architect, shop drawings of proposed material and equipment that differ from the specified materials and equipment, and of any specified materials and equipment with special conditions and/or arrangements. These drawings shall show necessary modifications of Owner, plumbing, electrical and mechanical work required by the proposed materials and equipment.
 5. Refer to Division 01 for substitutions requirements. Submittal of substitutions shall be limited to one proposal for each type or kind of item. If the first proposed product submittal is rejected, the Contractor shall then submit the first named or scheduled product. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material will not waive these requirements.
 6. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. Review of drawings and other material submitted shall not be construed as a complete check or constitute a waiver of the requirements of the Drawings and Specifications but will indicate that the material submitted is acceptable in quality and utility. This review shall not relieve the Contractor of the responsibility to fit the proposed materials to the spaces provided, and to effect necessary rearrangement or construction of other work.
- B. Seismic Shop Drawing Submittal:
1. Provide submittal for seismic supports, anchorages, and restraints indicated to comply with performance requirements and design criteria.
 - a. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
 - b. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an OSHPD pre-approved system such as Mason OPM #0043-13. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
 - c. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.

1.05 WARRANTIES

- A. In accordance with Division 01 and as follows. Refer to specific items of equipment specified for warranty duration if different from that specified in Division 01.
1. Equipment warranties shall be provided for all equipment, with all necessary information filled in, except purchase date, in favor of the Owner.
 2. Provide new materials, equipment, apparatus and labor to repair or replace that determined to be defective or faulty.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Contractor shall be responsible for delivery, storage, protection and placing of all equipment and materials.
- B. Contractor shall protect the work and materials from damage during construction. Equipment stored at the jobsite shall be protected from dust, water or other damage, and be covered if equipment is exposed to weather. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
- C. Any items damaged shall be repaired or replaced, at no additional cost to the Owner.
- D. Cleanliness of Piping and Equipment Systems:
 - 1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 - 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 - 3. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.07 COOPERATION WITH OTHER TRADES

- A. Coordinate HVAC work with other trades doing work on the project as may be necessary for the proper completion of the project. Refer to the Structural, Plumbing, and Electrical Drawings for details of the building structure and equipment installation that will tend to overlap, conflict with, or require coordination with the work of this Section, and schedule this work accordingly.
- B. Priority of right of way in space shall be as follows, in decreasing order of authority:
 - 1. Electrical lights, electrical panels and drain piping.
 - 2. Ductwork.
 - 3. Fire protection piping, domestic hot water, domestic cold water and condenser water piping.
- C. Any work done without regard for other trades shall be moved, replaced, or redone as required, without extra charges to Owner.

1.08 FEES AND PERMITS

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.

1.09 UTILITIES CONNECTIONS

- A. Arrange for all utility connections, determine their exact requirements, and pay all costs incurred. Send proper notices, make necessary arrangements, and perform other services required for care and maintenance of all utilities and assume all responsibility concerning same. Observe all rules and regulations of the respective utilities in executing the work.

1.10 ELECTRICAL REQUIREMENTS

- A. Electrical work in this Section shall conform to the requirements of Division 26. Equipment shall conform to the standards of the National Electric Manufacturer's Association. Electrical equipment shall bear the label of Underwriters' Laboratories, Inc. where examination and listing service is available for such materials. Motors and motor control equipment shall be as specified herein.
- B. Refer to Division 26 for conduit fittings and devices, and service voltage and power feed wiring

for equipment specified under this Section. Wiring includes all connections to devices, and all wiring shall be installed in conduit. Contractor shall have responsibility to verify that electrical services provided are adequate and compatible with equipment requirements.

- C. Electrical work shall include the furnishing of:
 - 1. Motor controls mounted as integral part of equipment assemblies.
 - 2. Pre-wired control panels as described and shown.
 - 3. Electronic control panels and their components.
 - 4. Wiring for low voltage controls and "interlock work" except where specifically shown otherwise.
- D. Electrical work shall include the installing of:
 - 1. All motors.
 - 2. All control panels and their components.
 - 3. Low voltage wiring, line voltage "interlock" wiring, control wiring for safety devices, alarms, and refrigeration.
- E. Wiring includes all connections to devices, and all wiring shall be installed in conduit.
 - 1. Conduit fittings and devices shall be as specified in the basic electrical materials section of Division 26.
 - 2. Line voltage work (in equipment assemblies) shall be as specified in Division 26.
- F. Devices shall be installed in NEMA enclosures of type required for location.
- G. Electrical Controls:
 - 1. Refer to Electrical, Fire Protection, Plumbing and Mechanical documents for work and devices required. All wiring required by heating, ventilating and air conditioning work shall be performed by the Controls Contractor.
- H. The following work will be furnished and installed under Division 26.
 - 1. Disconnect switches, remote switches, motor starters, relays and test switches not mounted as integral part of equipment assemblies or in temperature control panels.
 - 2. All line voltage controls and interlocks, all other controls, circuits from electric panel board to disconnect switches, starters, motors, switches and/or other motor controls, to temperature controls and safety devices.

1.11 DAMAGE BY LEAKS

- A. Contractor shall be responsible for any damage to work of other Contractors that is caused by leaks in any temporary or permanent piping systems due to pipe rupture, disconnected pipes or fittings, or by overflow of equipment.
- B. Patching and replacing of damaged work shall be done by the Contractor who installed the work, as directed by the Architect, but the cost of same shall be paid by the Contractor who is responsible for the damage.

1.12 LICENSING REQUIREMENTS

- A. All work of Divisions 23 shall be performed by an appropriately licensed Contractor. The licenses shall be current, valid through the term of the contract and in the name of the Contractor.
 - 1. All HVAC work, which includes warm air heating systems and water heating pumps, ventilating systems, air conditioning systems, and ductwork, registers, flues, humidity, and thermostatic controls in connection with these systems, shall be performed by a C-20 - Warm-Air Heating, Ventilating and Air-Conditioning Contractor.

- B. All air and water balancing shall be performed by a D-62 air and water balancing Contractor. An air and water balancing contractor installs any device and performs any work related to providing a specified flow of air in all types of existing heating and cooling systems.

PART 2 PRODUCTS

2.01 PRODUCTS CRITERIA

- A. All materials, appliances, and equipment shall be new and best of their respective kinds, free from defects, and of the make, brand or quality specified or as accepted by the Architect.
- B. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
- C. All fixtures, materials, and equipment equal in quality and utility to these herein mentioned will be accepted. When specific names are used in describing fixtures, materials, and equipment they are mentioned as standards only, but this implies no right on the part of the Contractor to use other fixtures, materials and equipment, or methods, unless approved as equal in quality and utility by the Architect. The decision of the Architect shall govern as to what fixtures, materials, and equipment are equals to those mentioned, but the burden of proof as to the quality of any proposed fixtures, materials, or equipment shall be upon the Contractor. If any tests are necessary to determine the quality of proposed fixtures, materials, or equipment, an unbiased laboratory satisfactory to the Architect shall make such tests at the expense of the Contractor .

2.02 HANGERS, SUPPORTS

- A. Piping - General
 - 1. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for un-insulated copper piping systems.
 - 2. Hangers and supports shall be designed and manufactured in conformance with ANSI/MSS SP-58. Selection and application shall be in accordance with ANSI/MSS SP-69.
 - 3. All piping shall be supported with Superstrut, B-Line, Anvil, Mifab, or approved equal pipe hangers and supports. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with shield for insulated piping.
 - 4. All hangers shall be electro-chromate or corrosion resistant finished. Hanger rods shall have electro-galvanized finish.
- B. Roof top pipe supports
 - 1. MiFab "C-Port" series or B-Line "Dura-Block" or approved equal.
 - a. Model C rubber support series with 14-gauge galvanized channel.
 - b. Seismic: Model CZ rubber base with 14-gauge galvanized channel
- C. Copper tubing:
 - 1. B-Line 3690, Superstrut C-711 or Anvil Figure 67 "J" pipe hangers or approved equal, complete with isolator.
 - 2. Isolators: B-Line "Vibra Cushion" B1999, Type L & K for copper tubing, Superstrut C-716 isolator for copper, Anvil Figure CT-769 or approved equal
- D. Insulated pipe:
 - 1. Hangers: B-Line 3690 "J" pipe hanger, Superstrut C -711 or Anvil Figure 67 fitted to outside of insulation or approved equal
 - 2. Pipe Shields: B-Line 3151 insulation protection shield, Superstrut C-790, or Anvil Figure 167

or approved equal

- E. Point of support connectors:
 - 1. Wood construction:
 - a. Stationary pipes: B-Line B3060, Superstrut 540 or Anvil Figure 206 side beam hanger clip or approved equal
 - b. Pipes subject to movement: B-Line B-756 or Superstrut S-541 beam clamp swing connector or approved equal
 - 2. New concrete construction: B-Line B2501 light duty spot inserts or Superstrut 452-TB spot inserts or approved equal.
 - 3. Existing concrete construction: Phillips "Red-Head" 3-piece concrete anchors or Hilti "Quik-Bolt", drilled-in, concrete anchors.
 - 4. Steel beams: Series 500 beam brackets.
 - 5. Plywood decks: machine bolts, nuts and washers.
- F. Vertical pipe risers:
 - 1. Riser clamps: Superstrut C-720 extension riser clamps anchored to construction
 - 2. Bare cold water pipe: Superstrut C-720P, PVC coated to prevent corrosion
- G. Insulated pipe supports: K.B. Enterprises "Snapp Itz".
- H. Pipes through studs or joists shall be isolated from structure with properly sized Hubbard "Hold-Rite" suspension clamps or LSP "Acousto-Plumb" system.
- I. Ductwork
 - 1. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
 - 2. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
 - 3. 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."
 - 4. Steel Cable End Connections: Steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
 - 5. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
 - 6. Trapeze and Riser Supports:
 - a. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - b. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - c. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.03 PIPE LABELS

- A. Brady, Seton, Graphic Products, or approved equal pipe labels. Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. 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.
- D. 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.
- E. Label Sizes (per ANSI A13.1 / ASME A13.1-2015 Standards):
 - 1. For pipes or covering with outside diameter $\frac{3}{4}$ to $1\frac{1}{4}$ inches, minimum length of label: 8

- inches, minimum height of letters: 1/2 inch.
2. For pipes or covering with outside diameter 1 1/2 to 2 inches, minimum length of label: 8 inches, minimum height of letters: 3/4 inch.
 3. For pipes or covering with outside diameter 2 1/2 to 6 inches, minimum length of label: 12 inches, minimum height of letters: 1 1/4 inch.

2.04 ELECTRICAL MOTORS

- A. With exception of motors in UL labeled equipment, motors for HVAC blowers and fans, pumps, and other general purpose applications using an adjustable speed drive shall be Baldor Premium Efficient Super-E®, three phase, foot mounted, Class H insulated motor with AEGIS shaft grounding ring installed internally, re-greasable ball bearings, dynamically balanced rotors.
- B. Motors shall be certified for quiet operation and shall bear a label so stating. Motors shall be drip-proof frame, 1.15 minimum service factor in 40°C, ambient windings specially impregnated and epoxy coated for outdoor service.
- C. Torque characteristics of motors shall be as required to accelerate machine to 100% full load speed within 10 seconds. Motors shall be dynamically balanced to maximum deflection as follows:
 1. 15 HP and larger: 0.0003 inches.
 2. 10 HP and smaller: 0.0002 inches.
- D. Motors shall be Inverter duty, meet NEMA MG-1 and part 30 and 31, and shall be guaranteed to satisfactorily operate at ± 10% voltage shown on Drawings. Transformers of adequate capacity shall be provided if necessary to satisfy this requirement.
- E. All 3-phase motors shall be provided with phase and brown-out protection to shut down all motors in the unit if the phases are more than 10% out of balance on voltage or the voltage is more than 10% under design voltage.
- F. Fractional horsepower fan motors (1/4 hp, 1/2 hp, 3/4 hp) shall be Greenheck "Vari-Green" series motors, DC electronic commutation type, specifically designed for fan applications. Motors shall be permanently lubricated with heavy duty ball bearings to match the fan load and pre-wired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.
- G. Provide fan drives rated at 150% of motor horsepower. Drives shall be adjustable sheave type unless specified otherwise. Listed fan speeds are only approximate; select and/or change drives to operate at approximately midpoint of adjustable range after final balancing.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. Prior to commencing the work of this Section, the Contractor shall inspect the installed work of other trades and verify that their work is sufficiently complete to permit the start of work under this Section, and that the completed work will be in complete accordance with the original design. In the event of discrepancy, immediately notify the Architect and proceed as directed.

3.02 INSTALLATION, GENERAL

- A. Provide all necessary sleeving, core drilling, carpentry, cutting and patching required for proper installation of material and equipment specified.
- B. No structural members shall be drilled, bored, or notched in a manner that will impair their structural capacity. No structural cutting or drilling shall be done without the approval of the Architect and DSA.
- C. All penetrations of concrete or masonry shall be made with core drills.

3.03 VERIFICATION OF EXISTING CONDITIONS AND DEMOLITION

- A. Before installation of any new work, verify the location, size and other conditions at all points of connection to services or other existing piping, and at all locations where new work will cross or pass near existing piping, electrical, or other facilities.
- B. Information shown relative to existing services is based upon available records and data during preparation of the Drawings but shall be verified. Make reasonable deviations found necessary to conform with actual locations and conditions, without extra charge.
- C. Remove piping, controls, fixtures, and equipment that is not to remain in service as shown on the Drawings or as required. This includes the removal of associated appurtenances and supports.
- D. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.
- E. Patch, cap, or repair existing works affected by this demolition in concealed spaces within 6" of a live main or branch.
- F. Deliver removed material to the Owner as directed by the Architect. Dispose of all other removed material offsite.

3.04 EQUIPMENT

- A. Equipment shall operate quietly and without objectionable vibration. Such problems, other than from equipment operating at optimum conditions, shall be the Contractor's responsibility and shall be eliminated at the direction of the Architect.
- B. Install equipment to provide good appearance, easy access, and adequate space to allow replacement and maintenance. Provide bases, supports, anchor bolts, and other items required to achieve this. Installation shall be level, above moisture level, and adequately braced.
- C. Extend ¼" schedule 40 black steel lubrication pipes from hard-to-reach locations to front of equipment or to access doors. Terminate with proper lubrication fittings.
- D. Move equipment into building through available openings. Dismantle equipment where necessary to accomplish this. After reassembly, test equipment to verify its satisfactory operating condition.
- E. Thoroughly lubricate equipment before operating. Repair of damage resulting from failure to comply with this requirement shall be the Contractor's responsibility.
- F. Connections to piping shall be secured and properly aligned and all utility and control connections shall be properly isolated from the building structure by means of vibration isolators and flexible connections. Any equipment not meeting this requirement will be

modified and properly reinstalled at no expense to the Owner.

3.05 ACCESS

- A. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include but are not limited to all types of valves, filters and strainers, transmitters and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract Drawings to Architect for resolution.

3.06 MECHANICAL SERVICES

- A. Terminals and services weighing no more than 20 pounds, may be supported directly on the runners of a heavy-duty grid system but, in addition, they must have a minimum of (2) #12-gauge slack safety wires attached at diagonally opposite corners and anchored to the structure above.

3.07 CONCRETE EQUIPMENT BASES

- A. Concrete work that is part of the mechanical installations, as such is shown and/or detailed on the Drawings, shall conform to the requirements of the Concrete Section of these Specifications.
- B. Concrete bases: Anchor equipment to concrete base according to equipment details on mechanical and structural Drawings. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
- C. Bases shall be neatly finished, have rounded corners and smooth trowel finish.

3.08 PAINTING

- A. Properly prepare work to be painted per the requirements of Division 09, except preservative and special painting as described herein. Priming shall conform to Division 09 requirements and be of a material compatible with paint for finish painting.
- B. All equipment and materials shall be cleaned of grease, wax, oil, rust or dirt in preparation for finish painting. Any prime coated surfaces showing signs of rust before being finish painted shall be thoroughly cleaned and a new prime coat applied.
- C. Equipment in equipment rooms and like spaces, shall be furnished with a factory applied baked prime coat or at Contractor's option, a standard factory baked enamel finish in approved colors. Machinery such as fans, or motors shall be furnished with a factory applied baked on prime coat, or at the Contractor's option, a standard paint finish (air dried or baked enamel) in approved colors. Mechanical equipment in other locations shall be furnished with a factory applied baked prime coat, unless noted otherwise.
- D. Paint interior of ductwork at air outlets with one coat of flat black paint.
- E. Prime paint both sides of flashings prior to installation.
- F. Furnish can of touch up paint with each factory finished piece of equipment.
- G. Paint all piping in mechanical rooms. Color as selected by the Architect.
- H. Black steel piping exposed to the environment shall be painted with rust-inhibiting paint. Color as selected by Architect.

3.09 IDENTIFICATION OF SYSTEMS

- A. Nameplates
 - 1. Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- B. Piping
 - 1. All piping shall be identified. Attach arrows at one or both ends of the marker to indicate flow direction
 - 2. If the pipe being labeled contains multiple hazards, determine which has the greatest hazardous risk and label accordingly.
 - 3. 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:
 - a. Adjacent to all valves and flanges
 - b. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - c. At both sides of wall or floor penetrations.
 - d. Before and after all wall, floor and ceiling penetrations and inaccessible enclosures.
 - e. Adjacent to changes in direction.
 - f. At access doors, manholes, and similar access points that permit view of concealed piping.
 - g. Near major equipment items and other points of origination and termination.
 - h. Spaced at maximum intervals of 25 feet along each run. Reduce intervals in areas of congested piping and equipment.
 - i. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
 - 4. Pipe Label Color Schedule: (per ANSI A13.1 / ASME A13.1-2015)
 - a. Potable, Cooling, Boiler Feed and Other Water Piping:
 - 1) Background Color: Green.
 - 2) Letter Color: White.
 - b. Fire Quenching Fluids:
 - 1) Background Color: Red.
 - 2) Letter Color: White.
 - c. Toxic or Corrosive Fluids
 - 1) Background Color: Orange.
 - 2) Letter Color: Black
 - d. Flammable or Oxidizing Fluids:
 - 1) Background Color: Yellow.
 - 2) Letter Color: Black.
 - e. Combustible Fluids:
 - 1) Background Color: Brown.
 - 2) Letter Color: White
 - f. Compressed Air:
 - 1) Background Color: Blue.
 - 2) Letter Color: White.
- C. Valves
 - 1. For identification and Owner's maintenance records, all valves shall be numbered and identified with clearly stamped 1 $\frac{1}{4}$ " diameter brass tags, in accordance with drawings and service performed.
 - 2. Control valves shall be also marked whether normally open (N.O.) or normally closed (N.S.).

- D. Equipment
 - 1. All equipment shall be labeled with 1" high stencils showing identifying mark noted on drawings, and usage.
 - 2. Warning signs shall be placed on machines driven by electrical motors that are controlled by fully automatic starters, per California Code of Regulations, Title 8, Subchapter 7 - General Industry Safety Orders, Article 7, Section 3320.
- E. A typewritten schedule of all nameplates and valve tags used, with identification, shall be framed and posted in mechanical rooms, at locations as directed.

3.10 SEISMIC FORCE RESISTANCE

- A. Equipment:
 - 1. Each piece of equipment installed under these sections shall be constructed and anchored to structural supports to resist a seismic force of 150% of the equipment's operating weight in any direction. Supports, anchors, and braces shown shall be minimum.
 - 2. Equipment manufacturer shall design, construct, and certify that his equipment satisfies the special minimum seismic resistance requirements and shall submit calculations or test results supporting his certification.
- B. Vibration
 - 1. All rotating mechanical equipment and associated piping and duct work shall be mounted by vibration isolators as required to minimize transmission of vibrations and noise to building structures or spaces.
 - 2. All rotating equipment shall be balanced both statically and dynamically.
 - 3. To minimize alignment problems, all motors over 5 hp must be designed to be solidly attached to a common base with the driven unit.
 - 4. In order to minimize vibration, solid sheaves and band belts shall be designed to be used in multiple V-belt driven equipment over 15 hp
- C. Isolation of Equipment
 - 1. Isolation shall be designed to be stable during starting and stopping of equipment without any transverse and eccentric movement of equipment that would damage or adversely affect operation of the equipment or appurtenances.
 - 2. Isolation shall be designed for the operating speed of the equipment.
 - 3. Isolators, including springs, exposed to the weather shall be hot dipped galvanized after fabrication. Hot dipped zinc coating shall comply with ASTM Method A-123 and shall not be less than 2 oz per square foot.
 - 4. Isolators shall be selected and located to produce uniform loading and deflection even when equipment weight is not evenly distributed.
 - 5. Isolation equipment includes neoprene pads, hanger spring and neoprene, travel limited floor spring and neoprene, inertia base, flexible duct connections, flexible pipe connections, thrust limits, grommets, and snubbers.
- D. Seismic Control and Restraint
 - 1. Brace or anchor mechanical equipment to resist horizontal forces acting in any direction using the latest editions of the CBC and ASCE.
 - 2. Seismic-restraint devices shall meet CBC seismic restraint requirements, shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPM 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.

- E. Ductwork:
 - 1. All ductwork shall be supported in accordance with the recommendations and requirements of the SMACNA Duct Construction Standards, latest Edition, with the exception of strap hangers and trapeze hangers, which shall have bracing capable of resisting a seismic force equal to 100% of the weight of the duct system in any direction. (Seismic force shall be in addition to static loading.)
- F. Cable Bracing
 - 1. Cables shall be pre-stretched galvanized 7x19 strand core aircraft cable, with no limit to their installed length. Cables meet the following specifications: MIL-DTL-83420M with Amendment 2, Type 1 non-jacketed cable.
 - 2. Cables shall be installed slightly slack, so as not to support gravity loads.
 - 3. Cable shall connect the braced item to a building structural element. Cable shall have a bracket at each end to make the connections. The cable assembly, with connection brackets, shall be Mason Industries "SCB" or "SCBH". Cable is held to end brackets with one or two bolts. Cable bolts shall be tightened to the torque values stated in the details or, in the case where break off nuts are provided, until the nut breaks off.
 - 4. The Mason Industries "SCBH" component can be used for connection directly to the threaded vertical hanger rod used for supporting system gravity loads as detailed in Section D of OPM-0043-13.
 - 5. The "SCB" bracket and cable (Ref. X1.0), "SCBH" bracket and cable (Ref. X1.1), and "UCC" rod stiffener clamp (Ref. X3.0) manufactured by Mason Industries, are included (with accompanying hardware) in the kit options provided in Section D of OPM-0043-13.
- G. Piping:
 - 1. Flexibility of piping systems must be maintained by using flexible devices at critical points at junctions of separate building structures. Braces or anchors shall be designed to damp oscillations or check excessive movement. Flexible devices for piping of gas shall be loops or offsets. Flexible devices for other piping may be loops, Victaulic grooved, or roustabout couplings.
 - 2. Piping at tops and bottoms of risers are critical points where flexibility is required, as well as at changes in direction on long runs of piping 4" and larger. Tops of risers shall be restrained from motion in horizontal direction, and midpoints shall be anchored in all directions.

3.11 INSTALLATION - HANGERS AND SUPPORTS

- A. Pipe supports shall be spaced according to CMC 2019, Table 313.3 and sufficiently close to support pipes properly without formation of pockets. Hangers shall be installed at ends of mains and branches.
- B. Refrigerant piping shall be supported per CMC 1105.2 and 1109.6.
- C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- D. No valve or piece of equipment shall be used to support piping.
- E. 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.
- F. Install lateral bracing with pipe hangers and supports to prevent swaying.
- G. Install building attachments within concrete slabs or attach to structural steel. Install additional

attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2 inches 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.

- H. Metal Pipe-hanger Installation: Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- I. Metal Trapeze Pipe-Hanger Installation: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
- J. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. 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.
- M. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
- N. Ductwork
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
 - 2. 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 maximum intervals of 16 feet.
 - 3. 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.

3.12 PIPE WELDING

- A. All hot and chilled water, steam and steam condensate, compressed air and vacuum piping shall be installed, examined, inspected and tested in accordance with the requirements of ASME B31.9, Building Services Piping, current edition.
- B. Before any welding is performed, the contractor shall submit to the Architect, copies of any welding procedure specifications and their supporting procedure qualification records for review and acceptance. Copies of welder qualification records shall be made available for review to the owner or his representative at the construction site.
- C. Weld all pipe 2.5 inches and larger. Use the following procedure. All welders must be AWS certified. AWS B2.1 SMAW 6G Pipe Welding Procedure Specifications

Welding process: SMAW Position: 6G Fixed position Weld Progression: Up Backing: No Current/Polarity: DCEP Root Opening: 1/16 to 1/8	Groove Angle: 60 degrees Material/Spec: A 106 Thickness (pipe/tube): Groove (in) .280 Notes: Sch. 40 Pipe Filler Metal Class: E6010Rt/E7018F1 Other Filler Metal Class: Rt. 1/8, 3/32 Filler
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- D. Welded joints shall be beveled and butt-welded. Reductions of pipe shall be made with forged

steel welding fittings. Branch reductions of two or more pipe sizes smaller than the main, may be Bonney "Weld-O-Let" fittings, or equal. Job fabricated reductions and branches shall not be used. All pipe burrs shall be reamed out. Welding rods shall be as follows, or approved equal:

<u>Pipe Size</u>	<u>Arc Welding</u>	<u>Gas Welding</u>
2" and larger	Fleetweld #5	Oxweld #1 or Page Hi-Test M
1½" and smaller	None	Oxweld #1 or Page Hi-Test M

3.13 INSTALLATION, PIPING

- A. Installation of piping shall be such that damage cannot result through thermal expansion or contraction, to piping, building, or pipe hangers and supports. Anchors shall be installed at midpoints of all runs in main piping for the purpose of localizing pipe expansion or prevention of creepage.
- B. Rough in shall proceed as rapidly as general construction will permit. All rough-in shall be complete, at locations verified by Architect and Owner, and tested and inspected prior to installation of concrete, lath, plaster, gypsum wallboard, or other finishes.
- C. All piping shall be concealed in finished rooms, installed in furred walls and partitions. Where furred or suspended ceilings occur, piping shall be installed in the concealed space at points adjacent to beams and/or other structural members and coordinated with ductwork and equipment. Where exposed piping occurs, it shall be installed parallel to or at right angles to building walls, unless specifically shown otherwise on the Drawings.
- D. All pipe lines shall be installed free from traps and air pockets, true to line and grade, with suitable supports properly spaced. All piping shall be installed without undue stresses and with provision for expansion and contraction.
- E. All piping shall be new and free from foreign substances. American standard pipe threads shall be used for IPS threaded work. Joints in threaded piping shall be made up with Teflon tape applied to the male threads only. No screwed pipe joints shall be caulked or packed with rope or other packing materials. Pipe shall be free from tool marks, threads cut accurately with not more than two threads showing beyond fitting. Friction wrenches shall not be used with plated, polished, or soft metal piping. All changes in pipe size shall be made with reducing fitting. Bushings will not be permitted.
- F. Protect unattended openings in piping during construction.
- G. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- H. 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.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- J. Install piping to permit valve servicing.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install piping to allow application of insulation.
- N. Install escutcheons for penetrations of walls, ceilings, and floors according to the following. Use one-piece escutcheons wherever possible in new construction. Split-casting units acceptable for

installation on existing piping systems.

- O. No valve or piece of equipment shall be used to support piping.
- P. 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 7 Section "Through-Penetration Firestop Systems" for materials.
- Q. All copper tubing shall be formed in a workmanlike manner, in accordance with the Pipe and Tube Bending Handbook of the Copper and Brass Research Association. A tube bender giving support to the periphery of the tube shall be used. The tubing shall be protected against flatting or other injury.
- R. All copper connections and joints shall be made in accordance with the Copper Tube Handbook, Copper and Brass Research Association. No swaged connections will be permitted. All valves, pumps, and similar equipment shall be connected to copper piping through union or flange adapter fittings.
- S. Valves, cocks, etc., shall be installed to allow convenient accessibility and operation.
- T. Unions and flanges shall be installed to allow convenient replacement of all equipment and cleaning tubes.
- U. A union connection shall be installed downstream from all valves, at equipment connections and at other locations as required or directed.
- V. Shut off valves shall be provided in all main services, and where required to permit proper servicing of equipment. Valves of one type shall be of one manufacturer.
- W. All valves shall be of the same size as the pipelines in which they are installed, unless specifically sized on the Drawings. All hand-controlled line valves shall be ball valves, except where throttling control or frequent operation is required, in which case globe or angle valves shall be used. Globe valves in horizontal lines shall be installed with stem in horizontal to permit line draining. All globe and angle valves shall be installed to close against pressure. Disc valves shall have discs suitable for the services for which they are to be used.
- X. All valves shall be accessible and shall not be installed with the stems below the horizontal plane. Provide access panels at walls, ceilings, or floors.
- Y. Provide chrome plated escutcheon plates at all points where exposed piping penetrates finished wall ceilings or floors.
- Z. Cutting or boring of joists or other structural members shall be done only when alternative routing is impossible and only upon written approval of the Architect or Owner.

3.14 CLEANING OF PIPING

- A. All new piping shall be thoroughly cleaned of rust, scale, etc., prior to enclosing and placing in operation. Water shall be forced through pipes until the systems are free from foreign substances.

3.15 CLEANUP

- A. Upon completion of the work, remove all material, debris, and equipment associated with or used in the performance of this work.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems
 - 2. Additional Tests
 - a. Duct leakage testing
 - b. Controls verification

1.03 SCOPE

- A. The T&B Agency will provide the following services:
 - 1. Provide all supervision, personnel, instruments, calibration equipment, and all other materials necessary to perform balancing and testing, and compile test data including calculations and services necessary for the heating, ventilating, and air conditioning systems for this project, all in accordance with the project Drawings and Specifications and as specified herein.
 - 2. The T&B Agency shall be responsible for inspecting, balancing, adjusting, testing, and logging the data of the performance of fans, all dampers in the duct systems, all air distribution devices or heat exchangers, and the flows of water through all coils.
 - 3. The T&B Agency shall balance, test, and adjust the systemic components to obtain optimum conditions in each conditioned space in the building. If construction deficiencies are encountered which preclude obtaining optimum conditions, the deficiencies will be recorded and given to the Owner's Representative. The T&B Agency is advised that deficiencies in the HVAC construction are often encountered during final T&B services and should include in the bid an amount deemed advisable to compensate for time in identifying the deficiencies.
- B. During construction, the T&B Contractor shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of three times. Typically, this is performed when 60% of the ductwork and piping are installed and again when 90% of the total system is installed and prior to insulation. A copy of the written report is to be issued to the Mechanical Engineer for review.

1.04 SUBMITTALS

- A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit T&B strategies and step-by-step procedures.
- B. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists for use by systems installers in verifying system readiness for T&B.
Examination Report: Within 30 days of Contractor's Notice to Proceed, provide a summary report of the examination review required in Part 3 "Examination", if issues are discovered that may preclude the proper testing and balancing of the systems.

- C. Examination Report: Provide a summary report of the examination review if issues are discovered that may preclude the proper testing and balancing of the systems.
- D. Certified T&B reports: Within 30 days of completion of balancing work, submit AABC-certified T&B report.
 - 1. Submit one copy of the final T&B Report directly to the design professional of record. Provide three additional copies to the contractor.

1.05 QUALITY ASSURANCE

- A. T&B Contractor Qualifications:
 - 1. General Contractor will employ a T&B Agency that is certified by the Associated Air Balancing Council (AABC). The T&B Agency will have experience in the field of air system balancing, possess calibrated instruments, and employ qualified Supervisors and skilled Technicians to perform all required tests. The T&B Agency shall have a minimum of 10 years of experience in the Testing, Adjusting, and Balancing field.
- B. T&B technician shall perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified T&B reports.
 - 2. Certify that the T&B team complied with the approved T&B plan and the procedures specified and referenced in this Specification.
 - 3. Certify the T&B report
- C. T&B Conference: If requested by the Owner or Construction Manager after approval of the T&B Agency's submittals, meet to develop a mutual understanding of the details
 - 1. Agenda Items:
 - a. The examination report.
 - b. The Strategies and Procedures plan.
 - c. Systems readiness checklists.
 - d. Coordination and cooperation of trades and subcontractors.
 - e. Coordination of documentation and communication flow.
- D. Approved Test and Balance agencies in the area:

RS Analysis, Inc.

1035 Suncast Lane, Suite 130
El Dorado Hills, CA 95762
(916) 358-5672

National Air Balance Company, Inc.

4171 Business Center Drive
Fremont, CA 94538
(510) 623-7000

Raglen System Balance, Inc.

1121 University Terrace
Reno, NV 89502
(775) 747-0100

Pacific Test & Balance, Inc.

4771 Mangels Blvd.
Fairfield, CA 94534
(707) 696-2444

- E. T&B Report Forms: Use standard T&B contractor's forms.

- F. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in "AABC National Standards for Total Systems Balance."

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

- A. Provide T&B agency one complete set of contract documents, change orders, and approved submittals in digital and hard copy formats. Project Schedule and Mechanical Contractor's Shop Drawings and Temperature Control Drawings shall be provided as issued or received.
- B. Controls contractor shall provide required BAS hardware, software, personnel and assistance to T&B agency as required to balance the systems. Controls contractor shall also provide trending report to demonstrate that systems are complete.
- C. Coordinate meetings and assistance from suppliers and contractors as required by T&B agency.
- D. Provide additional valves, dampers, sheaves and belts to properly test and balance, which shall be installed by the Mechanical Contractor as directed by T&B agency, at no additional cost to owner.
- E. Mechanical Contractor shall install test holes where indicated by the T&B Agency. Test holes shall be complete with removable and replaceable plugs
- F. Flag all manual volume dampers with fluorescent or other high-visibility tape.
- G. Provide access to all dampers, valves, test ports, nameplates and other appurtenances as required by T&B agency.
- H. Replace or repair insulation as required by T&B agency.
- I. Have the HVAC systems at complete operational readiness for T&B to begin. As a minimum verify the following:
 - 1. Airside:
 - a. All ductwork is complete with all terminals installed.
 - b. All volume, smoke and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. All fans are operating, free of vibration, and rotating in correct direction.
 - e. VFD start-up is complete and all safeties are verified.
 - f. System readiness checklists are completed and returned to T&B agency.
- J. Promptly correct deficiencies identified during T&B.
- K. Maintain a construction schedule that allows the T&B agency to complete work prior to occupancy.
- L. Before testing or balancing is started, the Mechanical Contractor shall adjust belts and sheaves; align all parts; oil and grease bearings in accordance with manufacturer's instructions; clean exterior surfaces of coil tubes and fins; flush interior of coil tubes, pull until clean; and check mixing damper operation to insure free operation and activation by the correct thermostat
- M. The Mechanical Contractor shall be responsible for certifying in writing that the system, as scheduled for balancing, is operational and complete. Completeness shall include not only the physical installation, but the Mechanical Contractor's certification that the prime movers are installed in good working order, and that full load performance has been preliminary tested under the certification of the Mechanical Contractor. Before any testing and balancing is started, a complete report shall be sent to the T&B Agency by the Mechanical Contractor.

- N. The Mechanical Contractor shall be responsible for making all modifications to rectify discrepancies reported by the T&B Contractor as indicating non-compliance with the Contract Documents. By completing the work on time, the Mechanical Contractor shall provide sufficient time before the completion date so that balancing can be accomplished.

3.02 EXAMINATION & REVIEW

- A. Review the Contractor shop drawing submittals for their effect on the test and balance process and overall performance of the HVAC system. Submit recommendations for enhancements or changes to the system.
- B. Review location and type of volume damper inlet conditions to air terminals, air valves, and HVAC equipment.
- C. Review location, type, and size of balancing valves, flow metering stations, and automatic control valves in the water flow station.
- D. Review location of pressure sensors in the air and water distribution system.
- E. Review automatic control systems as they affect the test and balance procedure.
- F. Review sheet metal and piping shop drawings to verify the installation of flow control devices.
- G. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.
- H. Review the approved submittals for HVAC systems and equipment.
- I. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas.
- J. Review equipment performance data including fan and pump curves.
- K. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, clean permanent filters are installed, and controls are ready for operation.
- L. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected, configured by the Controls Contractor and functioning.
- M. Examine strainers to verify that Mechanical Contractor has replaced startup screens with permanent screens and that all strainers have been cleaned.
- N. Examine two-way valves for proper installation and function.
- O. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- P. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

3.03 PREPARATION

- A. Prepare a T&B plan that includes:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Prepare system-readiness checklists, as described in the *AABC National Standards for Total System Balance*, for use by contractors in verifying system readiness for T&B. These shall include, at a minimum:
 - 1. Airside:

- a. All ductwork is complete with all terminals installed.
- b. All volume, smoke and fire dampers are open and functional.
- c. Clean filters are installed.
- d. All fans are operating, free of vibration, and rotating in correct direction.
- e. VFD start-up is complete and all safeties are verified.
- f. Automatic temperature-control systems are operational.
- g. Ceilings are installed.
- h. Windows and doors are installed.
- i. Suitable access to balancing devices and equipment is provided.

3.04 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for T&B procedures.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.05 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain approved submittals and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare single-line schematic diagram of systems for the purpose of identifying HVAC components.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling-unit components.

3.06 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:

- a. Measure static pressure directly at the fan outlet or through the flexible connection.
- b. Measure static pressure directly at the fan inlet or through the flexible connection.
- c. Measure static pressure across each component that makes up the air-handling system.
- d. Report any artificial loading of filters at the time static pressures are measured.
3. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 1. Measure airflow of submain and branch ducts.
 2. Adjust sub-main and branch duct volume dampers for specified airflow. Re-measure each sub-main and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure airflow at all inlets and outlets.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after all have been adjusted.
- D. Verify final system conditions.
 1. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
 2. Re-measure and confirm total airflow is within design.
 3. Re-measure all final fan operating data, rpms, volts, amps, static profile.
 4. Mark all final settings.
 5. Test system in economizer mode. Verify proper operation and adjust, if necessary.
 6. Measure and record all operating data.
- E. Record final fan-performance data

3.07 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

- A. Adjust the variable-air-volume systems as follows:
 1. Verify that the system static pressure sensor is located 2/3 of the distance down the duct from the fan discharge.
 2. Verify that the system is under static pressure control.
 3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure and adjust system static pressure control setpoint so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
 4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows
 - a. Adjust controls so that terminal is calling for maximum airflow (note some controllers require starting with minimum airflow. Verify calibration procedure for specific project).
 - b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
 - c. When maximum airflow is correct, balance the air outlets downstream from terminal units.

- d. Adjust controls so that terminal is calling for minimum airflow.
- e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
- f. When in full cooling or full heating, ensure that there is no mixing of hot deck and cold deck airstreams unless so designed.
- g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.
5. After all terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
 - a. Set outside air, return air and relief air dampers for proper position that simulates minimum outdoor air conditions.
 - b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
 - c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
6. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report any artificial loading of filters at the time static pressures are measured.
7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
 - a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
 - b. Verify all terminal units are meeting design airflow under system maximum flow.
8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure setpoint to the most energy-efficient setpoint to maintain the optimum system static pressure. Record setpoint and give to controls contractor.
9. Verify final system conditions as follows:
 - a. Re-measure and confirm minimum outdoor air, return and relief airflows are within design. Readjust to design if necessary.
 - b. Re-measure and confirm total airflow is within design.
 - c. Re-measure all final fan operating data, rpms, volts, amps, static profile.
 - d. Mark all final settings.
 - e. Test system in economizer mode. Verify proper operation and adjust, if necessary. Measure and record all operating data.
 - f. Verify tracking between supply and return fans.

3.08 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
 - a. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 - b. Air Outlets and Inlets: Plus or minus 10 percent.

- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.09 FINAL TEST AND BALANCE REPORT

- A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.
- B. The report must be organized by systems and shall include the following information as a minimum:
 - 1. Title Page:
 - a. AABC certified company name
 - b. Company address
 - c. Company telephone number
 - d. Project identification number
 - e. Location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project number
 - j. Date of report
 - k. AABC Certification Statement
 - l. Name, signature, and certification number of AABC TBE
 - 2. Table of Contents.
 - 3. AABC National Performance Guaranty.
 - 4. Report Summary:
 - a. The summary shall include a list of items that do not meet design tolerances, with information that may be considered in resolving deficiencies.
 - 5. Instrument List:
 - a. Type.
 - b. Manufacturer.
 - c. Model.
 - d. Serial Number.
 - e. Calibration Date.
 - 6. T&B Data:
 - a. Provide test data for specific systems and equipment as required by the most recent edition of the "AABC National Standards."
 - 7. Print or sketch, reduced in size, showing all supply, return and exhaust air outlets for easy reference to report data.
- C. One copy of the final test and balance report shall be sent directly to the Mechanical Engineer of record. Provide five additional copies to the contractor.
- D. An approved copy of the balancing report shall be included in the maintenance manual submittal.

3.10 ADDITIONAL TESTS

- A. Duct Leakage Test
 - 1. All ductwork shall be tested for leaks, using necessary instruments before insulating any ductwork. Conduct test as follows and as recommended in SMACNA Balancing Manual.

- a. Seal all openings in duct section and plenum to be tested.
 - b. Connect test apparatus to test section of cuts, using a flexible duct connection or hose (fitting provided by Mechanical Contractor).
 - c. Close damper on blower suction side, to prevent excessive build-up of pressure.
 - d. Start blower and gradually open damper on suction side of blower.
 - e. Determine amount of air leakage and make repairs as required.
 - f. Leakage factor allowable shall be 5% based on the total operating cfm of the section of duct under testing.
 - g. Tested sections of ductwork shall be visually marked with certification sticker and initials of field test inspector. Tests shall be made before duct sections are concealed.
 2. Witness the duct pressure testing performed by the mechanical/installing contractor.
 3. Verify that proper test methods are used and that leakage rates are within specified tolerances.
 4. Report any deficiencies observed.
- B. Controls Verification
1. In conjunction with system balancing perform the following:
 - a. Work with the temperature control contractor to ensure the system is operating within the design limitations and gain a mutual understanding of intended control performance.
 - b. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open position. This includes dampers in multi-zone units.
 - c. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
 - d. Verify the proper application of all normally open and normally closed valves.
 - e. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
 - f. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures, humidities, or pressures. Controls Contractor will relocate as deemed necessary by the TAB Agency.
 - g. Check the sequence of operation for any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs. Observe that heating cannot take place until the cooling zone of valve is completely closed.
 - h. Verify that all controller set points meet the design intent.
 - i. Verify the operation of all interlock systems.
 - j. Verify that controllers are calibrated and function as intended.
 - k. Verify that controller setpoints are as specified.
 - l. Verify the operation of lockout or interlock systems.
 - m. Verify the operation of all valve and damper actuators.
 - n. Verify that all controlled devices are properly installed and connected to the correct controller.
 - o. Verify that all controlled devices travel freely and are in the position indicated by the controller: open, closed, or modulating.
 - p. Perform all system verification to assure the safety of the system and its components.
 2. Reporting
 - a. The report shall include a summary of verifications performed, remaining deficiencies, and any variations from specified conditions.
 3. A systematic check of the above requirements shall be included in the final TAB report.

3.11 FINAL ACCEPTANCE

- A. At the time of final inspection, the T&B Agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data, i.e. water and air quantities, recorded in the Certified Report.
- B. Points and areas for recheck shall be selected by the Owner's Representative.
- C. Measurement and test procedures shall be the same as approved for work forming basis of Certified Report.
- D. Selections for recheck, specific plus random, will not normally exceed 25% of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.
- E. If random tests elicit a measured flow deviation of 10% or more from that recorded in the Certified Report listings, by 10% or more of the selected recheck stations, the report shall be automatically rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to the Owner.
- F. Following final acceptance of the Certified Report by the Owner's Representative the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the T&B Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after final acceptance.

END OF SECTION

SECTION 23 0900

DIRECT DIGITAL CONTROLS FOR HVAC

PART 1 GENERAL

1.01 INCLUSION OF GENERAL CONDITIONS AND GENERAL REQUIREMENTS

- A. The Bidding Requirements, Contract Forms, General Conditions, Supplemental General Conditions, Division 01 - General Requirements are a part of this Section and the Contract for this work and apply to this Section as fully as if repeated herein.

1.02 DESCRIPTION

- A. The school has an existing Alerton "Ascent" DDC system already in place. The intent of these Specifications is to connect the new mechanical equipment as shown on the Drawings to the existing DDC.

1.03 APPROVED MANUFACTURERS

- A. Approved Control Manufacturers:
 - 1. Alerton "Ascent Compass"; no substitution – Contact Syserco for further bid coordination.

1.04 WORK INCLUDED

- A. Furnish a totally native BACnet-based system, including software for a Microsoft Windows Professional operator's terminal, based on a distributed logic control system in accordance with this Specification. The operator's terminal, all global controllers, logic controllers, and all input/output devices shall communicate using the protocols and local area network (LAN) standards as defined by ANSI/ASHRAE™ Standard 135-2016, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used. Items of work included are as follows:
 - 1. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for every controller in system, including unitary controllers. All direct digital logic hardware is to comply with BACnet.
 - 2. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
 - 3. Implement the detailed design for all system-standard analog and binary objects, distributed control and system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
 - 4. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
 - 5. Provide and install all interconnecting cables between supplied cabinets, logic controllers, and input/output devices.
 - 6. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.
 - 7. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
 - 8. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.
 - 9. Provide a comprehensive operator and technician training program with a minimum of 24 hours at control company training center.

10. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.
11. Provide new sensors, valves, and damper actuators. No used components shall be used as any part or piece of installed system.

1.05 SYSTEM DESCRIPTION

A. General Requirements

1. A distributed logic control system, complete with Direct Digital Control (DDC) and Direct Analog Control (DAC) software shall be provided. System shall be totally based on ANSI/ASHRAE Standard 135-2001, BACnet.
2. The entire processing system shall be in complete compliance with the BACnet standard: ANSI/ASHRAE 135-2001. The system shall use BACnet protocols and LAN types throughout and exclusively. Non-BACnet-compliant or proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.
3. All logic controllers for controlled equipment and Microsoft Windows-based operator's terminals shall communicate and share data utilizing only BACnet communication protocols.
4. All logic controllers shall be fully programmable. That is, programmable controllers for any piece of controlled equipment shall be provided.
5. The Controls Contractor shall assume complete responsibility for the entire controls system as a single source. The Contractor shall certify that there are factory-trained technical personnel on staff, under direct employ, on a daily basis. These employees shall be qualified to engineer, program, debug, and service all portions of the BACnet based logic control system. This shall include operator's terminal, global controllers, routers, terminal unit controllers, sensors, and all other sections of the system.

B. Basic System Features

1. Zone-by-zone direct digital logic control of space temperature, scheduling, optimum start, equipment alarm reporting, and override timers for after-hours usage. A zone is the area served by one AC logic controller unit.
2. Operator's terminal software shall be Microsoft Windows XP Professional based. The Energy Management and Control System (EMCS) application program shall be written to communicate specifically utilizing BACnet protocols. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Software shall support Windows Dynamic Data Exchange (DDE) interface. Software shall strictly follow Microsoft Windows API guidelines. Systems using proprietary software or operating systems other than that described above are strictly prohibited. Operation of the terminal software shall be simple and intuitive.
3. Operator's terminal software shall contain an easy-to-operate system allowing configuration of system-wide BACnet controllers, including management and display of the controller programming. This system shall provide the capability to configure controller binary and analog inputs/outputs.
4. Operator's terminal operating system shall be capable of utilizing third-party Windows-based programs for such things as spreadsheet analysis, graphing, charting, custom report generation, and graphics design packages. Graphics generation shall be done using standard Windows packages. No proprietary graphics generation software shall be needed.
5. Complete energy management firmware, including self-adjusting optimum start, demand limiting, global control strategies, and logging routines for use with total control systems,

- shall be supplied. All energy management firmware shall be resident in field hardware, shall be easily updateable through software downloads as provided by the manufacturer, and shall not be dependent on the operator's terminal for operation. Operator's terminal software is to be used for access to field-based energy management control firmware only.
6. Priority password security systems shall prevent unauthorized use. Each user shall have an individual password. The user shall only be given access to the system functions required for individual job performance.
 7. Equipment monitoring and alarm functions, including information for diagnosing equipment problems, shall be included with the system.
 8. The complete system, including but not limited to terminal unit controllers, global controllers and operator's terminals, shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in global controller memory shall be battery-backed up for a minimum of 1 year. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM for all variable data storage. Batteries on unitary controllers shall not be allowed.
 9. System design shall be modular and have proven reliability.
 10. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal shall be provided.

1.06 SUBMITTALS

- A. All submittals shall be submitted under the provisions of Section 01 33 00.
- B. Product Data:
 1. Submit Detailed Bill of Material list for each panel, identifying quantity, part number, description, and associated options.
 2. Cataloged cut sheets of all equipment used. This includes, but is not limited to, the following: DDC panels, peripherals, sensors, actuators, dampers, control air system components, and so forth.
 3. Control Valve Schedules. This spreadsheet type schedule shall include a separate line for each valve and a column for each of the valve attributes, including: code number, configuration, fail position, pipe size, valve size, body configuration, close off pressure, capacity, valve CV, calculated CV, design pressure, actual pressure, and actuator type.
 4. Range and scale information for all transmitters and sensors. This sheet shall clearly indicate one device and any applicable options. Where more than one device to be used is on a single sheet, submit two sheets, individually marked.
 5. Hardware data sheets for all operator workstations, local access panels, and portable operator terminals.
 6. Software manuals for all applications programs to be provided as a part of the operator workstations, portable operator terminals, programming devices, and so forth for evaluation for compliance with the performance requirements of this Specification
- C. Shop Drawings:
 1. Prepare shop drawings of temperature controls and air conditioning unit controls and include the following information. Any work installed without prior shop drawing approval shall be removed at the Contractors expense.
 2. Each submittal shall include the following information:
 - a. FMS riser diagram showing all DDC controllers, operator workstations, network repeaters, and network wiring.
 - b. One-line schematics and system flow diagrams showing the location of all control devices.

- c. Points list for each DDC controller, including: tag, point type, system name, object name, expanded ID, display units, controller type, address, cable destination, module type, terminal ID, panel, slot number, reference drawing, and cable number.
 - d. Vendor's own written description for each sequence of operations, to include the following:
 - 1) Sequences shall reference input/output and software parameters by name and description.
 - 2) The sequences of operations provided in the submittal by the FMS Contractor shall represent the detailed analysis needed to create actual programming code from the design documents.
 - 3) Points shall be referenced by name, including all software points such as programmable setpoints, range limits, time delays, and so forth.
 - 4) The sequence of operations shall cover normal operation and operation under the various alarm conditions applicable to that system.
 - e. User interface functional outline. The outline shall include each display screen to be provided, data to be displayed, and links to other screens. The outline level hierarchy shall be:
 - 1) Site
 - 2) Building
 - 3) Floor
 - 4) System
- D. Training Course Outlines:
 - 1. Submit training course outlines for each four-hour session. Refer to Section 01 7900 - Demonstration and Training for other training requirements.
- E. O&M Manuals:
 - 1. Submit three sets of each manual. Refer to Section 01 77 00 - Contract Closeout for other Operation and Maintenance Data requirements.
 - 2. Include the following documentation in the DDC Software Manual:
 - a. Sequence of Operations
 - b. Program listing of software source code or flow chart diagrams of programming objects.
 - c. Printed listing of controller and operator workstation database files.
 - d. Software point name abbreviation list. Include name, description, controller where located, point type and point ID.
 - e. I/O point list. Include point name, controller location, point number, control device, range and span.
 - f. Printouts of all reports, group listings and alarm messages.
 - g. Index of all DDC point names with documentation manual page number references.
 - 3. Include the following documentation in the Hardware Manual:
 - a. General description and cut sheets for all components.
 - b. Detailed wiring and installation illustrations and complete calibration procedures for each field and panel device.
 - c. Complete trouble-shooting procedures and guidelines.
 - d. Complete operating instructions for all systems.
 - e. Maintenance instructions: Document all maintenance and repair/replacement procedures.
 - 4. Provide three copies of all manufacturers manuals covering the installed system. This shall include, as a minimum:
 - a. System Engineering Manual
 - b. System Installation Manual

- c. Programming Manual
 - d. Engineering and Troubleshooting Bulletins
 - e. Operator Workstation Software Manual
 - f. All other pertinent manuals published by the control system manufacturer.
- F. Record Drawings: Refer to Section 01 77 00 for project record document requirements.
- G. Warranty: Refer to Section 01 78 36 - Warranties for additional warranty requirements.
 - 1. Material: The Control System shall be free from defects in material and workmanship under normal use and service. If within thirty six (36) months from the date of manufacture any of the equipment herein described is defective in operation, workmanship or materials, it will be replaced, repaired or adjusted at the option of the FMS Contractor free of charge.
 - 2. Installation: The Control System shall be free from defects in installation workmanship for a period of one year from acceptance. The FMS Contractor shall, free of charge, correct any defects in workmanship within one week of notification in writing by the Owner.
- H. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).

PART 2 PRODUCTS

2.01 TERMINAL UNIT CONTROLLERS

- A. Terminal unit controllers shall be BACnet class 3 devices.
- B. Provide (1) native BACnet logic controller for each controlled device. All controllers shall interface to global controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output, and self-contained logic program as needed for complete control of unit.
- C. Visual logic controllers shall include universal inputs with 10-bit resolution and that can accept 3K and 10K thermistors, 0-5 VDC, 4-20 mA, and dry contact signals. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board.
- D. Each EMS controller shall have a "hand-off-auto" switch associated with each Digital Output (DO) and shall have a "hand-off-auto" switch and associated potentiometer associated with each Analog Output (AO). This will allow each output (digital or analog) to be manually operated through the entire intended range of operation.
- E. Each EMS controller shall be mounted in an accessible location, below ceiling level, and outside of classroom areas. This will allow service access without ladders and without disturbing occupied classrooms.
- F. All program sequences shall be stored on board logic controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices.
- G. Programming of logic controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Logic controller shall be programmed using programming tools as described in operator terminal section.
- H. Logic controller shall include support for intelligent field sensor. Display on field sensor shall be programmable at logic controller and include an operating mode and a field service mode.

All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent field sensor.

2.02 PARTS EQUIPMENT LIST (DISTRICT STANDARD)

- A. Alerton Ascent control module; (2) visual logic programmable controllers, models VLC-853 and VLC-550; Microset 4 room controller with integral CO2 sensor.
- B. ACI 6" duct temperature sensor, model TS-2006-FB-10-AA; steel wall plate temperature sensor, model TS-1101-WA-10-AA
- C. Contemporary Controls 5-port ethernet switch, model EIBA5-T
- D. Dwyer differential pressure sensor, model MS2-W101
- E. IDEC DPDT socket relay, model RJ2S-CL-A24
- F. Functional Devices 100VA power supply w/120 VAC outlet, model PSH100AWB10
- G. Hoffman NEMA 1 enclosure 12x12x4, model ASE12X12X4; NEMA 1 enclosure 24x20x6, model A24N20ALP; NEMA-3R enclosure 12x12x4, model A12R124
- H. Sycom 120VAC surge suppressor, model SYC-120HW
- I. Veris current switch with adjustable trip point, model H608; Victory SPDT R.I.B., model V120; 100VA transformer, 120VAC to 24VAC, model X100CAA; and 100VA transformer, multi-tap, model X100CHB

END OF SECTION

ELBD375E GRAVITY EXHAUST COMBINATION LOUVER DAMPER EXTRUDED ALUMINUM

STANDARD CONSTRUCTION

FRAME

6" (152) deep, 6063T5 extruded aluminum with .081" (2.1) nominal wall thickness. Caulking surfaces provided.

BLADES

Louver blades: 6063T5 extruded aluminum, .081" (2.1) nominal wall thickness. Drainable blades are positioned at 37 1/2° angle. Blade spacing is approximately 4" (102) center to center.

Backdraft damper blades: .025" (.64) formed aluminum.

SCREEN

5/8" x .040" (16 x 1) expanded, flattened aluminum bird screen in removable frame. Screen adds approximately 1/2" (13) to louver depth.

SEALS

Extruded vinyl blade edge seals on rear adjustable blades to provide quiet operation.

FINISH

Mill.

APPROXIMATE SHIPPING WEIGHT

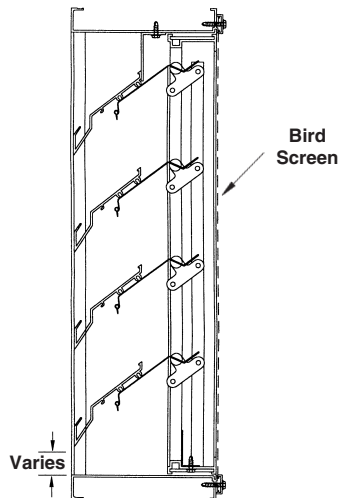
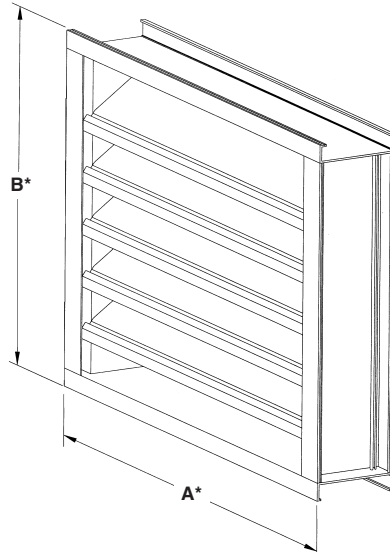
7 lbs. per sq. ft. (34 kg/m²).

MINIMUM SIZE

12"w x 12"h (305 x 305).

MAXIMUM SIZE

Maximum section size is 60"w x 96"h (1524 x 2438). Louvers larger than the maximum single section size will be shipped in multiple sections to be assembled in the field (field assembly not by Ruskin). Louver assemblies consisting of multiple sections in width and height will require additional structural support provided by other.



FEATURES

The ELBD375E offers:

- Drainable blade stationary louver and backdraft damper combined in a common frame system.
- Approximately 45% free area with backdraft damper blades full open, based on a 48" x 48" (1219 x 1219) size.
- All aluminum construction for low maintenance and high resistance to corrosion.

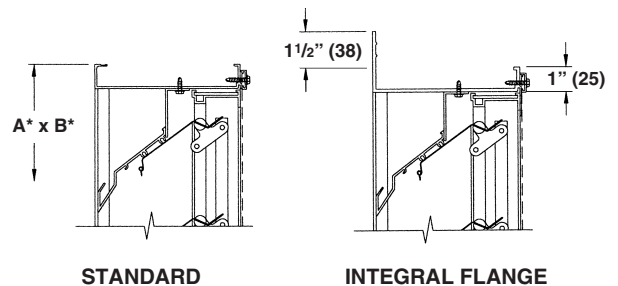
VARIATIONS

Variations to the basic design of this louver are available at additional cost. They include:

- Extended sill.
- Front or rear security bars.
- Installation angles.
- A variety of bird and insect screens.
- Selection of finishes: prime coat, baked enamel (modified fluoropolymer), epoxy, Pearledize 50 & 70, Kynar, clear and color anodize. (Some variation in anodize color consistency is possible.)

Consult Ruskin for other special requirements.

FRAME CONSTRUCTION



Dimensions in inches, parenthesis () indicate millimeters.

*Units furnished 1/4" (6) smaller than given opening dimensions.

TAG	QTY.	SIZE		FRAME	VARIATIONS
		A*-WIDE	B*-HIGH		
	4	18	30	yes ?	free area 1.42 sf, V=845, apd=0.09
	4	18	34	yes ?	free area 1.58 sf, V=760, apd=0.087
PROJECT		AUSD Franklin			LOCATION
ARCH./ENGR.					CONTRACTOR
REPRESENTATIVE					DATE

SUGGESTED SPECIFICATION

Furnish and install louvers as hereinafter specified where shown on plans or as described in schedules. Louvers shall be automatic exhaust dual combination louver damper. Stationary blades with extruded vinyl seals and automatic backdraft blades shall be entirely contained within a 6" (152) frame. Louver components (heads, jambs, sills, blades & mullions) shall be factory assembled by the louver manufacturer. Louver sizes too large for shipping shall be built up by the contractor from factory assembled louver sections to provide overall sizes required. Louver design shall limit single section blade span to 60" (1524) and shall be designed to withstand a wind load of 20 lbs. per sq. ft. (.96kPa) Additional structural supports provided by others may be required.

Louvers shall be Ruskin Model ELBD375E construction as follows:

Frame: .081" (2.1) extruded aluminum.

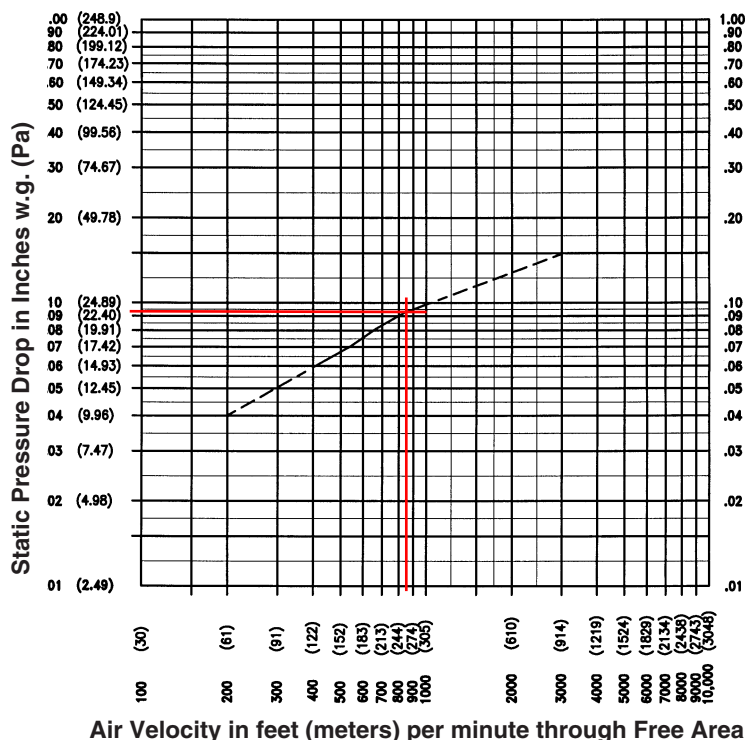
Blades: Stationary blades: .081" (2.1) wall thickness.

Gravity backdraft blades: .025" (.064) formed aluminum.

Screen: 5/8" x .040" (16 x 1) expanded, flattened aluminum bird screen in removable frame.

Finish: Select finish specification from Ruskin Finishes Card.

PRESSURE DROP



FREE AREA GUIDE

Free Area Guide shows free area in ft² and m² for various sizes of ELBD375E.

	12	18	24	30	36	42	48
	0.30	0.46	0.61	0.76	0.91	1.07	1.22
12	0.19	0.32	0.45	0.58	0.71	0.84	0.98
0.30	0.02	0.03	0.04	0.05	0.07	0.08	0.09
18	0.43	0.74	1.05	1.36	1.67	1.98	2.29
0.46	0.04	0.07	0.10	0.13	0.16	0.18	0.21
24	0.58	0.99	1.40	1.82	2.23	2.64	3.05
0.61	0.05	0.09	0.13	0.17	0.21	0.25	0.28
30	0.83	1.42	2.01	2.60	3.19	3.77	4.36
0.76	0.08	0.13	0.19	0.24	0.30	0.35	0.41
36	0.97	1.67	2.36	3.05	3.75	4.44	5.13
0.91	0.09	0.16	0.22	0.28	0.35	0.41	0.48
42	1.22	2.09	2.96	3.83	4.70	5.57	6.44
1.07	0.11	0.19	0.28	0.36	0.44	0.52	0.60
48	1.37	2.34	3.32	4.29	5.26	6.24	7.21
1.22	0.13	0.22	0.31	0.40	0.49	0.58	0.67
54	1.62	2.77	3.92	5.07	6.22	7.37	8.52
1.37	0.15	0.26	0.36	0.47	0.58	0.69	0.79
60	1.76	3.02	4.27	5.53	6.78	8.03	9.29
1.52	0.16	0.28	0.40	0.51	0.63	0.75	0.86
66	2.01	3.44	4.87	6.31	7.74	9.17	10.60
1.68	0.19	0.32	0.45	0.59	0.72	0.85	0.99
72	2.16	3.69	5.23	6.76	8.30	9.83	11.37
1.83	0.20	0.34	0.49	0.63	0.77	0.91	1.06
78	2.41	4.12	5.83	7.54	9.25	10.96	12.68
1.98	0.22	0.38	0.54	0.70	0.86	1.02	1.18
84	2.55	4.37	6.18	8.00	9.81	11.63	13.44
2.13	0.24	0.41	0.58	0.74	0.91	1.08	1.25
90	2.80	4.79	6.79	8.78	10.77	12.76	14.75
2.29	0.26	0.45	0.63	0.82	1.00	1.19	1.37
96	2.95	5.58	7.67	9.76	11.85	13.94	16.03
2.44	0.27	0.52	0.71	0.91	1.10	1.30	1.49

MAXIMUM RECOMMENDED FREE AREA EXHAUST VELOCITY THROUGH LOUVER:
1,500 fpm (457 m/min)



3900 Dr. Greaves Rd.
Kansas City, MO 64030
(816) 761-7476
FAX (816) 765-8955
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ELF211 THIN LINE STATIONARY LOUVER EXTRUDED ALUMINUM

STANDARD CONSTRUCTION

FRAME

2" (51) deep 6063T5 extruded aluminum with .060" (1.5) nominal wall thickness. Caulking surfaces provided.

BLADES

6063T5 extruded aluminum with .060" (1.5) nominal wall thickness. Blades are positioned at 45° angle and spaced approximately 3³/₁₆" (81) center to center.

SCREEN

3/4" x .051" (19 x 1.3) expanded, flattened aluminum bird screen in removable frame. Screen adds approximately 1/2" (13) to louver depth.

FINISH

Mill.

MINIMUM SIZE

6"w x 10"h (152 x 254).

APPROXIMATE SHIPPING WEIGHT

2 lbs. per sq. ft. (9.8 kg/m²).

MAXIMUM SIZE

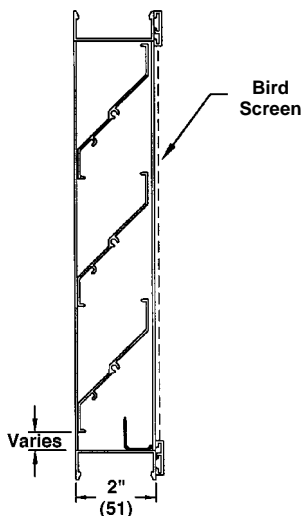
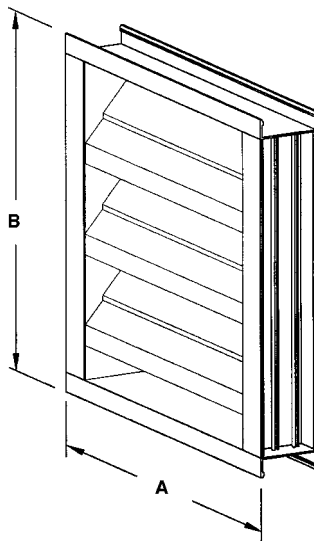
Shall be 75 sq. ft. (7m²) per section, not to exceed 120"w x 90"h (3048 x 2286) or 90"w x 120"h (2286 x 3048).

Louvers larger than the maximum factory assembly size will require field assembly of smaller sections.

SUPPORTS

Louvers may be provided with rear mounted blade supports that increase overall louver depth depending on louver size, assembly configuration or windload.

Consult Ruskin for additional information.



FEATURES

The ELF211 offers:

- 42% Free Area.
- Published performance ratings based on testing in accordance with AMCA Standard 500.
- Aluminum construction for low maintenance and high resistance to corrosion.

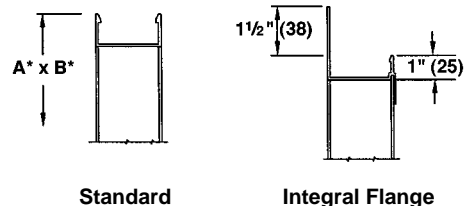
VARIATIONS

Variations to the basic design of the louver are available at additional cost. They include:

- Extended sill.
- Hinged frame.
- Front or rear security bars.
- Filter racks.
- Installation angles.
- A variety of bird and insect screens.
- Selection of finishes: prime coat, baked enamel (modified fluoropolymer), epoxy, Acrodize, Kynar, clear and color anodize. (Some variation in anodize color consistency is possible.)

Consult Ruskin for other special requirements.

FRAME CONSTRUCTION

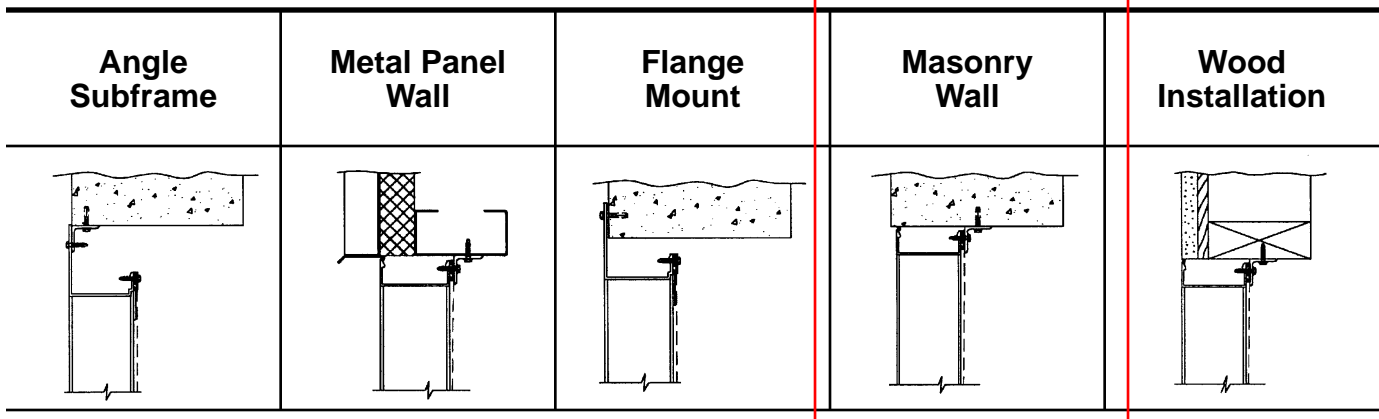


Dimensions in inches, parenthesis () indicate millimeters.

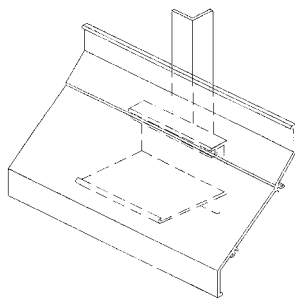
*Units furnished 1/4" (6) smaller than given opening dimensions.

TAG	QTY.	SIZE		FRAME	VARIATIONS
		A*-WIDE	B*-HIGH		
PROJECT ARCH./ENGR. REPRESENTATIVE			LOCATION CONTRACTOR DATE		

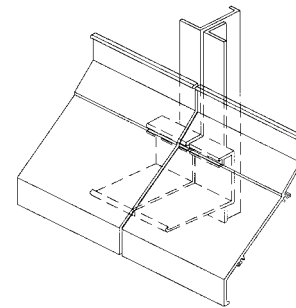
TYPICAL INSTALLATION DETAILS



STANDARD CONSTRUCTION DETAILS

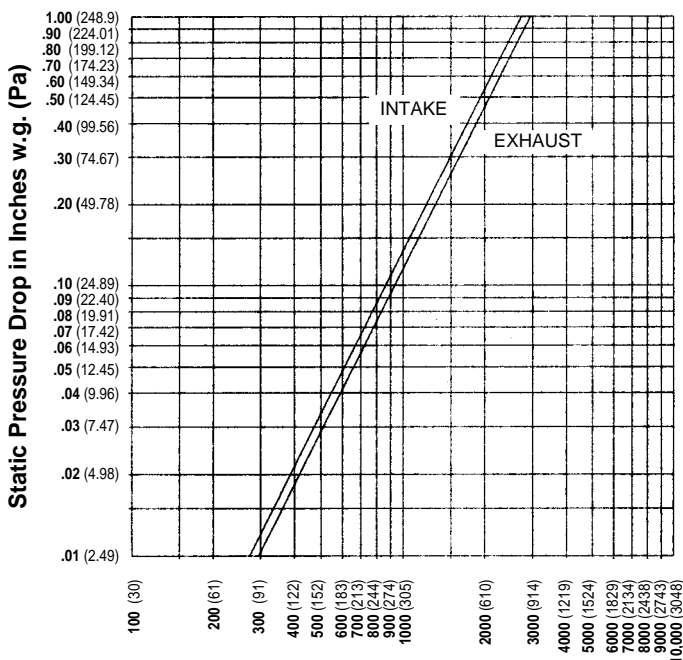


Hidden Vertical Blade Support (HVBS)



Continuous Blade Appearance at Multiple Section Junctions

PRESSURE DROP



FREE AREA GUIDE

Free Area Guide shows free area in ft² and m² for various sizes of ELF211

Width – Inches and Meters

	12	18	24	30	36	42	48	54	60
	0.30	0.46	0.61	0.76	0.91	1.07	1.22	1.37	1.52
12	0.26	0.41	0.56	0.71	0.86	1.01	1.16	1.31	1.46
0.30	0.02	0.04	0.05	0.07	0.08	0.09	0.11	0.12	0.14
18	0.45	0.71	0.96	1.22	1.48	1.73	1.99	2.25	2.50
0.46	0.04	0.07	0.09	0.11	0.14	0.16	0.19	0.21	0.23
24	0.76	1.20	1.63	2.07	2.50	2.94	3.37	3.81	4.24
0.61	0.07	0.11	0.15	0.19	0.23	0.27	0.31	0.35	0.39
30	0.95	1.49	2.03	2.57	3.12	3.66	4.20	4.74	5.29
0.76	0.09	0.14	0.19	0.24	0.29	0.34	0.39	0.44	0.49
36	1.14	1.78	2.43	3.08	3.73	4.38	5.03	5.68	6.33
0.91	0.11	0.17	0.23	0.29	0.35	0.41	0.47	0.53	0.59
42	1.32	2.08	2.83	3.59	4.35	5.10	5.86	6.61	7.37
1.07	0.05	0.08	0.11	0.14	0.17	0.20	0.23	0.26	0.29
48	1.51	2.37	3.23	4.10	4.96	5.82	6.69	7.55	8.41
1.22	0.14	0.22	0.30	0.38	0.46	0.54	0.62	0.70	0.78
54	1.70	2.67	3.64	4.60	5.57	6.54	7.51	8.48	9.45
1.37	0.16	0.25	0.34	0.43	0.52	0.61	0.70	0.79	0.88
60	1.88	2.96	4.04	5.11	6.19	7.26	8.34	9.42	10.49
1.52	0.18	0.28	0.38	0.48	0.58	0.68	0.78	0.88	0.98
66	2.20	3.45	4.71	5.96	7.21	8.47	9.72	10.98	12.23
1.68	0.20	0.32	0.44	0.55	0.67	0.79	0.90	1.02	1.14
72	2.38	3.74	5.11	6.47	7.83	9.19	10.55	11.91	13.27
1.83	0.22	0.35	0.47	0.60	0.73	0.85	0.98	1.11	1.23

Height – Inches and Meters

Free Area Velocity in feet (meters) per minute through free area.

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SECTION 26 0500
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to provide and install the Electrical Work as shown on the drawings and as specified hereinafter, including, but not limited to the following:
 - 1. Electrical provisions as outlined on the drawings, including temporary power for construction.
 - 2. Branch panels, transformers, circuit breakers, and feeders.
 - 3. Branch circuit wiring, wiring devices and connections to all equipment requiring electrical service.
 - 4. Mechanical equipment power connections, and motor starters where noted.
 - 5. All required incidental work, such as roof flashing, electrical testing, title 24 acceptance testing, and temporary power.
 - 6. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the the drawings.
 - 7. It is the intent of the drawings and specifications that systems be complete and, except as otherwise noted, be ready for operation.

1.02 RELATED WORK

- A. Division 1 - General Requirements
- B. Division 9 - Finishes
- C. Division 23 - Mechanical
- D. Section 07270 - Firestopping

1.03 INCORPORATED DOCUMENTS

- A. Requirements of the General Conditions, Supplementary Conditions, and Division 1 Sections apply to all work in this Section, unless modified herein.
- B. Published specifications, standard tests or recommended methods of trade, industry or government organizations apply to work of this Section where cited by abbreviations noted below, unless modified herein.
 - 1. 2019 California Code of Regulations.
 - 2. 2019 California Building Standards Administrative Code, Part 1, Title 24, C.C.R.
 - 3. 2019 California Building Code (CBC), Part 2, Title 24, C.C.R. (Based on 2018 International Building Code with 2016 California Amendments).
 - 4. 2019 California Electrical Code (CEC), Part 3, Title 24, C.C.R. (Based on 2017 National Electrical Code with 2019 California Amendments).
 - 5. American Society of Civil Engineers 7-10 (ASCE/SEI), Minimum Design Loads for Buildings and Other Structures.
 - 6. Underwriters' Laboratories, Inc. (UL).
 - 7. Local Utility Company regulations.
- C. All State and Municipal Codes and Ordinances.

1.04 CONDITIONS AT SITE:

- A. Visit to site is required of all bidders prior to submission of bid. All will be held to have familiarized themselves with all discernible conditions and no extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

- B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner to the complete satisfaction of the Owner.

1.05 QUALITY ASSURANCE

- A. Conformance:
 - 1. All work shall conform to the applicable requirements of Article 1.03 above.
 - 2. The Contractor shall notify the Architect, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
 - 3. If after contract is awarded, minor changes and additions are required by aforementioned authorities, even though such work is not shown on the drawings or covered in the specifications, they shall be included at Contractor's expense.
- B. Coordination:
 - 1. The Contractor shall become familiar with the conditions at the job site, and with the drawings and specifications and plan the installation of the electrical work to conform with the existing conditions and that shown and specified so as to provide the best possible assembly of the combined work of all trades.
 - 2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Architect's approval, before work proceeds in these areas. No additional costs will be considered for work, which must be relocated due to conflicts with the work of other trades.
 - 3. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.

1.06 SUBMITTALS

- A. Product Data:
 - 1. Comply with the provisions of Section 01 33 00 - Submittals.
 - 2. Within 15 days after award of the Contract, submit:
 - a. Complete electrical systems material list of all items proposed to be furnished and installed under this Division. Provide manufacturers data sheets for all devices, raceways, fixtures, equipment, and related products to be used for the Division 26 work.
 - b. Manufacturers' specifications and other data required demonstrating compliance with the specified requirements.
 - c. Manufacturers' recommended installation procedures which, when approved by the Architect, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
 - 3. Shop Drawings: Furnish shop drawings and/or equipment cuts for the following:
 - a. Panel boards and transformers. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents.
 - b. Disconnect switches
 - c. Arc flash, Short Circuit, and Protective Device Coordination Study.
 - d. Mechanical equipment. The Electrical Contractor shall review the Mechanical Submittals, and verify the voltage, wire size and overcurrent protection required. Also provide the Electrical Engineer with a copy of the submittals for their review.
 - 4. Test Reports:
 - a. Factory Tests: As specified for specific equipment.
 - b. Field Tests: Performance tests as specified for specific equipment.
 - c. Megger Tests: As specified under TESTING.

- d. When series rated circuit breakers are used, provide a letter from the manufacturer of the equipment confirming that U.L. series rating exists for all protective devices. State the available fault current from the Utility Company and indicate that the overcurrent devices exceed the available fault current at the respective point of protection.
 - e. Special Seismic Certification documentation as per CBC Section 1616A and ASCE/SEI 7-10 requirements for all equipment defined as 'critical' with an importance factor of 1.5 in Paragraph 1.10.M.3 of this Section.
 - f. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-10 requirements.
5. Maintenance and Operating Manuals:
- a. Systems Description: Description of operating procedures.
 - b. Controls: Diagrams and description of operation of each system.
 - c. Equipment: Manufacturer's brochures, ratings, certified shop drawings, maintenance data, and parts lists with part numbers. Mark each sheet with equipment identification number and actual installed condition.
 - d. Materials and Accessories: Manufacturer's brochures, parts lists with part numbers, and maintenance data where applicable. Mark each sheet with identification number of system and location of installation.
 - e. The Maintenance and Operation Manual shall be presented in a three ring binder that has tabbed sections as stated below. Provide all information in each section as stated below.
 - 1) 26 2400:
 - (a) Insert the approved submittals for the panelboards and for transformers if specified herein and/or indicated on the drawings.
 - (b) Provide the names, addresses and telephone numbers of the manufacturer and the two closest manufacturer's representatives of the equipment.
 - 2) For all other systems specified herein and/or indicated on the drawings:
 - (a) Insert the approved submittals for each system.
 - (b) Insert all operating instructions for each system.
 - (c) Provide the names, address and telephone number of the manufacturer and the closest manufacturer's representative for each system.
 - (d) Include the manufacturer's recommended maintenance of each system.
 - 3) 26 0800:
 - (a) Insert all systems testing results.
6. Record Documents: "As-builts": As specified under Paragraph 3.2 of this Section.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.
- B. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- D. This Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

1.08 SCHEDULING/SEQUENCING

- A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by this Contractor.
- B. The Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

1.09 REQUIREMENTS

- A. The contract drawings indicate the extent and general arrangements of the conduit wiring systems, etc. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable, and within thirty-five (35) days after award of the electrical contract.
- B. Unless material list and data is received as a complete and all-inclusive submittal within the stipulated time all items shall be provided as specified, with no deviations permitted.
- C. Any and all additional costs incurred by the substitution of electrical material or equipment, or installation thereof, whether architectural, structural, plumbing, mechanical or electrical, shall be borne by the Contractor under this Section.
- D. Burden of proof of equality of any substitution for a specified product is the responsibility of this Contractor.
- E. Where required by Architect to ascertain equality of substitute product, Contractor may be requested to provide the specified item and the submitted substitution for comparison, at no additional cost to the Owner.

1.10 SEISMIC CERTIFICATION AND INSTALLATION OF EQUIPMENT

- A. See Architectural and Structural Drawings and Specifications for description of Occupancy Group and Seismic Design Category applicable to this project.
- B. Provide Special Seismic Certification per CBC Section 1616A and ASCE/SEI 7-10 for all equipment and components defined as critical with an importance factor 1.5 in Paragraph 1.10.M.3 of this Section.
- C. Special Seismic Certification shall require either certification through approved analytical method or approved shake table testing in accordance with Section 13.2.5 of ASCE/SEI 7-10 or experience data in accordance with Section 13.2.6 of ASCE/SEI 7-10.
- D. Manufacturer's Seismic Certification or Project-Specific Design of Supports and Attachments for all other equipment and fixtures as per CBC Section 1616A and ASCE/SEI 7-10 requirements.
- E. Provide seismic restraints per applicable code and as specified or indicated. Design restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.
- F. Rigidly Supported Equipment, Conduits, and Raceways.
- G. Components supported by chains or simply suspended from above are not required to meet lateral seismic force requirements and seismic relative displacement requirements provided that they cannot be damaged or cannot damage any other component when subject to seismic motion. They must have ductile or articulating connections to the structure at the point of attachment.

- H. The attachment of additional external items is not permitted unless such items have either been provided by the Manufacturer, or analysis shows that their effects are supported by design.
- I. Conduit and their connections shall be constructed of ductile materials unless otherwise approved by the Architect. Conduits and their connections constructed of non-ductile materials (e.g., cast iron, no-hub pipe and plastic) shall have brace lengths reduced to one-half that allowed for ductile material.
 - 1. All trapeze assemblies supporting conduit shall be braced to resist CBC design forces considering the total weight of the elements on the trapeze.
 - 2. Seismic restraint spacing shall be in accordance with hanger spacing.
- J. Independent Supports: An independent means of secure support shall be provided for all wiring methods in non-fire-rated assemblies. Where independent support wires are used, they shall be distinguishable by color, tagging, or other effective means.

1.11 DESCRIPTION OF DEMOLITION AND REPLACEMENT WORK

- A. This project includes the demolition and replacement, modification, or enhancement of existing facilities. As such, the project scope for this contractor shall include all associated electrical upgrades and demolition/removal work at the existing buildings(s) and/or site. The intent is that all systems will be complete and functional at the completion of this contract and that all old systems, equipment, feeders, circuits, wiring, and related devices (no longer used) be completely and neatly removed. Where discrepancies between the drawings and existing conditions are noted, the Architect or Owner shall be notified immediately for resolution.
- B. As with every renovation project, the electrical work will include (and require) exploration and other field work on a daily basis to complete the new designed equipment and connections within the constraints of the existing building and existing site conditions.
- C. The contractor shall include as part of the base bid, sufficient labor hours to provide such exploration and field work throughout the duration of the project. Change orders for miscellaneous coordination of existing conditions will not be approved unless specific and latent conditions are uncovered that warrant such additional compensation or require additional work not shown on the drawings or included in the specifications, or implied by the designed conditions.
- D. New raceways and wiring to new and renovated equipment are to be installed unless otherwise noted. Where raceways are installed in accessible concealed locations (i.e. unfinished spaces or electrical / mechanical / attic spaces), EMT with wire shall be used. Where new wiring is required to be routed through existing walls and ceilings that cannot readily be accessible for new conduit, MC cable or flex conduit and wiring may be installed, fished through and secured in each space as required by Code. Non-metallic sheathed cable shall not be utilized on this project.
- E. All new raceways shall be installed concealed and all new equipment installed flush, unless otherwise noted on the drawings or in these specifications.

1.12 GUARANTEE

- A. This Contractor shall guarantee that all work executed under this Section will be free from defects of materials and workmanship for a period of one (1) year or as per the General Conditions of this project, whichever is longer. Dates shall be from the date of final acceptance of the building. The contractor shall further guarantee that he will, at his own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the guarantee. Such repair or replacement shall be guaranteed for one (1) year from the date of repair or replacement.

1.13 PERMITS AND INSPECTIONS

- A. This Contractor shall arrange for and obtain all required permits and inspections.
- B. Do not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

1.14 IDENTIFICATION

- A. Branch panels and feeder circuit breakers therein, disconnect switches, transformers, motor disconnect switches and other apparatus used for the operation of, or control of circuits, appliances or equipment, shall be properly identified by means of engraved laminated plastic descriptive nameplates mounted on apparatus using stainless steel screws. Nameplates shall have white letters with black background and be submitted to the Architect for approval. Cardholders in any form are not acceptable.
- B. Provide p-touch style labeling of circuit designations for all receptacles on the project.
- C. Each branch circuit of panel boards to have a permanently fixed number with load directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of equipment supplied by breakers. Where changes are made to existing panelboards, newly typewritten circuit directories shall be prepared to replace existing directories.
- D. Provide label on all motors: "Caution. Automatic equipment. May start at any time."
- E. Provide silk-screened or engraved identification labels on all switch box covers identifying specific loads that are not readily apparent to the user, including electroshades, projection screens, exhaust fans, audio-visual controls, etc.. Submit proposed labels to Architect for approval prior to manufacture of labels.
- F. Provide identification of all pull boxes, junction boxes, and conduit stub-ups on the project as outlined below:
 - 1. For Power Feeders:
 - a. Stencil cover with identifying circuit number.
 - b. Lettering 1" high.
 - c. Color of lettering black.
 - d. Place lettering on cover in neat manner; run parallel to long sides of box.
 - 2. For branch circuits, grounding, communication, signal, and control systems boxes and blank conduit stub-outs:
 - a. Paint inside back of each j-box, front of each cover, and ends of each blank conduit stub-out with identifying system color as listed below:
 - 1) 277/480-volt Orange
 - 2) 120/208-volt Blue
 - 3) Ground system Green

PART 2 - PRODUCTS

2.01 GENERAL

- A. Refer to applicable Division 26, 27, and 28 Sections for complete products specifications.

2.02 MATERIALS

- A. Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer.

2.03 ACCEPTABLE MANUFACTURERS

- A. Materials shall be of make mentioned elsewhere in this specification. All materials shall be the best of their several kinds, perfectly new and approved by the Underwriters' Laboratories.

- B. Where material, equipment, apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish standards of desired quality, style and utility and shall be the basis of the bid. Materials so specified shall be furnished under the contract unless changed by written approval of the Architect. Where two or more designations are listed, choice shall be optional with this Contractor, but this Contractor must submit his choice for final approval.

2.04 POSTED OPERATING INSTRUCTIONS

- A. Furnish approved operating instructions for systems and equipment where indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instruction exposed to the weather. Operating instruction shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

2.05 CATALOGED PRODUCTS/SERVICE AVAILABILITY

- A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which the work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Drawings:
 - 1. The general arrangement and location of wiring and equipment is shown on the electrical drawings and shall be installed in accordance therewith, except for minor changes required by conflict with the work of other trades.
 - 2. The Contractor shall coordinate and verify all backbox, device, lighting fixture, or equipment mounting requirements with the devices or equipment to be installed, prior to rough in.
 - 3. Drawings indicate the circuit and panel which supplies each device or fixture. Provide and install conduit and conductors to make all connections from panel to nearest device and from first device to additional devices on same circuit. Conduit size and fill shall satisfy NEC requirements. Two or three different phases supplied by a 3-phase panel may share a single neutral only if circuit positions are adjacent in the panel. Do not

exceed 4 #12 or 3 #10 conductors in a 1/2" conduit, 7 #12 or 5 #10 in a 3/4" conduit, and 11 #12 or 9 #10 in a 1" conduit, unless otherwise noted. Provide common handle-tie on breakers for multi-wire branch circuits (with common neutral), per NEC. If more than three current carrying conductors are installed in one conduit, conductor size shall be increased as required per NEC. Do not share neutrals for branch circuit runs to electronic equipment or where noted on the drawings.

4. Drawings indicate the location of all light switches. Where fixtures in a room are controlled by more than one switch, the same lower case letter is drawn adjacent to a switch and each fixture controlled by that switch. Where no lower case letter is adjacent to a switch, all fixtures in the room are controlled by that switch. Provide and install conduit and wire from fixture to switch and between fixtures as required to accomplish switching shown. Do not route branch circuit wiring for light fixtures through switch boxes. Where dimming controls are specified, provide required dimming control wiring in addition to power wiring from control device to all controlled light fixtures. Provide separate conduit for dimming control wiring unless otherwise indicated on the drawings.
 5. Drawings indicate location of all signal outlet boxes. Provide and install conduit system as required and complete system wiring, unless otherwise noted.
 6. Control wiring is generally not shown on the plans. Contractor shall refer to control diagrams and provide and install all wiring and raceways required to make all interconnections.
 7. All branch circuit wiring No. 12 or No. 10 as noted, all control wiring No. 14, except as noted next to "slash marks" on the drawings, or as noted under "Wire," as specified herein.
 8. All dimensions, together with locations of doors, partitions, etc. are to be taken from the Architectural Drawings, verified at site by this Contractor.
 9. Maintain "as-built" records at all times, showing the exact location of concealed conduits and feeders installed under this contract, and actual numbering of each circuit. Upon completion of work and before acceptance can be considered, this Contractor must forward to the Architect, updated CAD plans, corrected to show the electrical work as actually installed.
 10. Branch circuit conductors shall be #12 minimum and #10 minimum for runs longer than 150 feet.
- B. Measurements: Before ordering any material or closing in any work, verify all measurements on the job. Any differences found between dimensions on the drawings and actual measurements shall be brought to the Architect's attention for consideration before proceeding.

3.03 FIELD QUALITY CONTROL

- A. All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Architect.
- B. This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and so far as possible keep the same foreman and workmen on the job throughout.

3.04 COORDINATION

- A. In electrical rooms, where electrical equipment is located at walls with brace framing, provide and install steel channel supports for mounting of electrical equipment away from wall to avoid conflict with brace framing. Steel channel supports shall be unistrut or equal, and shall include all channels, bases, fittings, etc., as required for a complete installation.
- B. In electrical rooms, Contractor is responsible for installation of electrical equipment within the space provided. Contractor shall provide 1/4" scale plans of electrical room layouts, and

elevations of steel channel supports (where used or required) of electrical equipment for review and approval prior to any installation or rough-in

3.05 INSTALLATION/APPLICATION/ERECTION

- A. All electrical raceways and devices shall be installed concealed (for raceways) and/or flush mounted (for devices), unless otherwise noted. Provide cut-in boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans. Cut and patch to facilitate such installation to match adjacent and original finish.
- B. All cutting, repairing and structural reinforcing for the installation of this work shall be done by the General Contractor in conformance with the Architect's requirements.

3.06 EMERGENCY POWER SOURCES

- A. All emergency source circuits shall be installed in separate raceways (from normal power), per 2017 NEC 700.10(B), or the applicable code at the time of permitting.

3.07 TEMPORARY LIGHTING AND POWER

- A. Provide and install temporary lighting and power systems for the duration of construction, of adequate size to accommodate the required lighting and power loads. Coordinate with other trades to insure adequate sizing.
- B. Provide distribution equipment as required to support all construction activities.

3.08 FIRE STOPPING AND FIRE RATED PENETRATIONS

- A. All electrical equipment mounted in, on, or through fire rated construction shall be installed to maintain the fire rating of the construction.
- B. Provide fire rated pads (or other suitable assembly) around all electrical junction boxes in fire rated walls/ceilings/floors to maintain the fire rating.
- C. Provide fire rated construction around all recessed light fixtures and/or panel board / cabinets mounted flush in fire rated walls to maintain the fire rating. Coordinate depth of construction with other trades to avoid conflicts.
- D. Conduit sleeves shall be provided as a means of routing cables through fire-rated walls or floors. Openings in sleeves and conduits used for system cables and those which remain (empty) spare shall be sealed with an approved fireproof, removable sagging material. Sleeves which pass vertically from floor to floor shall be sealed in a similar manner using an approved re-enterable system. Additional penetrations through rated assemblies necessary for passage of tel/data wiring shall be made using an approved method and permanently sealed after installation of cables.

3.09 ADJUSTING AND CLEANING

- A. All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.
- B. All equipment, lighting fixtures, etc., shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

3.10 SCHEDULES

- A. Coordination: Coordinate installation of electrical items with the schedule for other work to prevent unnecessary delays in the total Work.

3.11 WARNING SIGN MOUNTING

- A. Provide the number of signs required to be readable from each accessible side, but space the signs a maximum of 30 feet apart.

3.12 PAINTING OF EQUIPMENT

- A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.
- B. Field Applied: Paint electrical equipment as required to match finish or meet safety criteria. Painting shall be as specified in the respective equipment section.

3.13 TESTS

- A. Testing and inspection: See Section 26 08 00 - Testing.

END OF SECTION

SECTION 26 0800

TESTING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work Included in This Section: All materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of the electrical work, including but not limited to the general systems noted below:
 - 1. Grounding system.
 - 2. Distribution system.
 - 3. Test additional work where specified in other Sections of these specifications or where indicated on the drawings (provide all materials, labor, equipment, services, and incidentals necessary to perform the testing and inspection of this Electrical Work):
 - a. Transformers and distribution system.
 - 4. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
 - 5. All work shall comply with Sections 26 05 00 and 26 27 00.
 - 6. In addition to the general system tests and inspections indicated above, the Contractor shall perform the following inspections and tests. The Contractor shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections:
 - a. System Grounding.
 - b. Panelboards.
 - c. Feeders.
 - 7. The purpose of these tests is to assure that all tested electrical equipment is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications.

1.02 APPLICABLE CODES, STANDARDS, AND REFERENCES

- A. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2017 (referred to herein as NETA ATS-2017).

1.03 QUALIFICATIONS

- A. Qualifications of the Testing Firm shall be as listed in NETA ATS-2017.

PART 2 - PRODUCTS

2.01 THIS ARTICLE DOES NOT APPLY TO TESTING.

PART 3 - EXECUTION

3.01 GENERAL

- A. Final test and inspection to be conducted in presence of the Authority having Jurisdiction (AHJ) or Inspector of Record (IOR). Test shall be conducted at the expense of, and managed by, the Contractor, at a mutually agreed time. Submit written test report of all tests, with test result values and overall outcome.
- B. All portions of the electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities and Contract Documents, and for proper system operation.

3.02 INSPECTIONS AND TESTS

- A. Tests: Field tests shall be performed and reports submitted, as per Section 26 05 00, Part 1.

1. Final Inspection Certificates: Prior to final payment approval, deliver to the Owner, with a copy to the Architect, signed certificates of final inspection by the appropriate local authority having jurisdiction.
2. Grounding System:
 - a. All ground connections shall be checked and the entire system shall be checked for continuity. The resistance of grounding electrodes in the system shall be measured using a 3 point fall-of-potential method. The maximum ground resistance shall be three ohms. If the measured ground resistance exceeds three ohms, install (1) additional ground rod, bonded and interconnected with the grounding electrode system.
 - b. Ground tests shall meet or exceed the requirements of the National Electric Code.
3. Power Distribution System:
 - a. Test main switchboard, panel boards, and transformers for grounds and shorts with mains disconnected from feeders, branch circuits connected and circuit breakers closed, all fixtures in place and permanently connected and grounding jumper to neutral lifted and with all wall switches closed.
 - b. Test each individual circuit at each panelboard with equipment connected for proper operation. Inspect the interior of each panel.
 - c. Check verification of color coding, tagging, numbering, and splice make-up.
 - d. Verify that all conductors associated with each circuit are in same conduit.
 - e. Demonstrate that all lights, jacks, switches, outlets, and equipment operate satisfactorily and as called for.
 - f. Perform megger tests of all new distribution system feeders prior to energizing. All Cables failing megger tests or with evidence of damage shall be removed and replaced in their entirety (no splices), at no cost to the Owner. Damaged cables may not be field repaired without specific approval of the Architect.
4. Where the following systems are specified herein and/or indicated on the drawings, verify that all equipment, components, and devices function as specified and meet all additional testing as described in related individual Sections of this specification:
 - a. Transformers and distribution system.

END OF SECTION

SECTION 26 2400
SERVICE AND DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work Included in This Section: All materials, labor, equipment, services and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below.
- B. Underground service distribution conduits and cables where noted for power and telecommunications services, including utility company coordination.
- C. Temporary power for construction.
- D. Concrete pad and ground rods for Utility installed padmounted transformer.
- E. Main switchboard, Transformers, Distribution System, Panel Boards, Grounding, and Overcurrent Protective Devices.
- F. All required incidental work, such as excavating, backfilling, testing, and temporary power.
- G. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- H. All work shall comply with Sections 26 05 00 and 26 27 00.

1.02 RELATED WORK

- A. Division 09 - Finishes
- B. Division 23 - Heating, Ventilating, and Air Conditioning

1.03 SUBMITTALS

- A. Comply with the provisions of Section 26 05 00 - Submittals.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Refer to Section 26 05 00, Part 2 - Products
- B. All new equipment shall match existing.
- C. Panelboards
 - 1. Same manufacturer as Existing Main Switchboard.
- D. Dry-type Transformers
 - 1. Eaton-Cutler Hammer, Schneider-Square D, General Electric.

2.02 MATERIALS

- A. Grounding:
 - 1. Provide and install grounding system as noted on the drawings.
 - 2. Grounding electrode conductor: bare stranded copper type, #4/0 minimum.
 - 3. Install ground wires in rigid conduit.
 - 4. All grounding electrode conductor connections "thermite" or "cad-weld" welded.
 - 5. Use approved pressure type solderless connector or use fusion welding for all connections to and bonding of grounding electrode system. All connections shall be visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
 - 6. Furnish and install solid copper or copper-clad 5/8" x 10'-0" ground rod(s). Where multiple ground rods are shown, install a minimum of 20'-0" apart. Install ground rods in accessible boxes with covers. Furnish and install 2-#4/0 bare copper cables between multiple ground rods and main switchboard ground bus.

7. Terminate grounding conduits at equipment with ground bushing, with ground wire connected through bushing.
 8. Provide No. 12 stranded (green) THHN conductor from outlet box to ground screw of every receptacle.
 9. Ground all isolated sections of metallic raceways.
 10. Provide #12 minimum stranded (green) THHN conductor sized per NEC, or as noted, connected continuously throughout branch circuit for all circuits, bonded to panel ground bus, and to all electrical devices and equipment enclosures.
 11. Grounding electrode installed as follows:
 - a. Place #4/0 bare copper cable in foundation trench; tensioned, supported in such a manner that it cannot be less than two (2) inches from bottom or side of concrete when foundation concrete is poured; not less than one hundred feet of conductor. Embed in foundation with a loop at approximate center, brought out at top of foundation at location of building service equipment for connection to service equipment and for bonding to other parts of the grounding electrode system.
 - b. Use approved pressure type solderless connector or use fusion welding for all connections to grounding electrode. Connection visible, readily accessible for testing purposes. Grounding electrode conductor between the grounding electrode and service equipment: Minimum #4/0.
 - c. Connect grounding electrode system to metallic water service entry metallic cold water pipe (if available) with nonferrous clamp and bare copper cable (sized as required) in conduit. Connection shall be accessible for inspection.
 - d. Connect grounding electrode system to effectively grounded building steel as indicated on the drawings. Use exothermic weld, connection shall be accessible for inspection.
 - e. After installation, test system using the three-point fall of potential method only. Record results and submit to Architect for approval. If resistance to ground exceeds three ohms, install an additional ground rod, bonded and interconnected to the grounding electrode system.
 - f. Connect ground bar of separately derived systems (e.g all dry-type transformers) to effectively grounded building steel at the closest possible accessible location, or if building is concrete, or the steel is not effectively grounded, to the main switchboard ground bus: Use #4/0 copper conductor for all connections.
- B. Panelboards:
1. Surface mounted, with branch circuits as indicated on the drawings.
 2. Enclosures: code gauge galvanized sheet steel with welded full flange end pieces, stretcher- leveled steel trim, backpan and door.
 3. Bussing of copper with silver-plated contact surfaces.
 4. Provide a 200% rated neutral bus for panels supplied with 200% rated feeders (incoming or outgoing). Refer to single line riser diagram for feeder ratings.
 5. Properly identify the "high leg" of 4-wire delta connected systems as required by NEC 384-3(e).
 6. Trims on surface-mounted cabinets secured with nickel-plated screws with cup washers, bottom of all trims to have lugs for resting on cabinet flange.
 7. Panels shall be 20 inches minimum in width, provided with approved gutter space, barriers and adjustable supports. Doors mounted with concealed hinges provided with combination spring latch and lock. Doors and trims and surface mounted cabinets primed and finished with one coat baked on gray enamel. All visible panel enclosures and covers in finished (occupied) areas shall be painted to match adjacent wall finish.

8. Breakers on same phase to be aligned horizontally. Each panel provided with quantity (5) spare handle locks. Install handle locks on all breakers serving fire alarm equipment.
 9. Each branch circuit of panelboards to have a permanently fixed number with one word directory, mounted under celluloid on inside of cabinet door, showing circuit numbers and typewritten description of outlets controlled by breakers. Color code mains and each breaker terminal, same as conductor insulation.
 10. Each panel shall be equipped with a copper ground bus.
 11. All panels shall be fully bussed to accept future circuit breakers, with breaker hardware provided where indicated on the drawings.
 12. Panel board submittals shall include diagrams of the circuit breaker arrangements in the panels. Arrange circuit breakers in panels exactly as shown on the panel schedules in the construction documents - no deviations permitted.
- C. Circuit Breakers:
1. General: Circuit breakers shall be molded case rated for 480 or 240 volts, multiple or single pole and amperage rating as shown on the drawings, bolt on, manually operated with "de-ion" arc chutes.
 2. For all circuit breakers rated 1,200 Amps or higher, provide an arc energy reduction measure in compliance with NEC 240.87(B), to reduce arc clearing time.
 3. Main circuit breaker shall be rated to interrupt the available short circuit current - 65,000 amps RMS unless otherwise indicated on the drawings.
 4. Distribution circuit breakers shall be rated for the amps interrupting capacity noted on the drawings or U.L. series rated with the main circuit breaker.
 5. Branch circuit breakers shall be rated for the amps interrupting capacity or U.L. series rated with the distribution and main circuit breakers, General Electric type THQB or equal, minimum 10,000 A.I.C for 120/208 volt; type TEY or equal, minimum 14,000 A.I.C for 277/480 volt.
 6. Where mechanical equipment is U.L. listed for overcurrent protection with fuses or HACR type circuit breakers, provide fuses where a fused switch is shown. Where the overcurrent protection is a circuit breaker provide HACR, (Heating, Air-Conditioning and Refrigeration) type.
 7. Provide switch rated type "SWD" circuit breakers where the circuit breaker is used as a switching device in a panelboard.
- D. Dry-Type Transformers:
1. Ventilated type.
 2. Dry-type general distribution transformers shall meet the California Title 24 requirements for energy efficiency standards and DOE 10 - CFR, Part 431 (2016) for energy efficient transformers.
 3. Transformer shall be 3 phase, 60 Hertz. Primary winding shall be Delta connected and secondary winding shall be Wye connected. The temperature rise at rated voltage and full load shall not exceed 150 degrees C with a 220 degrees C U.L. Component Recognized Insulation System. The windings shall be aluminum or copper.
 4. The higher voltage winding shall have quantity (6) 2.5% taps - (2) FCAN and (4) FCBN. Set secondary voltage for 120/208V.

PART 3 - EXECUTION

3.01 REFER TO SECTION 26 05 00 FOR DETAILS OF WORK UNDER THIS SECTION.

3.02 INSTALLATION/APPLICATION/ERECTION

- A. Excavate and trench as necessary for the electrical installation, and when the work has been installed, inspected and approved, backfill all excavations with clean earth from excavation, or

imported sandy soil in maximum 8" (eight-inch) layers, moisten and machine tamp to 95% compaction, and restore the ground and/or paving or floor surfaces to their original condition.

B. Motor Connections:

1. Install motor circuits complete for all motors by other trades
2. Furnish and install all disconnect switches, outlet boxes, etc., as required by code.
3. All motor and temperature control low voltage wiring shall be installed and connected by Division 23 Section of specifications, unless otherwise indicated on electrical drawings.

3.03 TESTS

- A. Testing and Inspection: See Section 26 08 00 - Testing.

END OF SECTION

SECTION 26 2700
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Work included in this Section: All materials, labor, equipment, services, and incidentals necessary to install the electrical work as shown on the drawings and as specified hereinafter, including but not limited to the work listed below:
 - 1. Raceways, feeders, branch circuit wiring, wiring devices, safety switches and connections to all equipment requiring electric service.
- B. Any other electrical work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.
- C. All work shall comply with Section 26 05 00.

1.02 RELATED WORK

- A. Division 09 - Finishes
- B. Division 23 - Motors and Mechanical Equipment Installation

1.03 SUBMITTALS

- A. Comply with the provisions of Section 26 05 00.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Refer to Section 26 05 00, Basic Electrical Requirements, Part 2 - Products.
- B. List of Equipment Manufacturers:
- C. Conduit and Conduit Fittings
 - 1. Allied Tube and Conduit, Wester Tube and Conduit, LTV Steel Tubular, National Electric Products, AFC, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, Killark Electric Manufacturing Company, Racor, VAW Aluminum Company, Bridgeport, Steel City, Thomas & Betts, Carlon, O.Z. Gedney, Appleton, Regal.
- D. Wire and Cable (600V)
 - 1. American Wire Company, General Wire and Cable Corporation, Okonite Company, Rome Cable Corporation, Cerrowire, American Insulated Wire, AFC Cable Systems, Essex, Simplex Wire and Cable Company, Southwire.
- E. Solderless Lugs and Grounding Connections
 - 1. Burndy Engineering Company Inc, O.Z. Gedney Company Inc, Penn Union Electric Corporation, Thomas and Betts Company Inc.
- F. Pull Boxes, Gutters, Special Cabinets
 - 1. Schneider-Square D Company, Columbia Electric Manufacturing Company, General Electric Company, Eaton Inc.
- G. Outlet Boxes
 - 1. Appleton Electric Company, Killark Electric Manufacturing Company, Lew Electric Fittings Company, National Electric Products Corporation, Racor, Steel City Electric Company, Carlon, Bowers.
- H. Wiring Devices
 - 1. Leviton, Arrow-Hart, Cooper, Hubbell, Lutron, Bryant.
- I. Conduit Racks, Hangers

1. General Electric Company, Killark Electric Manufacturing Company, Caddy, National Electric Products Corporation, Republic Steel Corporation, Rome Cable Corporation, United States Steel Corporation, VAW Aluminum Company, Superstrut, B-Line.
- J. Safety Switches (Disconnect and Fusible)
 1. Schneider-Square D Company, Eaton-Cutler Hammer Inc, General Electric Company.
- K. Fuses
 1. Bussman Manufacturing Company, Chase-Shawmut Company.

2.02 MATERIALS

- A. Raceways: Only the raceways specified below shall be utilized on this project. Substitutions shall be pre-approved in writing. All bare conduit ends (stub-ups or stub-outs) shall be provided with bushed ends or manufactured insulated throat connectors:
 1. Rigid Type - hot dip galvanized or sherardized steel, use on all exterior locations, below grade or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs, with completely watertight, threaded fittings throughout. Compression fittings are not acceptable.
 - a. All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.
 - b. ½ lap wrap all rigid steel conduit stub-ups from slab or grade to 6" above finished grade level with Scotch #50 tape.
 2. In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A "stub-up" is considered to terminate 6" above the finished surface.
 - a. Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.
 - b. Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.
 - c. All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable CBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the Owner.
 - d. Where schedule 80 PVC is coupled to schedule 40 or other raceways with differing interior dimensions, each end shall be reamed with a reaming tool to reduce the edge profile for protection of the passing conductors during the pull.
 3. Intermediate metal conduit may be used in all exposed interior locations, except that electrical metallic tubing may be used in some locations as noted below. Utilize steel compression type fittings for all exposed conduit runs, unless otherwise noted. Die-cast zinc fittings are unacceptable.
 4. Electrical metallic tubing shall be used exposed in interior electrical and mechanical rooms, in interior unfinished spaces, and in interior concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. EMT shall not be used in under-building crawl spaces or other areas subject to moisture. Set screws shall have hardened points. Die-cast zinc fittings are unacceptable.
 5. Surface mounted rectangular steel raceways and boxes: use for all surface mounted installations, unless otherwise noted (all catalog numbers listed are Wiremold - equals allowed) - color Ivory, unless otherwise noted;
 - a. #V500 for branch power runs on ceilings and walls (used with V500 series straps, elbows, connectors and V5000 series low profile boxes and covers).

- b. #2000 or 2400 low profile for larger power run requirements on ceiling or walls (used with V2000 series straps, elbows, connectors and low profile boxes and covers).
 - c. #2400D for dual service power and tel/data run requirements (used with divided V2400 boxes and covers).
- 6. Surface mounted rectangular non-metallic dual service raceways; Wiremold #5400 (Ivory) or equal with all required compatible activation covers, bezels, inserts, and blank plates for a complete installation. Refer to drawings for outlet quantities in raceway and feed points. All raceway fed flush from rear with horizontal j-boxes, unless otherwise noted.
 - 7. Use flexible conduit for all motor, transformer and recessed fixture connections, minimum ½"; "Seal tite" type used outdoors and in all wet locations, provide with code size (minimum No. 12) bare ground wire in all flexible conduit.
 - 8. All conduit cuts (factory or field cut) shall be perfectly square to the length of the conduit and cut ends shall be reamed with a reaming tool to provide a smooth edge to the passing conductors and to remove all burs and scrapes. Use of a hand file is not acceptable.
 - 9. All electrical raceways shall be installed concealed, unless otherwise noted. Cut and patch to facilitate such installation to match adjacent and original finish. All exposed conduits, where required, shall be installed parallel to building members.
 - 10. Where existing conditions preclude the installation of EMT in existing walls to remain, provide and install cut-in type boxes and "fish" flexible MC or flex conduit and wire through existing walls to remain, unless shown otherwise on plans.
 - 11. Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.
 - 12. Provide chrome escutcheon plates at all exposed wall, ceiling and floor conduit penetrations.
 - 13. Support individual suspended conduits with heavy malleable strap or rod hangers; supports for ½ inch or ¾ inch conduit placed on maximum 7-foot centers; maximum 10-foot centers on conduits 1 inch or larger.
 - 14. Support multiple conduit runs from Kindorf B907 channels with C-105 and C-106 straps.
 - 15. Conduit bends - long radius.
 - 16. Flash conduits through roof, using approved roof jack; coordinate with General Contractor.
 - 17. To facilitate pulling of feeder conductors, install junction boxes as shown or required.
 - 18. All empty conduits on the project shall be provided with a nylon pull rope to allow pulling of future conductors intended for the specific raceway. Provide plastic wire-tie style nameplate tags on each end of pull rope with printed identification of conduit use and the location of the opposite end of the rope. Pull ropes for telecommunications service conduits shall meet the utility company requirements.
 - 19. Where conduits pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. Installed condition shall allow for a minimum deflection of raceway and wire (in any direction) equal to the structural expansion joint dimension (building to building). No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement.
 - 20. Minimum cover of conduits in ground outside of building - 36 inches, unless otherwise noted.
 - 21. Provide and install exterior wall conduit seals and cable seals in the locations listed below. Coordinate installation and scheduling with other trades:
 - a. Conduit seals through exterior wall or slab (below grade): O.Z. Gedney series "FSK" in new cast in concrete locations, series "CSM" in cored locations.

- b. Conduit seals through exterior wall or slab (above grade): O.Z. Gedney series "CSMI."
 - c. Cable seals at first interior conduit termination after entry through exterior wall or slab: O.Z. Gedney series "CSBI." Coordinate quantity of conductors at each location.
- B. Outlet Boxes and Junction Boxes. Verify all backbox requirements with devices to be installed prior to rough-in.
 - 1. One piece steel knockout type drawn boxes, unless otherwise noted, sized as required for conditions at each outlet or as noted.
 - 2. Flush-mounted boxes equipped with galvanized steel raised covers for device mounting flush with finished surface. Provide extension rings as required on all acoustical or additional wall treatment areas to bring top of cover flush with finished surface (coordinate with architectural drawings). Devices shall be capable of being tightly mounted to boxes without distorting or bending device or mounting hardware.
 - 3. Receptacle outlets - not smaller than 4-inch-square in furred walls, with raised cover for single device; ganged where required.
 - 4. Outlet and switch boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof "Bell" type boxes are not acceptable.
 - 5. All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
 - 6. Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.
 - 7. Pull boxes: All site pull boxes shall be flush in-ground concrete, with engraved covers identifying service use (i.e. electrical, communications, etc.). Boxes shall be Nema 250, Type 6, outside flanged, with recessed cover for flush mounting, by Christy or equal, with required depth to provide box and conduit depths shown or required.
 - a. Provide concrete covers for all boxes in planted or paved areas (up to available concrete cover size).
 - b. Provide galvanized steel covers for all larger boxes (when concrete is not available), or in traffic areas. No cast iron covers.
 - c. Provide bolted covers and slab bottoms (with grouted perimeter) or vault type boxes for all electrical distribution and signal system pull boxes used for site distribution, to prevent rodent entry. No collar type boxes with dirt or gravel bottoms
 - d. Provide drain hole at bottom of all vault type boxes, with loose aggregate base below, for proper drainage.
 - e. All covers to be completely flush with finished adjacent surfaces.
 - f. Provide galvanized steel H20 rated covers and installation of box rated for H20 in all traffic areas.
 - g. Provide pullboxes per utility company specifications for all electrical primary and secondary services and for telecommunications service runs. Verify exact size and type prior to order with each utility company.
- C. Wire and Cable (line voltage and signal systems):
 - 1. 600-volt class where used for or run with line voltage power wiring, insulation color coded, minimum No. 12 AWG for power branch circuits, No. 14 for power control circuits, and wiring size and type as directed by signal system manufacturer for each signal system.
 - 2. All conductors shall be copper.
 - 3. Size and insulation type:
 - a. Standard locations: #12 to #1 AWG: THWN for wet locations and THHN for dry locations. #1/0 through #4/0 AWG: XHHW (55 Mils). 250MCM and larger: XHHW

- (65 Mils). All wire sizes used shall be based on a 75 degree insulation rating, unless specifically used with 90 degree rated breakers and devices.
- b. All wiring (power and signal) installed underground between buildings, or in wet or damp locations, shall be outside listed and rated for wet locations.
 - c. High temperature and non-standard locations: Provide wire type and insulation category suitable for area of use as defined in NEC table 310-13.
4. Conductors No. 8 and larger and as otherwise noted on drawings shall be stranded. Power conductors No. 12 and No. 10 shall be solid or stranded. Power conductors No. 14 or smaller shall be solid.
 5. Provide signal system wiring for each system to meet the system manufacturers requirements and recommendations for each device or equipment type. Signal wiring systems shall be provided with shielding and/or insulation type and cable quantities as directed by the manufacturer, and meet all NEC requirements for locations used.
 6. Install all wiring branch circuits and feeders (low voltage and line voltage) in conduit unless noted otherwise on the drawings. Contractor shall mandrel all feeders and pass a "sock" (or utilize other suitable means) through each raceway prior to pull to remove all water and construction debris. All raceways shall be completely clear of any obstructions or debris and all cut ends shall be reamed, prior to pull. Utilize pulling compound on all runs to insure minimum friction and pulling tension.
 7. Megger test all feeders prior to energizing. See section 26 08 00 for additional information.
 8. Approximately balance branch circuits about the neutral conductors in panels.
 9. Connections to devices from "thru-feed" branch circuit conductors to be made with pigtails, with no interruption of the branch circuit conductors.
 10. Neutral conductor identified by white outer braid, with different tracers of "EZ" numbering tags used where more than one neutral conductor is contained in a single raceway.
 11. Neatly arrange and "marlin" wires in panels and distribution panelboards with "T and B Ty-rap" or approved equal plastic type strapping.
 12. All wire and cable shall bear the Underwriters' Label, brought to the job in unbroken packages; wire color-coded as follows:

a. Voltage	Phasing	A	B	C	N
b. 120/208	3PH4W	Black	Red	Blue	White
c. 2083PH	3W	Black	Red	Blue	--
d. 277/480	3PH4W	Brown	Orange	Yellow	White
e. 4803PH	3W	Brown	Orange	Yellow	--
 13. The equipment grounding conductor shall be insulated copper; where it is insulated, the insulation shall be colored green.
 14. Label each wire of each electrical system in each pull box, junction box, outlet box, terminal cabinet, and panelboard in which it appears with "EZ" numbering tags indicating the connected circuit numbers.
 15. Install feeder cables in one continuous section unless splices are approved by Architect. Exercise care in pulling to avoid damage or disarrangement of conductors, using approved grips. No cable shall be bent to smaller radius than the spool on which it was delivered from the manufacturer. Color code feeder cables at terminals. Provide identifying linen tags in each pullbox.
- D. Switches: Model numbers are Hubbell, color to be selected by architect, unless otherwise noted. All switches to utilize screw terminals for wire connections - no plug-in terminations:
1. Single Pole - No. HBL1221
 2. Motor Rated Double Pole (30A) - Hubbell No. 7832

- E. Receptacles: Mounting straps and contacts shall be one piece design, constructed of minimum .050" solid brass. Base shall be high strength, heat resistant, glass reinforced nylon. Device shall accept up to #10 wire, side or back wired with screw terminals - no plug-in terminations. Hubbell, Leviton, Pass & Seymore, or equal. Color to be selected by architect, unless otherwise noted. Numbers listed below are Hubbell:
1. 15A 3PG 125 volt duplex - No. HBL5262
 2. 20A 3PG 125 volt duplex - No. HBL5362
 3. 20A 3PG 125 volt ground fault interrupter receptacle; GFI receptacles shall conform to the 2006 UL requirements to a) interrupt power to the unit in the event of internal failure, or b) provide an audible or visual indication of internal failure of the GFI; No. GF20 or equal. Through wiring to down stream GFI designated receptacles is not acceptable.
 4. All receptacles located in exterior or wet locations shall be corrosion resistant with UV stabilized body.
- F. Plates: Leviton, or equal, except as noted:
1. The color of all faceplates shall match the color of the devices installed under/in the faceplate, except as specifically noted otherwise.
 2. For flush outlet boxes, for switches, and receptacles: nylon, color to be selected by architect, unless otherwise noted.
 3. Plates for surface-mounted outlets: galvanized steel unless otherwise noted.
 4. Weatherproof duplex receptacle plates for exterior locations with ground fault interrupter receptacles in type FS or FD boxes - Hubbell #WPFS26 or compatible equal. Verify cover compatibility with box type and device installed.
 5. Weatherproof "in-use" cover, vertical or horizontal mount, for exterior with GFCI receptacles. Die-cast metal alloy, TayMac MX series or equal with openings to match installed devices.
 6. Locking plates for duplex receptacles where noted; Pass & Seymour #WP26-L (non-weather proof).
 7. Locking plates for duplex exterior GFCI receptacles (or in wet or damp locations); Heavy duty cast aluminum flush cover with locking latch and key, Pass & Seymour #4600 with appropriate mounting plate for type of device installed. Coordinate backbox requirements and finished wall trim-out with wall installer prior to rough-in to insure an adequate and neat trim appearance upon completion.
- G. Equipment Disconnects: All disconnects shall be located to allow proper code required clearance in each area. Locations shown on drawings are diagrammatic only. The contractor shall coordinate exact locations in the field (with other trades) prior to rough-in to insure proper clearances.
1. Motor Disconnect Switches and Safety Switches: General Electric Company Heavy Duty Type "THD", cover interlocked with operating handle so that cover cannot be opened with switch in closed position and switch cannot be closed with cover in open position. 240V or 480V rating, single or multi-pole as required or as noted on drawings, in Nema 1 enclosure indoors or Nema 3R enclosure outdoors unless otherwise noted. Provide dual element motor circuit fuses sized as recommended by equipment manufacturer (for final equipment actually installed).
 2. Code required disconnects: Provide a local disconnect in addition to the branch circuit protection device for all equipment as required by code (whether shown or not). Disconnects shall consist of a motor rated switch (or disconnect) for all motor loads less than 3/4HP or other suitable disconnect sized to match branch circuit conductors and load current of equipment, with number of poles as required.
- H. Lugs and Connectors: Thomas and Betts "lock-tite", for No. 4 and larger wire; 3M "Scotchlock" fixed spring screw-on type wire connectors with insulator for No. 6 and smaller wire.

1. All splices shall be made up with screw-on type connectors - no plug-in or push-in style connectors acceptable. Wires shall be solidly twisted together with electricians pliers before screw-on connector is installed to ensure a proper connection in the event of wire nut failure. No exceptions.
 2. Connectors listed or labeled for "no wire twisting required" are not an acceptable substitute for actual wire twisting.
 3. Utilize porcelain type connectors in all high temperature environments (above 105 degrees Celsius).
- I. Splice Insulation: "Scotch" electrical tape with vinyl plastic backing or rubber tape with protective friction tape for interior work.
1. Splices in electrical cables of 600 volt insulation class in underground system duct shall be made only in accessible locations such as pullboxes, light pole handholes, etc., using a compression connector on the conductor and by insulating and waterproofing (for exterior and underground locations) by one of the following methods:
 - a. Cast type splice insulation shall be provided by means of a molded casting process employing a thermosetting epoxy resin insulating material which shall be applied by a gravity poured method or by a pressure injected method. The component materials of the resin insulation shall be in a packaged form ready for convenient mixing after removing from the package. Do not allow the cables to be removed until after the splicing material has completely set.
 - b. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be applied. When the mold is in place around the joined conductors, the resin mix shall be prepared and poured into the mold. Do not allow cables to be moved until after the splicing materials have completely set.
- J. Identification: Refer to Section 26 05 00.
- K. Firestopping: as manufactured by 3M Fire Protection Products or equal.
1. Fire-rated and smoke barrier construction: Maintain barrier and structural floor fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, and at other construction gaps.
 2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

PART 3 - EXECUTION

3.01 REFER TO BASIC ELECTRICAL REQUIREMENTS - SECTION 26 05 00 FOR WORK UNDER THIS SECTION.

3.02 TESTS

- A. Testing and Inspection: See Section 26 08 00 - Testing.

END OF SECTION

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 5000 - Temporary Facilities and Section 01 5600 Temporary Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 7000 - Contract Closeout: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.
- D. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Comply with other requirements specified in Section 01 7000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

- 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. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the limits indicated on drawings.
- D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.

- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 - 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION